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# Teaching the Smartphone Generation: How Cognitive Science Can Improve Learning in Law School

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## I. INTRODUCTION

Lara Law Student sits down for her first year torts class, opens her laptop, and puts her iPhone on her desk. She quickly checks her email while her professor begins talking about the reading. A friend told her about some pictures posted on Facebook that she HAS to see. She quickly goes to Facebook while the professor is reviewing the facts of a case. She feels confident she can check the pictures out, "untag" herself from any that are unflattering, and check back into class before she misses anything important. Suddenly she realizes that her professor has called on someone in her row, so she logs off Facebook and listens. The professor is discussing the elements of negligence, which reminds Lara that her mother was sued for negligence for a rear-end collision a few months before. She sends her mother an email to find out about the lawsuit. The professor then calls on a classmate next to Lara to discuss the holding of a case, so she switches back to listening. Lara begins typing, but then her phone vibrates signaling a text message from her roommate, confirming their lunch plans. Lara texts back, then returns to note taking. Where was she again? It takes her a moment to orient herself to the lecture and she realizes that she missed something about the element of duty. Lara is not concerned because she knows she can look at the her friends' notes, and she has an outline that a 2L gave her, so she's sure she'll figure it out later.

Scenes like this are becoming the norm across law school classrooms nationwide. Today's law student enters law school as a digital native, constantly "plugged in" and accessing information at a moment's notice, often during class time itself. Yet scholars agree that these students are entering law school with weaker reading and reasoning skills than prior generations, due in large part to the way students multitask through life. This article aims to address the problems caused by the intersection of these two issues by applying cognitive learning theory to the law school environment. Part One examines the characteristics of our current students by describing their skills and learning styles upon arriving at law school. Part Two examines cognitive learning theory insofar as it can inform our teaching andragogy: specifically, how do today's students learn, how can we help our students learn better, and what effect does their multitasking have on learning? The final section suggests ways for students and educators to better translate the information offered in class into knowledge. Ultimately, this article suggests teaching students about metacognition and effective study techniques while also encouraging professors to design and plan their courses by adopting cognitive

learning theories and using more visual aids, visual exercises, and assessments to help students better learn the material.

## II. TODAY'S LAW STUDENTS

It seems obvious that a good way to prepare to teach would be to learn about the students one is teaching. After all, "[o]ne of the basic tenets of good teaching is that you have to start where students are," yet, most law school professors teach in the same style in which they were taught many years prior.[1] There is little incentive for professors to spend the time to learn about their students' learning styles or abilities, and most law schools do not encourage or have any programmatic efforts directed at improving the teaching abilities of their professors.[2] In fact, the criteria by which law schools hire new law teachers and measure their performance ignore teaching skill or effectiveness.[3] Instead, professor hiring and performance review is based primarily on a record of, or potential for, scholarship, which serves as a key criterion evaluated in tenure review.[4] This emphasis on scholarship is based on the theory that increased publication will result in a law school's improved reputation within the legal community, and corresponding upward movement of the school in U.S. News & World Report rankings.[5] These rankings, however, do not take into account teaching skill or effectiveness.[6] "Thus, law professors, like most academics, have an incentive to be minimally competent teachers and excellent scholars."[7]

Incoming law school students vary in their ability, skills, background, self-knowledge and experiences.[8] Many law school professors believe they learned quite well without anyone considering their individual learning styles and, after

1. David Glenn, *Divided Attention*, CHRON. HIGHER EDUC., CHRON. REV., Feb. 28, 2010, *available at* http://chronicle.com/article/Scholars-Turn-Their-Attention/63746 (quoting N. Katherine Hayles [internal quotation marks omitted]); *see* Michael Hunter Schwartz, *Teaching Law By Design: How Learning Theory and Instructional Design Can Inform and Reform Law Teaching*, 38 SAN DIEGO L. REV. 347, 349-50 (2001). Law school instruction has remained generally unchanged since Christopher Columbus Langdell's time at Harvard Law School in the 1870's, when he developed what is now characterized as the "Vicarious Learning/Self-Teaching Model." *See* Schwartz, *supra*, at 350, 353; *see generally* ROBERT STEVENS, LAW SCHOOL: LEGAL EDUCATION IN AMERICA FROM THE 1850S TO THE 1980S (1983) (explaining and analyzing historical developments in the American legal education system).

2. *See* Schwartz, *supra* note 1, at 349-50, 356 & n.25.

3. Schwartz, *supra* note 1, at 360; *see also* Marin Roger Scordato, *The Dualist Model of Legal Teaching and Scholarship*, 40 AM. U. L. REV. 367, 373-74 (1990) (explaining that there is a greater incentive for law school professors to focus on the production of scholarship, rather than the "reworking or improvement of the courses they teach" if they seek to increase their salary or teach at other institutions).

4. Schwartz, *supra* note 1, at 360-61.

5. *See* Schwartz *supra* note 1, at 360 & n.44; *see also* DENISE S. GATER, THE LOMBARDI PROGRAM ON MEASURING UNIV. PERFORMANCE, A REVIEW OF MEASURES USED IN U.S. NEWS & WORLD REPORT'S "AMERICA'S BEST COLLEGES" 8 (2002) (observing that a terminal degree is unconnected to teaching effectiveness, and research institutions pay top researchers the highest salaries).

6. Schwartz, *supra* note 1, at 360.

7. *Id.* at 360-61.

8. *Id.* at 363. The author notes that he is unable "to locate a single law review article or text," outside of academic support materials, that would consider this variety, and suggests adapting teaching techniques to these particularities. *Id.* at 363 n.49

teaching for many years, are resistant to the idea that there is any change that could or should be made that would help their students learn better.[9]  Assuming we should consider the evolving characteristics of our students, understanding those characteristics is the starting point to teaching to the needs of our current students.

## A. Millennials

Significant scholarship has been devoted to the characterization and description of the "millennial student" ("Millennials").[10]  Millennials were born between 1977 and 1998 and started arriving at law schools around the turn of the 21st century.[11]  Because Millennials were wanted and planned by their parents, and are closely connected to them, they often feel individually and collectively special.[12]  Not surprisingly, Millennials are highly protected and sheltered by their parents.[13]  They are used to significant parent involvement, and they want and expect parents and other authority figures to protect and nurture them and to resolve their conflicts.[14]  Millennials are motivated, goal-oriented, and high achieving.[15]  Even in elementary school, their parents expected high grades and achievement from them in extracurricular activities.[16]  Despite an inherent focus on achievement and feeling pressured to succeed, this generation has received trophies and accolades whether they win or merely participate.[17]  Due to Millennials' focus

9. *See id.* at 364-65.  Schwartz opines that most law professors did well themselves in law school and due to their own successes, can justify their unchanged methods.  *See id.* at 365.

10. *See* Timothy W. Floyd, Oren R. Griffin, & Karen J. Sneddon, *Beyond Chalk and Talk: The Law Classroom of the Future*, 38 OHIO N.U. L.REV. 257, 273-76 (2011) (characterizing Millennials and highlighting desirable traits for educators to strategically target); Paula Gleason, *Meeting the Needs of Millennial Students,* IN TOUCH WITH STUDENT SERVS. NEWSL. (Div. of Student Servs., Cal. State Univ., Long Beach, Long Beach, Cal.), Winter 2008, *available at* http://www.csulb.edu/divisions/students2/ intouch/archives/2007-08/vol16_no1/01.htm (defining four main generations and distinguishing Millennials).

11. Diane Thielfoldt & Devon Scheef, *Generation X and The Millennials: What You Need To Know About Mentoring the New Generations*, A.B.A. LAW PRAC. MGMT. SEC., LAW PRAC. TODAY, Aug. 2004, *available at* http://www.abanet.org/lpm/lpt/articles/mgt08044.html.

12. *See* Gleason, *supra* note 10.

13. Andrea McAlister, *Teaching the Millennial Generation*, AM. MUSIC TCHR., Aug.-Sept. 2009, at 13, 14 (dubbing parents of Millennials as "helicopter parents"); Kathleen Vinson, *Hovering Too Close: The Ramifications of Helicopter Parenting in Higher Education*, 29 GA. ST. U. L. REV. 423, 424 (2013) (stating that "[h]elicopter parenting is a term used to describe the phenomenon of a growing number of parents—obsessed with their children's success and safety—who vigilantly hover over them, sheltering them from mistakes, disappointment, or risks; insulating them from the world around them").

14. *See* Gleason, *supra* note 10; Christy Price, *Why Don't My Students Think I'm Groovy?: The New "R"s for Engaging Millennial Learners,* 23 TEACHING PROF. 1, 2 (2009) (asserting helicopter parents of Millennials contribute to the delay of students' independence).

15. *See* Gleason, *supra* note 10; McAlister, *supra* note 13, at 14.

16. *See* Gleason, *supra* note 10.

17. *See* McAlister, *supra* note 13, at 14.  In fact, McAlister argues that "[t]oday's students are much more lauded than any preceding generation and have come to expect these types of rewards." *Id.  See also* Joan Catherine Bohl, *Generations X and Y in Law School: Practical Strategies for Teaching the "MTV/Google" Generation*, 54 LOY. L. REV. 775, 789-90 (2008).  Bohl describes the self-esteem movement in public education, noting its downward evolution, resulting less rigorous academic requirements, less vigorous criticism of student work, and fewer low grades for fear they would lower student self-esteem.  *See id.* at 788-89.  Not surprisingly, students are more likely to expect good grades and be rewarded for effort rather than achievement.  *Id.* at 789-90.

on achievement, rather than personal development, they may not value the benefit of lifelong learning.[18]  Millennials want and need instant feedback.[19]  This desire often clashes with the typical first year law-school experience, where they may receive little to no feedback before their final exam, which constitutes most or their entire grade.[20]

## B. Digital Natives

Most, if not all, of today's law students are "digital natives."[21]  Digital natives grew up on the Internet and in a world filled with technology.[22]  On average, over 20% of today's law students started using computers at age five.[23]  By 2003, at least 86% of American children were competent in using computers.[24]  As these children grow, their use of technology and the Internet encompasses music, entertainment, networking, and communication.[25]  They may even prefer to text message or use other technology-based communication rather than make a phone call or have a face-to-face conversation.[26]

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18. *See id.* at 780-81 (explaining Millennials' penchant for linking educational processes to entertainment).

19. *See id.* at 796-98.  Millennial students have developed a "just in time" attitude, where they block out information that does not seem immediately necessary.  *Id.* at 796.  Educators can be more effective by advocating the importance of information to students and transforming classroom time to actively engage full student participation.  *See id.* at 796-77; *see also* Robin A. Boyle, *Employing Active-Learning Techniques and Metacognition in Law School: Shifting Energy from Professor to Student*, 81 U. DET. MERCY L. REV. 1, 3-4 (2003) (describing the widely utilized Socratic method as contributing to the passive role of students).

20. Bohl, *supra* note 17, at 797-98.  Millennial students learn more effectively from active learning, such as in short-term projects with professor access for input and guidance, because it chunks the information into more manageable quantities and actively engages Millennials' attention to the material. *Id.*

21. *Id.* at 776.  "Digital natives" are masters of technology, simultaneously learning the language of computers with English.  *Id.*; *see* Samantha A. Moppett, *Control-Alt-Incomplete? Using Technology to Assess "Digital Natives,"* 12 CHI.-KENT J. INTELL. PROP. 77, 78 (2013).  *See also* Floyd, *supra* note 10, at 275 (describing that it is necessary for Millennials to integrate their technological skills into academic pursuits).

22. *See generally* DON TAPSCOTT, GROWING UP DIGITAL: THE RISE OF THE NET GENERATION (1998) (explaining that the Internet's shared, rather than hierarchical, delivery system is central to the digital natives', or "net generations'," culture of interaction).

23. Bohl, *supra* note 17, at 779; *see* STEVE JONES, PEW INTERNET & AM. LIFE PROJECT, THE INTERNET GOES TO COLLEGE: HOW STUDENTS ARE LIVING IN THE FUTURE WITH TODAY'S TECHNOLOGY 2, 6 (Sept. 15, 2002), http://www.pewInternet.org/Reports/2002/The-Internet-Goes-to-College.aspx.

24. Bohl, *supra* note 17, at 780; JENNIFER CHEESEMAN DAY ET AL., U.S. CENSUS BUREAU, CURRENT POPULATION REPORTS: COMPUTER AND INTERNET USE IN THE UNITED STATES: 2003, at 4 (2005), *available at* http://www.census.gov/prod/2005pubs/p23-208.pdf.  A decade ago, more than 90% of children in kindergarten through twelfth grade were using computers at school, at home, or in both, while only 64% of adults were using computers at work or at home.  DAY, *supra*, at 7, 9-11.

25. *See* TAPSCOTT, *supra* note 22, at 4-5.

26. *See* JOHN PALFREY, HARV. LAW SCH. FAC. WORKSHOP, DIGITAL NATIVES GO TO LAW SCHOOL 12-13 (2010), http://www.law.harvard.edu/faculty/faculty-workshops/john.palfrey.spring.2010.faculty.workshop.pdf (arguing that student multi-tasking gives cause for concern because digital natives exhibit shorter attention spans); *see also* AMANDA LENHART ET AL., PEW INTERNET & AM. LIFE PROJECT, THE INTERNET AND EDUCATION: FINDINGS OF THE PEW INTERNET AND AMERICAN LIFE

Digital natives use technology to integrate their work into their lives; they are not constrained by traditional ideas of studying.[27] For these students, learning rarely happens in a library.[28] They are used to scrutinizing everything and being given instant access to information.[29] They want entertainment and play integrated into their work, education, and social life.[30] Digital natives have been called the collaboration and relationship generation—they are used to using sites like Facebook, Instagram, Twitter, and Pinterest to instantly share their thoughts and quickly communicate with their peers.[31] This tendency also causes them to expect and desire quick feedback on assignments.[32] They have "a need for speed"—that is, technology has made rapid communication the new norm.[33] Contrasted with the way in which most law professors use technology, the rift in communication norms is wide.[34]

### C. The Google Generation: Jet Skiers, Not Scuba Divers[35]

Today's law students are also part of what has been called the "Google

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PROJECT 4 (Sept. 1, 2001), http://www.pewInternet.org/~/media//Files/Reports/2001/PIP_Schools_Report.pdf.pdf (noting that the Internet has "revolutionized many time-honored short cuts" for today's students).

27. *See* Moppett, *supra* note 21, at 97-98; *see also* Bohl, *supra* note 17, at 779-82 (suggesting that the effect of education linked to entertainment is that students are experiencing education from a consumer vantage point).

28. *See* LENHART, *supra* note 26, at 4. Not surprisingly, during online surveying for the Pew Internet and American Life Project, a 15-year old boy maintained:

> I find the Internet most useful when I need help for school . . . . Without the Internet you need to go to the library and walk around looking for books. In today's world you can just go home and get into the Internet and type in your search term. The results are endless. There is so much information that you have to ignore a lot of it.

*Id.* (internal quotation marks omitted).

29. *See* LENHART, *supra* note 26, at 4-5 (discussing the variety of online tools students not only have access to, but must sift through, in their quest for information on the Internet).

30. *See* Bohl, *supra* note 17, at 779-82.

31. *See, e.g,* DON TAPSCOTT & ANTHONY D. WILLIAMS, WIKINOMICS: HOW MASS COLLABORATION CHANGES EVERYTHING 47 (2008) (referring to this generation as the "collaboration generation"); Bohl, *supra* note 17, at 783 (discussing how this generation prefers to work in collaborative environments).

32. *See* Floyd, *supra* note 10, at 275 (encouraging faculty "to utilize creative classroom simulations" and give Millennials "immediate feedback"); Eric Hoover, *The Millennial Muddle,* CHRON. HIGHER EDUC., Oct. 16, 2009, at A1 (encouraging more group work and short assignments to satisfy students' desire for regular feedback); *but see* Mano Signham, *More than 'Millennials': Colleges Must Look Beyond Generational Stereotypes,* CHRON. HIGHER EDUC., Oct. 16, 2009, at A104 (criticizing generational stereotyping and suggesting that, rather than defining "Millennials" as a group which "demand[s] instant gratification," and suggesting that professors should treat students as individuals).

33. *See* Matt Richtel, *Growing Up Digital, Wired for Distraction*, N.Y. TIMES, Nov. 21, 2010, at A1.

34. *See* Floyd, *supra* note 10, at 258, 273-75 (noting a need for instructors to incorporate teaching strategies based on Millennials' technology comfort levels).

35. *See* NICHOLAS CARR, THE SHALLOWS 7 (2010). Carr writes "[w]hether 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." *Id.* at 6-7.

generation." [36]  In his book *The Shallows*, Nicholas Carr writes about the way we read and research for information and the impact that has on the information retained and processed.[37]  According to Carr, today's students do not read front to back, rather, they are "skilled hunters" for information.[38]  Instead of reading a document through once to understand the context of the work, since students often read on a screen, they tend to click hyperlinks and move on to other cross-referenced material, jumping from text to text, sometimes without reading the original document even once all the way through.[39]  Reading has become such an issue that an English professor lamented that she could not get her literature students to read books.[40]

The Internet has made so much information available to us, more than we could possibly retain in our brains, that we are more often "handing off the job of remembering" things to technology.[41]  Research at Columbia University showed three new realities about how we process information in the digital age.[42]  First, where subjects did not know the answer to a question, the study revealed that rather than thinking about the subject matter of the question, they would think about where they could find the nearest Internet connection.[43]  Second, when subjects

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36. *See* Bohl, *supra* note 17, at 791.  Improved and increased access to technology broke the link between law professors as transmitters of information and their students.  *Id.*  Past generations of students revered their professors as proverbial "gurus" while the current "Google generation" feels that they themselves are experts due to their information gathering skills.  *See id.* at 791-94.

37. *See* CARR, *supra* note 35, at 6-28.  Carr opines that the Internet "is chipping away [his] capacity for concentration and contemplation," and he is not alone in his troubles focusing on longer written pieces: one researcher dubbed his thinking as having absorbed a "staccato" form.  *Id.* at 6-7.  However, some view this "high-speed data processing" ability to quickly scan copious amounts of information as an efficiency tool that is making individuals "smarter."  *Id.* at 8, 16.  Other researchers have "found the rapid pace of technology can lead to more nimble thinking," but that "trends are leading to a future in which most people are shallow consumers of information" and that "immediate gratification is the default response."  *See* Christopher Murther, *The Growing Culture of Impatience Makes Us Crave More and More Instant Gratification*, BOS. GLOBE, Feb. 1, 2013, *available at* http://www.boston.com/lifestyle/specials/2013/02/01/the-growing-culture-impatience-where-instant-gratification-makes-crave-more-instant-gratification/eu5SPWCVTmFp9Nm6dUndhP/story-1.html.

38. *See* CARR, *supra* note 35, at 9 (explaining that books become "superfluous" after one becomes a "skilled hunter" online).

39. *See* CARR, *supra* note 35, at 8.  In fact, Carr writes, "[f]or some people, the very idea of reading a book has come to seem old-fashioned, maybe even a little silly—like sewing your own shirts or butchering your own meat."  *Id.*

40. *See id.* at 9 (quoting Duke University professor, Katherine Hayles).

41. Annie Murphy Paul, *Your Head Is in the Cloud*, TIME, Mar. 12, 2012, at 64, 64 (outlining three main consequences of technology reliance on human cognitive processes).  One researcher reported that when individual subjects were faced with questions they did not know the answer to, rather than thinking through the question asked, the subjects thought of where they could log onto the Internet.  Betsy Sparrow et al., *Google Effects on Memory: Cognitive Consequences of Having Information at Our Fingertips*, 333 SCI. 776, 776-78 (2011); *see also* Paul, *supra*, at 64.  In addition, the prospect of information being accessible in the future affects how well we remember that information; we remember information better when we believe it might later be unavailable.  Paul, *supra*, at 64; Sparrow, *supra*, at 778.  Finally, our brains remember where we can find information rather than the fact that it had been found.  *See* Paul, *supra*, at 64; Sparrow, *supra*, at 778.

42. *See* Sparrow, *supra* note 41, at 776-78 (reporting results of four studies suggesting that brains are primed for lower information-recall rates and higher accessibility-location rates).

43. *See id.* at 776 (noting when that subjects were asked, "[are there] any countries with only one color in their flag[?]," the subjects thought about computers, not flags).

expected to be able to find the information later on, they did not remember it as well as when they believed the information would no longer be available.[44]  Third, the knowledge of where the information can be found leads us to form a memory of how we will locate the information in the future and not of the information itself.[45] This delegation comes with a price: "[s]kills like critical thinking and analysis must develop in the context of facts . . . [a]nd these facts can't be Googled as we go; they need to be stored in the original hard drive, our long-term memory."[46]

### D. Gen M: The Multitasking Generation[47]

Multitasking has monumentally shifted the way students process information.[48] In a 1990 Stanford University survey, a majority of adolescents surveyed said that "the one medium they couldn't live without was a radio/CD player. . . . In a 2004 follow-up, the computer won hands down."[49]  Interestingly, the amount of time children spend with electronic media has not changed significantly over time—it has remained at six and one-half hours per day—but what they are doing with that time has changed.[50] Now, kids are often "media multitasking," that is, listening to music, doing homework, and texting friends, all at the same time.[51]  This level of multiprocessing seems commonplace now, but only fifteen years ago, the majority of home computers were not connected to the Internet.[52]  This generation does not often just sit down to watch a television show with their family; more often than not, while sitting and watching television, they also listen to music, play games, use the computer, text message friends, or even read.[53]

This multitasking is going on in law school classrooms as well.  Professors have noted that in lecture halls with wireless Internet access—which accounts for more than forty percent of classrooms nationwide—the need to multitask can get out of control.[54]  One law school professor saw a student in another professor's class surfing the web on her laptop while simultaneously texting a friend.[55]  At one

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44. *Id*. at 776-77.  Here, Sparrow's subjects were asked to type facts into a computer.  *Id*. at 776. Half were told their information would be saved, half were told it would not be saved.  *Id.*  Those who believed the information would be saved recalled fewer details than those who believed it would be erased.  *Id.* at 777.  "Because search engines are continually available to us, we may often be in a state of not feeling we need to encode the information internally.  When we need it, we will look it up."  *Id.*

45. *See id.* at 778 (concluding that we are learning what the computer knows and therefore "becoming symbiotic with our computer tools").

46. Paul, *supra* note 41, at 65.

47. *See* Claudia Wallis, *genM: The Multitasking Generation*, TIME, Mar. 27, 2006, *available at* http://www.time.com/time/printout/0,8816,1174696,00.html.  Wallis writes that "[h]uman beings have always had a capacity to attend to several things at once."  *Id.*  However, the current age of "multiprocessing and interpersonal connectivity" came about fairly recently.  *Id.*

48. *See id.*; Thielfoldt, *supra* note 11.

49. Wallis, *supra* note 47.

50. *Id.*

51. *Id.*

52. *Id.*

53. *Id.*

54. *Id.*; *see* PALFREY, *supra* note 26, at 4-5.  *See also* Glenn, *supra* note 1 (discussing scholars' response to student multitasking in the classroom).

55. Opinion, Jeff Sovern, *Laptops in Class: How Distracting are They?*, CHRISTIAN SCI. MONITOR, June 6, 2011, at 22.

time, distracted students might have played solitaire or doodled during class, but Internet access opens up a new world of distraction: Facebook, Twitter, ESPN, eBay, YouTube, and a variety of blogs, just to name a few.[56]   Some universities have blocked, or are considering blocking, Internet access during class.[57]

All of this multitasking comes with a price: the habit of attending to many things has implications for the way students learn and process information and cognitive scientists are concerned by the trend.[58]   While students believe they are able to simultaneously attend to many things at once, research indicates this is not true; rather than simultaneously processing all the information, the brain is actually toggling among tasks, "leaking a little mental efficiency with every switch."[59]   This is where cognitive learning theory helps us understand why students may not be developing the ability to deeply focus.

### III. COGNITIVE LEARNING THEORY

To understand why the characteristics of today's law students may impact their reading and reasoning skills, a basic understanding of cognitive learning theory is helpful.   Cognitive learning theory uses cognitive science to explain how we learn.[60]   While not a new theory, many teachers do not explore or apply cognitive learning psychology to their teaching preparation.[61]   Cognitive learning theory is an information processing theory, which seeks to understand how the brain processes

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56. Laura Mortkowitz, *More Colleges, Professors Shutting Down Laptops and Other Digital Distractions,* WASH. POST, Apr. 25, 2010, at GO3.

57. *See*, *e.g.*, *id.* (stating that, in 2008, the University of Chicago Law School disabled classroom access to the Internet); Wallis, *supra* note 47 (reporting the same at UCLA and the University of Virginia); Eric Moskowitz, *At Harvard, Elizabeth Warren Has Warm Reputation*, BOS. GLOBE, Oct. 14, 2012, http://www.bostonglobe.com/metro/2012/10/13/elizabeth-warren-known-harvard-law-school-tough-but-fair/9adfuU4jXPPSEfO8XyturM/story.html (noting that, for example, Senator Elizabeth Warren banned laptop use in all the classes she taught at Harvard Law.  Her ban was aimed at both preventing students from robotically typing every word iterated in class, and encouraging students' engagement in a "rapid-fire, room wide conversation."  Regarding the general effect of Warren's laptop ban, one of her recent students said in an interview: "even though I wasn't completely aware of it at the time, in taking the exam I knew the bankruptcy code like the back of my hand.").

58. *See* Glenn, *supra* note 1, at 2-4.

59. Sam Anderson, *In Defense of Distraction*, N. Y. MAG., May 17, 2009, *available at* http://nymag.com/news/features/56793 (describing how the brain processes different information types on separate "channels"); *see* Wallis, *supra* note 47 (cautioning that multitasking causes increases in errors and longer task completion times).

60. *See* Michelle D. Miller, *What College Teachers Should Know About Memory: A Perspective From Cognitive Psychology*, 59 C. TEACHING 117, 117 (2011).

61. Diane F. Halpern, *Teaching Critical Thinking for Transfer Across Domains: Dispositions, Skills, Structure Training, and Metacognitive Monitoring*, 53 AM. PSYCHOL. 449, 451 (1998); *see also id.* at 449-52 (positing that traditional teaching methods are not ideal for teaching critical thinking). Professor James Lang posits that most faculty members teach without knowing much about how students learn, arguing that "[w]e devote at least part of our careers to making lasting impressions on the minds of our students, yet the vast majority of us have little or no knowledge of how those minds actually work."  James M. Lang, *Teaching and Human Memory, Part I*, CHRON. HIGHER EDUC., Nov. 15, 2011, http://chronicle.com/article/TeachingHuman-Memory/129778.  *See also* Miller, *supra* note 60, at 117 (suggesting that, while "there is no shortage of theoretical research detailing the inner working of memory[, however] . . . when this theoretical research is translated into specific suggestions for pedagogical practice, it is too often misinterpreted, oversimplified, or substantially out of date").

information and translates that information into knowledge.[62]  Cognitive learning theory emphasizes learning of deeper skills, such as reasoning and solving of complex problems, and seeks to understand and explain this process.[63]  As law school is undoubtedly a deep-thinking experience, it would seem prudent to apply these principles to its teaching.[64]  Specifically, this article aims to apply these principles to today's Google-generation, net-savvy, media-multitasker—who is used to non-linear, shallow thinking—in a way that will allow for development of deep thinking and reasoning skills.

### A. The Science of Learning

Cognitive psychologists define learning, in scientific terms, as "a relatively permanent change in a neuron."[65]  So what is a neuron?  Early in the 1900's, scientists believed that the brain was made of "a single, continuous fabric of nerve fibers."[66]  However, scientists later discovered that the brain is made up of cells, called neurons.[67]  These neurons, while similar to other cells in our bodies, are also different because they have two appendages—axons and dendrites—that can send and receive electrical signals.[68]  When the neuron is active, it releases neurotransmitters, which flow across neurons and attach themselves to other neurons, either triggering or suppressing the neighboring neuron.[69]  The movement between neurons is called a synapse, which is a connection between the neurons.[70]  Many complex processes in our brains, such as thoughts, memories and emotions,

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62. *See* Schwartz, *supra* note 1, at 371-72 (classifying cognitive learning's goal to store information long-term in an "organized, meaningful, and useable manner").

63. *See id.* at 372; *see also* Halpern, *supra* note 61, at 450-51 (suggesting a four-part pedagogical model for teaching these deeper skills consisting of: "(a) a dispositional or attitudinal component, (b) instruction in and practice with critical thinking skills, (c) structure-training activities designed to facilitate transfer across contexts, and (d) a metacognitive component used to direct and assess thinking").

64. *See* Schwartz, *supra* note 1, at 372.  Schwartz suggests that many law professors believe they learned well with the current model of teaching (i.e., use of the Socratic Method and evaluation by way of one final exam).  *Id.* at 365.  These professors often find the current model is "intellectually defensible and easy to use" since they receive very little, if any, instruction in teaching, and know "little, if any, learning theory and nothing about instructional design." *Id.* at 364-65.  Adding to the issue is that cognitive theory remains a relatively new field and has evolved rapidly over the last 20-30 years in a way that, "[i]f you did happen to pick up some ideas 10 or 15 years ago about learning and cognition . . . what you learned . . . might have been superseded or even overturned since then by new information and theories." Lang, *supra* note 61.

65. DUANE F. SHELL ET AL., THE UNIFIED LEARNING MODEL: HOW MOTIVATIONAL, COGNITIVE, AND NEUROBIOLOGICAL SCIENCES INFORM BEST TEACHING PRACTICES 7 (2010).  When neurons strengthen and weaken, they affect neural patterns in ways that correspond to learning different skills, altering the "micro-architecture" of our brains until knowledge forms.  *Id.* at 10.

66. CARR, *supra* note 35, at 19.

67. *See id.* at 19.  Neurons operate by sending and receiving electrical signals to other neurons.  *Id.*; *see also* SHELL, *supra* note 65, at 8 (explaining that when the "firing threshold" or amount of input a neuron receives changes, learning occurs).

68. *See* CARR, *supra* note 35, at 19-20 (explaining that neurons' central cores are called somas and carry out those functions common to all cells).

69. *See id.* at 20-21.

70. *See id.* at 20.

come from these electrochemical interactions.[71]  However, even until the middle of this century, scientists believed that the neurons and circuits developed in childhood, when the brain was thought to be malleable, were fixed and formed before adulthood and that these synapses and connections no longer occurred in adulthood.[72]  However, we have since learned that "[v]irtually all of our neural circuits—whether  they're involved in feeling, seeing, hearing, moving, thinking, learning, perceiving, or remembering—are subject to change."[73]

## B. Attention and Learning

At the heart of learning is attention.[74]  To put it simply, adults learn by paying attention, processing information, and using it.[75]  But that process is anything but simple.[76]  Learning involves a complicated mental process whereby information is received by the senses and is briefly registered by the brain.[77]  That information can be absorbed through any of our senses: touch, smell, taste, sight, and sound.[78]  The brain attends to only a few pieces of the information contained in the register.[79]  This is known as "selective attention".[80]  The brain is continuously assaulted by so many stimuli that some can and must be ignored.[81]

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71. *See id.*

72. *See id.* at 20-21.

73. *Id.* at 26 (revealing that all areas of the brain are impacted by its plasticity; explaining the brain's ability to reprogram itself).

74. *See* Hillary Burgess, *Deepening the Discourse Using the Legal Mind's Eye: Lessons from Neuroscience and Psychology that Optimize Law School Learning*, 29 QUINNIPIAC L. REV. 1, 23 (2011) (suggesting students must filter environmental stimuli to better pay attention); *see also* M.H. Sam Jacobson, *Paying Attention or Fatally Distracted?  Concentration, Memory, and Multi-Tasking in a Multi-Media World*, 16 LEGAL WRITING 419, 421 (2010) (defining attention as "ability to attend to [only those] desired or necessary stimuli"); Miller, *supra* note 61, at 121 ("Without attention, there is no memory.").

75. *See* Burgess, *supra* note 74, at 23.  The many environmental stimuli adults experience exist in different forms, classifiable as auditory, visual, tactile, olfactory, and gustatory, all of which are involuntarily stored in sensory memory.  *Id.*  For students, sensory memory enables a student who is not paying attention to answer a professor's question: even though the question is not stored into their short- or long-term memory, the brain involuntarily stores the question and any information into sensory memory for about a half of a second.  *Id.* at 23-24.  Moreover, if the professor uses the student's name at the end of a question that is less than half of a second long, the student can move the question from sensory memory to working memory; but, if the question is more than a second long, the student will have no memory of the question.  *Id.* at 24.  Similarly, short-term, working memory, comprised of verbal memory, visual memory, and thinking, also has a thirty second life, and disappears after one stops focusing on an information item for thirty seconds.  *Id.* at 25.

76. *See id.* at 23; *see also* Miller, *supra* note 61, at 118 (explaining that memory  consists of "three components—sensory memory, short-term memory, and long-term memory—[that] work together much like an assembly line, with information making stops at each 'station' before being passed along.  Of course, not every bit of information makes it all the way into long-term memory").

77. *See* Floyd, *supra* note 10, at 265-66; Burgess, *supra* note 74, at 23.

78. *See* Burgess, *supra* note 74, at 23; Jacobson, *supra* note 74, at 421.

79. *See* Jacobson, *supra* note 74, at 421.

80. *See* Schwartz, *supra* note 1, at 372.

81. *See* Jacobson, *supra* note 74, at 421 (providing that, for example, students studying in the library must consciously ignore nearby conversations, people walking by, and dogs barking outside).

The brain processes stimuli to which it attends or pays attention.[82]   The information that is selectively attended to by the brain passes into short-term or working memory.[83]   Only small amounts of information can be stored in the working memory before it is lost or transferred to long term memory.[84] Historically, psychologists believed that the working memory could hold no more than about seven pieces of information.[85]   Depending upon the attention paid to those bits of information, they will either be forgotten or moved toward long term memory through a process known as encoding.[86]   "Encoding" refers to how information is stored and is the process whereby information travels from short-term to long-term memory.[87]   Encoding can happen through rehearsal—such as learning a musical instrument—, or by memorization—such as learning the provisions of the Uniform Commercial Code.[88]   Once rehearsed sufficiently, that information is retrieved from long term memory by a process called "automaticity."[89]   Other information is encoded by the brain's use of schemata or chunking, the process whereby new information is attached to prior knowledge through an understanding of its connection to something already known.[90] "Chunking" involves associating similar pieces of information so that the information collectively becomes one slot in the working memory instead of many.[91]   The more easily the information can be connected to an already existing

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82. *See id.* Certain automatic or highly routine tasks do not require being attended to before the brain can processes them. *Id.* These types of tasks are those that do not require conscious control, such as walking, breathing, or chewing, or other highly practiced activities, as long as they are within the same context as in they were practiced. *Id.* at 421-22.

83. *See* Burgess, *supra* note 74, at 23-26 (detailing processes within sensory memory and attention focusing and short-term, working memory).

84. *See id.* at 24-25 (commenting that this information is typically kept in sensory memory for only about thirty seconds).

85. *See* Jacobson, *supra* note 74, at 423; George A. Miller, *The Magical Number Seven, Plus or Minus Two: Some Limits on Our Capacity for Processing Information*, 63 PSYCHOL. REV. 81, 90 (1956) (classifying immediate memory as "absolute judgment" and explaining the ability to maintain judgment for seven stimuli). *But see* CARR, *supra* note 35, at 124 (highlighting new evidence that suggests an ability to process only two to four elements at once).

86. *See* Miller, *supra* note 61, at 119 (explaining that encoding information involves linking pieces of information together for easy retrieval in the future).

87. *See* Burgess, *supra* note 74, at 29-30; Miller, *supra* note 61, at 119; *see also* Schwartz, *supra* note 1, at 373 & n.108 ("Encoding refers to how we store . . . information in long-term memory.").

88. *See* Jacobson, *supra* note 74, at 421-23; *see also* Lang, *supra* note 61 (explaining challenges of encoding information to facilitate easy transfer from short-term to long-term memory).

89. *See* Schwartz, *supra* note 1, at 373 & n.110 (using "automaticity" to refer to information for which recall requires minimal mental energy).

90. *See id.* at 373; Burgess, *supra* note 74, at 28.

91. *See* Jacobson, *supra* note 74, at 424. Jacobson provides the example of "chunking" phone numbers and social security numbers into units of two, three, or four digits, and credit cards into four digit segments to enable working memory to retain the information. *Id.* Additionally, he references an experiment where people were asked to remember the letters "fbicbsibmirs." *Id.* Participants were unsuccessful at recalling the letters "sequentially and accurately" until they "chunked" them into fbi cbs ibm irs. *Id.* For students, "chunking" allows them to group complex knowledge into categories or schemas, such as when presented with twelve verbal stimuli  containing intentional torts, defenses, and negligence; using chunking reduces the twelve stimuli into three categories, occupying three verbal slots in working memory instead of twelve. *See* Burgess, *supra* note 74, at 28. Chunking significantly expands the capacity of our working memory. *See* SHELL, *supra* note 65, at 28. However, Jacobson

framework of knowledge, the more easily new information will be learned and retained.[92]   "Schema" similarly refers to making connections between new information and information previously learned.[93]

The short-term working memory is both the key to and bottleneck of learning because it must be used both to convert sensory input to memory, and to later access that information when needed.[94]  That information, though stored now in the long-term memory, must work its way back to short-term memory in order to be accessed for additional learning or attention.[95]  In this way, short-term memory and long-term memory work in a "continuous exchange program in which learning passes back and forth between them."[96] While short-term memory is limited, long-term memory has a much greater storage capacity.[97]   Therefore, in long-term memory, "the limiting factor is not storage capacity, but rather the ability to find what you need when you need it."[98]  Without attention, though, there can be no memory; therefore, holding students' attention in class is the imperative to learning.[99]

## C. The Limits on Attention

The key, then, to the ability to attend to the vast array of sensory information hitting the short-term memory, is attention.[100]  So, for example, when students sit in class and simultaneously (they think) listen to the lecture, take notes, check their email, text a friend, look at the scores from last night's games, and listen to the sounds of their fellow students taking notes, how well can they pay attention to the information being conveyed to them?  When students study for an exam while also texting, chatting with their study group about how easy or hard the exam will be, email their resume to job prospects, and watch a game on their phone, how well will they retain the answer?  While we could easily guess, neuroscientists give us the definitive answer: not that well.

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notes that the larger the chunks, the fewer number of chunks can be processed by working memory. *See* Jacobson, *supra* note 74, at 424-25.

92. *See* Burgess, *supra* note 74, at 30.  This reasoning may help explain why the first year of law school can be so overwhelming—it is quite likely that most, if not all, of the material students seek to learn will have no connection to any existing schema in their memories, creating a higher "cognitive load." *Id.* at 30-31.

93. *See* Floyd, *supra* note 10, at 265-66 (defining schema as "existing [hierarchical] cognitive structures" that "may be combined, extended, or altered"); Schwartz, *supra* note 1, at 374 (highlighting many functions of schema).

94. *See* Floyd, *supra* note 10, at 265; Christine Rosen, *The Myth of Multitasking*, 20 NEW ATLANTIS 105, 107 (2008) (classifying multitasking as undesirable learning due to a "response selection bottleneck" consequence).

95. *See* Floyd, *supra* note 10, at 265-66.

96. Schwartz, *supra* note 1, at 374.

97. *See* Floyd, *supra* note 10, at 265 (opining that "[l]ong-term memory has unlimited capacity"); Miller, *supra* note 60, at 119 (revealing timely retrieval as a limiting factor of long-term memory, not storage capacity).

98. Miller, *supra* note 61, at 119 (analogizing that "[l]ong-term memory is rather like having a vast amount of closet space—it is easy to store many items, but it is difficult to retrieve the needed item in a timely fashion").

99. *See* Burgess, *supra* note 74, at 24-25; Miller, *supra* note 61, at 121-22.

100. *See* Burgess, *supra* note 74, at 24-25; Miller, *supra* note 61, at 120-21.

Relatively recently, scientists have used brain scanning to shed new light on the mechanics of the brain and learning.[101] Attention is not something that can easily be studied as it is "a complex process that shows up all over the brain, mingling inextricably with other quasi-mystical processes like emotion, memory, identity, will, motivation, and mood."[102] Earlier, attention was measured through easily measurable senses, like vision and hearing.[103] From there, scientists began using PET scans, EEG's, and electrodes to measure electrical activity in the brain.[104] Only in the last ten years, however, have neuroscientists been able to use functional magnetic resonance imaging (fMRIs) to show not only that the brain is working, but to also watch individual areas of the human brain fire up while actively conducting tasks.[105]

These fMRI tests have revealed conclusively that different forms of memory are processed by different systems in the brain.[106] Remembering things like names, dates, or what one did a few days ago uses memory retrieval called "declarative memory".[107] Declarative memory uses the brain's hippocampus, which plays a key role in processing, storing and recalling information.[108] Remembering things, like how to ride a bike or play soccer, uses procedural memory and engages the brain's striatum, a portion of the brain primarily functioning when learning new tasks and in rote memory.[109]

This is also known as "top-down" versus "bottom-up" control of attention.[110] Top-down, or controlled, attention is most used when we are deeply focused on a

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101. *See* Anderson, *supra* note 59 (stipulating that the means of tracking attention have evolved considerably to yield insights into the shifts the brain must make in its processes when individuals are forced to multitask).

102. *Id*.

103. *See id.* (clarifying that, although often described as "an organ system," attention is not analogous to an organ "you can pull out and study like a spleen."). Glenn, *supra* note 1 (noting that one early researcher testing individuals' multitasking abilities asked her subjects to simultaneously read aloud from a novel and write the letter "A," while another asked subjects to sort differently shaped cards while counting by threes aloud).

104. *See* Anderson, *supra* note 59.

105. *See id.* (reporting that fMRIs show coordinated brain "storms of neural firing, rapid blood surges, and oxygen flows); Karin Foerde & Barbara Knowlton, *Multi-Tasking Adversely Affects Brain's Learning, UCLA Psychologists Report,* SCI. DAILY, July 26, 2006, http://www.sciencedaily.com/releases/2006/07/060726083302.htm (revealing that fMRIs use magnetic fields to indicate active brain areas and blood oxygen increases). *See also* Rosen, *supra* note 94, at 107-08 (explaining that brain scans of multitaskers and distracted individuals show activity in the striatum, the part of the brain involved in learning new skills, while brain scans of focused individuals show activity in their hippocampus, a region dedicated to storing and recalling information).

106. *See* Anderson, *supra* note 59; Foerde, *supra* note 105; Rosen, *supra* note 94, at 107.

107. *See* Foerde, *supra* note 105 (distinguishing "declarative memory" from "procedural memory" based on their use of different brain areas).

108. *See id.* (articulating the hippocampus' vital role in establishing declarative memory).

109. *See* Anderson, *supra* note 59; Foerde, *supra* note 105. *See also* DANIEL KAHNEMAN, THINKING, FAST AND SLOW 20-21 (2011) (labeling the systems involved in the decision-making process as "System 1" and "System 2." Kahneman explains that "System 1," like stimulus driven attention, uses the part of the brain constantly seeking new information and operates automatically and quickly, with little or no effort and no sense of voluntary control, while "System 2" uses the part of the brain used to deeply focus and allocates attention to activities that need it, like agency, choice, and concentration).

110. *See* Timothy J. Buschman & Earl K. Miller, *Top-Down Versus Bottom-Up Control of Attention in the Prefrontal and Posterior Parietal Cortices*, 315 SCI. 1860, 1860 (2007).

project or a goal and uses the pre-frontal cortex, the brain's manager, located behind the forehead.[111]  Law students working in their legal writing class to synthesize a rule from a number of cases are using this kind of attention. Bottom-up attention, or "stimulus-driven" attention, is more instinctual and automatic.[112]  It uses the parietal cortex, farther back in the brain, which is always seeking new information and stimuli from the environment.[113]  Things that grab our attention, such as email, texts, etc., attract the same part of the brain used to scan our environment for danger.[114]  The brain is wired to attend and respond to these seemingly important stimuli. [115]  "[M]odern brains," such as that of a distracted or multitasking legal writing student, "react the same way to novel or sudden changes as the brains of the Cro-Magnon of 40,000 years ago."[116]  Each time students respond to a distraction, they use their limited cognitive capacity and lose some of the focus in which their prefrontal cortex was engaged.[117]  Thus, these distractions interfere with memory and the reasoning process.[118]

Many think of this as multitasking and pride themselves in being able to do it.[119]  However, studies show that those identifying themselves as multitaskers do worse on cognitive and memory tasks that involved distraction than those who self-identified as preferring to work on a single task at a time.[120]  Moreover, the research has shown that no matter how much information hits the brain at once, there is a limit as to what most people's brains can process simultaneously.[121]  Many people believe that when they are multitasking, they are simultaneously doing more than one thing at a time.[122]  In fact, unless the tasks being performed are automatic and require no cognitive effort or attention, such as chewing gum while walking, most people who think they are multitasking are actually "task switching," where the brain divides its attention between the tasks and attention shifts back and forth between them.[123]  This switching from one task to another activates different neural circuits and different parts of the brain.[124]  Time and

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111. *See id.* at 1860; Jacobson, *supra* note 74, at 429; Jan Brogan, *Distracted Driving is Dangerous, Sure, But Distractions at Work, Home or Anywhere Can Take a Toll*, BOS. GLOBE, Feb. 27, 2012, at G15.

112. *See* Jacobson, *supra* note 74, at 429.

113. *See* Buschman, *supra* note 110, at 1862.

114. *See* Jacobson, *supra* note 74, at 430 (comparing modern brains to Cro-Magnon brains in terms of reactions to environmental stimuli); Brogan, *supra* note 111 (reporting that loud or bright things, similar to danger signals, are more likely to grab our attention,).

115. *See* Jacobson, *supra* note 74, at 429 (concluding that "[h]umans' evolutionary survival depended on noticing the flash of bright light, the thudding noise, the movement in the trees, the rush of water, or the unusual smell [because] [n]ovel or sudden changes could indicate an intruder, a food source, or danger").

116. *Id.* at 430.

117. *See id.*

118. *See id.*

119. *See* Glenn, *supra* note 1 (quoting Clifford I. Nass, professor of psychology at Stanford University, Glenn reports that "[h]eavy multitaskers are often extremely confident in their abilities . . . [b]ut there's evidence that those people are actually worse at multitasking than most people").

120. *See id.* (citing research as further support "for the unwisdom of multitasking").

121. Anne Enquist, *Multitasking and Legal Writing*, 18 PERSPECTIVES 7, 7-8 (2009).

122. *See id.*, at 8; Jacobson, *supra* note 74, at 435.

123. Enquist, *supra* note 121, at 7-8; *see* Jacobson, *supra* note 74, at 437.

124. Rosen, *supra* note 94, at 107.

efficiency are lost each time the brain shifts tasks.[125]   The time lost varies depending upon the tasks and whether those tasks require the same cognitive resource.[126]   Researchers have found evidence that even more time is often lost because of the "restart cost"—the time it takes for the brain to get back to the point it was when it left the first task.[127]   These restart costs are even higher when the brain is interrupted from tasks that are more demanding and require more attention.[128]   Researchers have also concluded that there is a "response selection bottleneck" that occurs when the brain has to attend to more than one task at a time.[129]   Time is lost when the brain has to decide which task to perform.[130]

There are other troubling aspects to multi-tasking in addition to this lost time and efficiency.  Multitasking requires a constant shift and switch, "energiz[ing] regions of the brain that specialize in visual processing and physical coordination and simultaneously appear to shortchange some of the higher areas related to memory and learning."[131]   This has led researchers to question whether there is an increase in errors caused by multitasking.[132]   The brain processes different kinds of information using different "channels": "a language channel, a visual channel, an auditory channel . . . each one of which can process only one stream of information at a time."[133]   Once a channel becomes overburdened, it will more easily become inefficient and make mistakes.[134]   Research has confirmed, for example, that walking while talking on the phone and texting while driving is dangerous.[135]

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125.  *See* Enquist, *supra* note 121, at 7; Rosen, *supra* note 94, at 106.

126.  *See* Jacobson, *supra* note 74, at 438.  Jacobson posits that:

 [A] good rule of thumb is the time [for shifting attention from one task to another] will be longer when the work gets more complex, when the work moves from familiar to unfamiliar, when the tasks must be done quickly, and when the tasks compete for the same cognitive resource, such as talking and reading. *Id.*

127.  Florian Waszak et al., *Task-Switching and Long-Term Priming: Role of Episodic Stimulus-Task Bindings in Task-Shift Costs*, 46 COGNITIVE PSYCHOL. 361, 400, 406 (2003).

128.  *See id.* at 400.

129.  Rosen, *supra* note 94, at 107.

130.  *See id.*

131.  Walther Kirn, *The Autumn of the Multitaskers*, ATLANTIC, Nov.1, 2007, *available at* http://www.theatlantic.com/doc/200711/multitasking.http://www.theatlantic.com/magazine/archive/2007/11/the-autumn-of-the-multitaskers/306342.

132.  *See* Enquist, *supra* note 121, at 8.

133.  Anderson, *supra* note 59 (internal quotation marks omitted).  For example, steering and dialing are both manual activities, while looking out the windshield and dialing a number are both visual; each of these examples would overburden their respective channels.  *Id.*   The only occasion when multitasking can be beneficial is when the tasks are simple and operate on separate channels, such as "folding laundry (a visual-manual task) while listening to [the radio] (a verbal task)."  *Id.*

134.  *See id.*

135.  *See* Enquist, *supra* note 121, at 8 (observing that "[w]hile no one has yet studied lawyers, it is reasonable to assume that lawyers who engage in multitasking might make more errors than lawyers who do not.  For example, a lawyer who answers the phone while reading a draft of a contract might be more likely to overlook an important provision than the lawyer who gives the contract his or her undivided attention").  *See also* Jacobson, *supra* note 74, at 436 (discussing examples of accidents involving the use of cellphones while walking and driving); Rosen, *supra* note 94, at 106 (noting some states limit multitasking by banning the use of phones while driving); Christina Lopez, *UK Woman Falls Into Icy Canal While Texting Boyfriend,* ABC NEWS BLOGS, Jan. 25, 2013, http://abcnews.go.com/blogs/headlines/2013/01/uk-woman-falls-into-icy-canal-while-texting-boyfriend (illustrating the dangers of texting when reporting that a woman, who was texting while walking to a

Accuracy can be reduced by as much as 20-40%, with the greatest reductions occurring when the task switches involved intellectually demanding work like reading, reasoning, and problem solving.[136]

Even more troubling is the evidence that all of this multitasking is having an effect on our cognitive abilities.[137]  In 2005, a study concluded that "[w]orkers distracted by e-mail and phone calls suffer a fall in IQ more than twice that found in marijuana smokers."[138]  Lawyers and law students need to be able to engage in in-depth thinking and sophisticated legal work.[139]  Yet multitasking may be having a detrimental effect on the area of the brain that engages in this deep thinking, since the part of the brain which is activated by distractions and task switching is the part that is not meant for deep focus.[140]  "[D]eveloping brains can become more easily habituated than adult brains to constantly switching tasks—and less able to sustain attention."[141]  It becomes a vicious cycle, where brains overloaded by distraction are even more subject to distraction.[142]  Finally, even if it is possible to learn while multitasking, that learning is less flexible and more specialized and the information is less easily retrieved.[143]

## IV. COGNITIVE LEARNING THEORY CAN MAXIMIZE LEARNING IN LAW SCHOOL

Understanding both the characteristics of today's law students and the process

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shopping center, failed to notice she was walking straight toward an icy canal a few feet from a staircase, dropped into the icy waters despite an observant bystander yelling to warn her, and was rescued by that same bystander).

136. *See* Jacobson, *supra* note 74, at 440 (explaining that accuracy decreases when the number of brain switches increases).

137. *See* Enquist, *supra* note 121, at 8 (citing confirming research of increased car accidents when driver uses a cell phone); Foerde, *supra* note 105 (reporting study findings of subjects' inability to glean "flexible" knowledge when learning with distraction).

138. Rosen, *supra* note 94, at 106. Rosen writes that "[t]he psychologist who led this study called this new 'infomania' a serious threat to workplace productivity." *Id.*

139. *See* Enquist, *supra* note 121, at 8.

140. *See* CARR, *supra* note 35, at 120. Carr explains that:

> Just as neurons that fire together wire together, neurons that don't fire together don't wire together. As the time we spend scanning Web pages crowds out the time we spend reading books, as the time we spend exchanging bite-sized text messages crowds out the time we spend composing sentences and paragraphs, as the time we spend hopping across links crowds out the time we devote to quiet reflection and contemplation, the circuits that support those old intellectual functions and pursuits weaken and begin to break apart. The brain recycles the disused neurons and synapses for other, more pressing work.

*Id. See also* Foerde, *supra* note 105 (quoting Professor Russell Podrack as stating that "[e]ven if you learn while multi-tasking, that learning is less flexible and more specialized, so you cannot retrieve the information as easily"); Laura E. Levine et al., *Electronic Media Use, Reading, and Academic Distractibility in College Youth,* 10 CYBERPSYCHOL. & BEHAV. 560, 565 (2007) (reporting that that IMing might interfere with reading in three ways: "(a) displacement of time available for study, (b) direct interference while studying, and (c) development of a cognitive style of short and shifting attention").

141. Richtel, *supra* note 33 (worrying that today's new generation of kids will be wired differently).

142. *See id.*; Jacobson, *supra* note 74, at 441-42 (noting that the addition of stress and fatigue, a salient effect of the law school experience, to multitasking has even worse effects on memory and accuracy).

143. *See* Foerde, *supra* note 105 (finding tasks that require higher attention levels to be especially adversely affected by multitasking).

of learning should enable law professors to adjust their teaching to maximize student learning.  However, "[a]lthough law teachers generally have salutary educational goals and some individual law teachers have . . . developed insightful experimental instruction, law school instruction as a whole, remains locked in an instructional methodology of dubious merit."[144]  Although the MacCrate Report,[145] the Clinical Legal Education Association's Best Practices,[146] and the Carnegie Report,[147] together with initiatives by the American Bar Association,[148] have led to discussions on how best to teach students, unfortunately not enough has changed in law school teaching, which includes mostly Socratic method, combined with lecture and discussion, and culminates in one exam at the end of the course, on which students often receive little or no feedback.[149]  Moreover, as discussed above, there is little, if any, discussion of learning styles or the changing characteristics of today's law students.[150]  The next sections have suggestions as to how law schools can enhance the learning of their students.

### A. Teaching Students How to Learn

#### 1. Metacognition[151]

Law school aims to teach higher order thinking skills.[152]  Students, however,

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144.  Schwartz, *supra* note 1, at 349.

145.  *See generally* A.B.A. SEC. LEGAL EDUC. & ADMISSIONS TO THE BAR, REPORT OF THE TASK FORCE ON LAW SCHOOLS AND THE PROFESSION: NARROWING THE GAP (1992) [hereinafter MACCRATE REPORT].

146.  *See generally* ROY STUCKEY ET AL., BEST PRACTICES FOR LEGAL EDUCATION: A VISION AND A ROADMAP (2007) [hereinafter BEST PRACTICES].

147.  *See generally* WILLIAM M. SULLIVAN ET AL., EDUCATING LAWYERS: PREPARATION FOR THE PROFESSION OF LAW (2007) [hereinafter CARNEGIE REPORT].

148.  *See* Susan Hanley Duncan, *The New Accreditation Standards are Coming to a Law School Near You—What You Need to Know About Learning Outcomes and Assessment*, 16 LEGAL WRITING: J. LEGAL WRITING INST. 605, 608 (2010) (discussing initiatives of the American Bar Association's Student Learning Outcomes Committee).

149.  *See* Floyd, *supra* note 10, at 260; Schwartz, *supra* note 1, at 348-51.

150.  *See* Vernellia R. Randall, *Increasing Retention and Improving Performance: Practical Advice on Using Cooperative Learning in Law Schools*, 16 T.M. COOLEY L. REV. 201, 212-14 (1999).  In her text, Randall posits that:
Law professors must put more of our effort into creating the conditions within which students can construct their own meaning and develop their own skills . . . . Because students not only have different skill levels, but also different cognitive structures, we cannot continue a "one-size-fits-all" approach to teaching.  *Id.* at 213.

151.  *See* A TAXONOMY FOR LEARNING, TEACHING, AND ASSESSING: A REVISION OF BLOOM'S TAXONOMY OF EDUCATIONAL OBJECTIVES § 3.2(D), AT 29 (LORIN W. ANDERSON & DAVID R. KRATHWOHL EDS., COMPLETE ED. 2001) [HEREINAFTER REVISED TAXONOMY] (defining metacognitive knowledge to include cognitive knowledge and "awareness and knowledge of one's own cognition"); Halpern, *supra* note 61, at 454 (explaining that metacognition broadly refers to understanding learning objectives and assessing one's own strengths and weaknesses, or "'what we know about what we know'").

152.  *See* Burgess, *supra* note 74, at 4, 6.  Traditional teaching methods leave students to learn the highest-level learning objectives, which successful performance on a final exam requires, on their own.  *Id.* at 4.  Burgess advocates that law schools should instead teach students to "think like a lawyer."  *Id.* at 6.  *See also* Anthony S. Niedwiecki, *Lawyers and Learning: A Metacognitive Approach to Legal*

may have never considered that law school teaching and learning often differs from educational experiences prior to law school, where the focus may have been on lower levels of learning. The focus during law school is on teaching doctrine and theory, and most schools do not devote any time to teaching metacognitive skills.[153] With all the emphasis often on the end of course assessment, students are not encouraged to even consider or test the successfulness of their learning during the semester.[154] Therefore, encouraging or teaching students to learn about their own metacognition would be an excellent addition to the first year curriculum.[155] Law students, like lawyers, need to be self-regulated learners: they must recognize what they do not know and learn it.[156] Educational psychologists have been studying the learning process for at least fifty years, and have created a theoretical framework capturing the types and levels of learning.[157] One of the most well-known frameworks is Bloom's taxonomy, recently revised, which divides learning into six cognitive processes with which all students should be familiar.[158] Introducing beginning law students to this taxonomy of learning may help them to understand that learning is a complex process and not one that should be taken for granted.[159] A visual representation of the taxonomy can help students understand that they must aspire to the top two levels of learning in law school: evaluating and creating.[160]

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*Education*, 13 WIDENER L. REV. 33, 33-34 (2006) (discussing that professors utilize the Socratic method specifically to help students learn to "think like a lawyer").

153. *See* Boyle, *supra* note 19, at 13 (explaining that "[m]etacognition has received a modicum of attention in law teaching"); Anthony Niedwiecki, *Teaching For Lifelong Learning: Improving the Metacognitive Skills of Law Students Through More Effective Formative Assessment Techniques*, 40 CAP. U. L. REV. 149, 157-59 (2012) (explaining that focusing on the "end product" inhibits development of students' metacognitive skills).

154. *See* Niedwiecki, *supra* note 153, at 158.

155. *See* BEST PRACTICES, *supra* note 146, at 127 (recommending professors "help students improve their self-directed learning skills"); CARNEGIE REPORT, *supra* note 147, at 173 (advising professional students' that they have a responsibility to "become 'metacognitive' about their own learning"); Niedwiecki, *supra* note 152, at 34 (arguing "more has to be done to integrate learning theory into the law school curriculum"); Niedwiecki, *supra* note 153, at 155 (positing teaching metacognitive strategies as " most important . . . to make [students] better lifelong learners").

156. *See* Niedwiecki, *supra* note 152, at 40-41 (classifying lawyers as constant learners; arguing law school, therefore, should teach law students to learn). Niedwiecki also notes that several law schools currently utilize programs to help develop students' learning abilities. *Id.* at 40 n.28.

157. *See* REVISED TAXONOMY, *supra* note 151, at xxvii; Mary J. Pickard, *The New Bloom's Taxonomy: An Overview for Family and Consumer Sciences*, 25 J. FAM. & CONSUMER SCI. EDUC. 45, 45 (2007).

158. *See* REVISED TAXONOMY, *supra* note 151, § 3.3, at 31; Pickard, *supra* note 157, at 45-46.

159. *See* Burgess, *supra* note 74, at 9 (explaining how traditional law school teaching focuses on the first, or bottom, four levels of the taxonomy despite traditional law school exams requiring use of the top two levels; offering critique where students have to learn the material at the top two levels on their own).

160. *See* Rosa Kim, *Lightening the Cognitive Load: Maximizing Learning in the Legal Writing Classroom*, 21 PERSPECTIVES 101, 104 (2013) (referring to original taxonomy, which addresses the top levels as "synthesis and evaluation"). Visual representation should also help students to appreciate and learn the taxonomy better than if the professor simply relayed the levels of learning to the students via lecture. *See infra* notes 202-205 and accompanying text.

*Bloom's Taxonomy (Revised)*[161]



What lawyers generally refer to as legal analysis generally falls into the category of "evaluating."[162] The highest level, "creating," was called "synthesis" in the original form of the taxonomy, and refers to "mentally reorganizing some elements or parts into a pattern or structure not clearly present before."[163] This does not mean that students are creating law; rather, they are creating a new understanding of the law based on their own experiences and knowledge.[164] Starting law school with the understanding that the type of learning required will be at a higher level than previously experienced should help students concentrate and pay attention in a way they may not have previously.

Similarly, educating students about cognitive capacity and overload may help them plan and manage their own learning more successfully. They may enter law school with academic success behind them, believing that doing what they've already been doing will be enough to see them through.[165] They likely have never thought about the science of learning or considered how much information their brains can absorb and retain during a class or a study session. Educating students about the limits of their attention and encouraging them to use and access their different learning "channels" will enable them to take more from each class and law school experience.

## 2. The Perils of Multitasking

Students will benefit from instruction regarding the perils of multitasking

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161. *See* REVISED TAXONOMY, *supra* note 151, § 3.1, at 28; Pickard, *supra* note 157, at 47 fig.1 (illustrating how the original taxonomy has been revised into a two-dimensional taxonomy).

162. *See* Burgess, *supra* note 74, at 19 (explaining that the "evaluating" level includes critiquing activities such as reviewing synthesized rules for accuracy, deciding likely case outcomes, and analyzing policy effects of a law or policy, as well as students' own assessment of whether their knowledge meets a professor's learning objectives or whether their learning strategies are successful).

163. REVISED TAXONOMY, *supra* note 151, § 6, at 84.

164. *See* Burgess, *supra* note 74, at 19-20 (reasoning that law school learning requires all levels of learning, as rules cannot be applied to new situations without first being memorized and understood).

165. Ostensibly, students are not alone in this belief, as it is this same mindset that many professors have in retaining their traditional law school teaching methods. *See supra* notes 9, 64 and accompanying text.

while learning, either in the classroom or during their own study sessions, as they seek to learn in the new law school environment. They are likely unaware that research shows that multitasking while learning, as compared to learning while concentrating on a single activity, slows the learning process.[166] Students need to know that studying while confronted with distractions such as texting, messaging, emailing, and surfing the web helps "to create a cognitive style based on quick, superficial multitasking rather than in-depth focus on one task such as reading."[167] As discussed above, each time students attend to something other than their professor during class or the material when they are studying, they are leaking a little mental efficiency with each task switch, as well as increasing the likelihood of making errors, decreasing the likelihood of remembering the material, and learning with the area of the brain least conducive to long term remembering.[168] When informed of this research, perhaps students would make better choices during class and study time to reduce their multitasking and commit to directing all of their attention to learning.

### 3. Successful Learning Methods

Another way to help students learn better is to provide them with information on successful learning and studying techniques. While most law schools have some type of Academic Support Program, which helps students with study techniques and exam preparation, some of these programs are available only to students in distress.[169] All law students would benefit from learning about which study techniques lead to the most learning. Cognitive psychologists have been researching the effectiveness of various learning techniques on memory.[170]

A recent study revealed that two techniques which students commonly used for studying, highlighting (or underlining) text[171] and rereading text,[172] were not

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166. *See* McAlister, *supra* note 13, at 15 (stating interruptions of neural pathway creation undermines students' "depth of learning").

167. Levine, *supra* note 140, at 565.

168. *See supra* notes 117-143 and accompanying text.

169. *SEE* LAW SCH. ACADEMIC SUCCESS PROJECT, SUMMARY REPORT OF THE 2011 NATIONAL LAW SCHOOL ASP SURVEY5-16 (2011) (stating that, while surveys show a "vast majority of services for 1Ls are open to all students," some services remain available only to "select 1Ls"). However, the Report suggests that the focus appears to be changing away from offering ASP services to targeted populations, and is focused rather on retention and towards maximizing the academic excellence of all students. *Id.* at 5.

170. *See* John Dunlosky et al., *Improving Students' Learning With Effective Learning Techniques: Promising Directions From Cognitive and Educational Psychology*, 14 PSYCHOL. SCI. IN PUB. INTEREST 4, 5 & TBL. 1 (2013) (exploring efficacy of ten learning techniques to improve students' learning success); Henry L. Roediger, III, *Applying Cognitive Psychology to Education: Translational Educational Science*, 14 PSYCHOL. SCI. IN PUB. INTEREST 1, 1 (2013) (analogizing cognitive functions to muscles, where "if you use [them] . . . [they] will become stronger").

171. *See* Dunlosky, *supra* note 170, at 18-21 (noting highlighting "may actually hurt performance on higher-level tasks that require inference making"); Roediger, *supra* note 170, at 2 (reporting troubling ineffectiveness of commonly-used highlighting technique).

172. *See* Dunlosky, *supra* note 170, at 26-29 (describing low utility of rereading, compared with other learning techniques).

effective techniques for translating information into knowledge.[173]   In addition, other strategies commonly used, such as imagery use for text based learning (drawing pictures to represent the content of a reading passage),[174] keyword mnemonics,[175] and summarization[176] were not found to improve the effectiveness of learning.[177]   Five techniques showed evidence of a correlation to learning: distributing practice on tasks (spreading learning out over time rather than in a massive block or back-to-back sessions—i.e., "cramming");[178] retrieval practice (testing);[179] interleaved practice (study of one topic interleaved with study of another topic, i.e., studying contracts and torts intermittently);[180] elaborative interrogation (students question the information while studying it)[181] and self-explanation (students explain procedures or information to themselves or others).[182] This research shows that students must not only be aware of their own learning ability, but they should also be instructed that techniques they may currently use—or may have used in the past successfully—are  not likely to produce learning at the highest levels,[183]  which is required for success in law school.

## B. Suggestions for Teachers

It is not up to students alone, however, to improve their learning; professors should play an essential role in helping their students translate information into knowledge.  By engaging in careful course design, using visual aids and exercises to increase multimodal learning, and using many more assessments than usually employed for a typical law school class, professors can greatly increase their students' learning.

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173. *See id.* at 7, 21, 29 (discussing effect of techniques on "criterion tasks" for effects on application on knowledge).

174. *See id.* at 24-26 (highlighting limitations in efficacy of imagery-friendly materials on memory tests).

175. *See id*. at 24 (rating mnemonics as low-utility due to inefficiency and lack of consistent "durable learning").

176. *See id*. at 14-18 (determining summarization is low-utility technique).

177. *See id*. at 6, 14-18, 21-26.

178. *See id*. at 35-40 (noting distributed practice widely effective, even for complex materials); James M. Lang, *Teaching and Human Memory, Part 2*, CHRON. HIGHER EDUC., Dec. 14, 2011, *available    at*    http://chronicle.com/article/TeachingHuman-Memory/130078   (quoting   cognitive psychologist, Michelle Miller, as stating that "[b]reaking study time into shorter sessions promotes retention—a phenomenon called the spacing effect").

179. *See* Dunlosky, *supra* note 170, at 29-35 (advocating that practice testing has high-utility and broad applicability).

180. *See id.* at 40-44 (ranking interleaving as a moderately viable technique, most applicable for mathematical skills, and some cognitive skills).

181. *See id.* at 8-11 (hesitantly noting the applicability to lengthy or complex information).

182. *See id.* at 11-14 (noting these techniques' utility on "various measures of memory, comprehension, and transfer"); Lang, *supra* note 178 (reporting "reciting and self-testing . . . are study methods that provide great return on investment"); Roediger, *supra* note 170, at 3 (asserting these techniques' "generalizability across types of materials, students, learning conditions, and criterion tasks").

183. *See* Roediger, *supra* note 170, at 1-3.

*1. Course Design and Planning*

The Carnegie Report, Best Practices, and other, similar reports have encouraged law schools to change their teaching focus from input measures—which focuses on material provided to students, and where the professor's role is solely to deliver information—to outcome measures—where the professor's role is "'to design effective learning experiences so that students achieve the course outcomes and to monitor student learning in order to continuously improve their experiences.'"[184] To date, law schools have not been required to implement such changes and "as a general rule . . . few, if any, have implemented [these] changes . . . ."[185] Curriculum reform admittedly requires significant time and effort.[186] If the professor's role is to teach students, however, then the work required to maximize the students' learning is simply part of the job.[187] Instructional course design is the first step in making such changes.

"Instructional design is the process of systematically planning teaching and learning" and should include an evaluation of learning objectives, teaching and learning methods, instructional materials, feedback, and assessment.[188] Professors should clearly articulate learning objectives both for the class in general and for each class session.[189] These objectives should then drive all the other decisions and planning in methods, materials and assessment.[190] In the law school context, learning objectives should include "doctrine, theory, thinking skills, performance skills, and values" that the professor has determined should be learned in the course.[191] Course planning should begin with assessing what the outcome should be at the end of the semester, then working backwards to ensure the ability to learn

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184. Moppett, *supra* note 21, at 84 & n.34 (quoting Robert B. Barr & John Tagg, *From Teaching to Learning*, CHANGE, Nov.-Dec. 1995, at 24); *see* BEST PRACTICES, *supra* note 146, at 30-32; CARNEGIE REPORT, *supra* note 147, at 181.

185. Moppett, *supra* note 21, at 10 & nn.50-54 (listing reasons why professors are resistant to such changes, including: wanting to preserve academic freedom; fear that professors will be unfairly blamed for poor results; fear of changing the status quo; reluctance to changes that will require additional work; and a belief that student learning may be affected by factors out of the professor's control); *see also* Niedwiecki, *supra* note 152, at 36 (suggesting that a lack of knowledge and experience in learning theory "forces professors to teach like they were taught, or to make teaching decisions based on intuition instead of well-accepted learning theory").

186. *See* Schwartz, *supra* note 1, at 386. Schwartz explains:

> One of the easiest errors to make as an instructor or designer is egocentrism, which, . . . involves assuming that the learners are like the instructor . . . [such that] explanations [are] closely tailored to how the instructor likes things explained, in examples with which the instructor is familiar and comfortable, and in instructional techniques that work well for the instructor.

*Id.* at 186-87.

187. *See* Niedwiecki, *supra* note 152, at 39. Many professors, however, believe schools can increase learning by raising admission standards, and that deficiencies in learning can be fixed if students would simply work harder. *See id.*

188. Gerald F. Hess, *Value of Variety: An Organizing Principle to Enhance Teaching and Learning*, 3 ELON L. REV. 65, 70-71 (2011).

189. *See id.* at 71.

190. *See id.*

191. *Id.*

that material.[192]

Keeping in mind that "the mind isn't a sponge that absorbs whatever disjointed information we happen to pick up through our senses," teachers should start by asking themselves how they will capture the students' attention, and then frame the information in a "meaningful, interpretable way."[193]  One theory is to not offer students "answers until the question itself is intriguing." [194]  Once the students' attention is captured, they can better chunk the material to be learned into their own, preexisting memory and knowledge, thereby helping them to remember it.[195]  When planning courses and individual classes, there are many methods to choose from, including: "[s]ocratic dialogue, large group discussion, small group discussion, problem and hypothetical analysis, lecture, simulation, writing, experiential exercises, student presentations, and electronic exercises and discussions."[196]  As discussed below, use of these different methods increases students' ability to retain and learn the information.

### 2. Use of Visual Aids and Visual Exercises Increases Learning

Multimodal learning refers to learning material in different ways, such as "reading, listening, writing, practicing, and viewing images."[197]  This suggests consideration of diverse learning styles—an educational theory that has been discussed and debated by psychologists for years.[198]  These styles or modes include: verbal (learning through written text), visual (learning through pictures, diagrams, models), oral (learning through talking out ideas), aural (learning through listening to lectures, discussions, or recordings), tactile (learning through touching and manipulating material) and kinesthetic (learning through moving and doing).[199]  The theory has been that "[w]hen you teach to accommodate diverse learning styles, all learners are included in the learning process, not just those whose learning is similar [to the professors]."[200]  Cognitive psychologists suggest, that multimodal teaching can increase learning for all students, regardless of learning styles or preferences, because using different methods of teaching has a greater likelihood of preventing cognitive overload by making use of different channels, rather than conveying all the material through one channel only, such as

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192. *See* Lang, *supra* note 178 (suggesting that the frequency of assignments is more important than the format of assignments for students).

193. *Id.* (quoting cognitive psychologist, Michelle Miller).

194. *Id.* (internal quotation marks omitted).

195. *See supra* notes 90-92 and accompanying text; Burgess, *supra* note 74, at 40, 43-44; Lang, *supra* note 178.

196. Hess, *supra* note 188, at 78-79 (proposing that variety increases learning potential); *see also* Schwartz, *supra* note 1, at 387-88 (analyzing factors to be taken into account in assessment design); *see generally* Burgess, *supra* note 74, at 47-51 (discussing the positive effects myriad visual aids and exercises have on learning); Moppett, *supra* note 21, at 95-130 (discussing myriad digital assessment techniques).

197. Burgess, *supra* note 74, at 45.

198. *See* M.H. Sam Jacobson, *Learning Styles and Lawyering: Using Learning Theory to Organize Thinking and Writing*, 2 J. ASS'N LEGAL WRITING DIRECTORS 27, 29 (2004).

199. *See id.* at 34-37.

200. *Id.* at 29.

the verbal channel during a lecture.[201]  While learning styles might be debated, research shows that use of multimodal learning, including visual aids and exercises, increases learning.[202]

Instead of conveying all the class information via reading, lecture, and discussion, which can overtax the verbal channel in working memory, "visual aids can decrease extrinsic cognitive load while increasing the number of topics and details."[203]  Research has shown that people remember visual representations "more accurately, more quickly, and for a longer period of time" than words alone.[204] Visuals and graphics are particularly helpful in developing higher-order thinking skills, and law students can greatly benefit from using visuals to remember rules, apply rules to slightly modified hypothetical situations, and apply rules to completely novel situations in the exam context.[205]  However, all material should not be presented visually, such as animation and text on a PowerPoint, as that can overtax the visual channel of students' brains.[206]  Instead, when information is presented as animation and narration rather than animation and on-screen text, students are better able to learn the material as it spreads the intake of information between the verbal and visual channels.[207]

Visual exercises can help with the learning process even more than static visual aids.[208]  Exercises such as having students create a graphic organizer or flow chart of information, rather than providing it to them, have been proven to be particularly helpful in the learning process as they engage students' higher order thinking skills, help them to make connections to the material (schema), and keep them actively engaged in the process.[209]  Exercises that are not as successful include providing flowcharts or outlines to students, as students will not be able to

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201.  *See* Burgess, *supra* note 74, at 42-43.  Burgess explains how new, unautomated information triggers a higher extrinsic cognitive load, and the need to inversely match the extrinsic cognitive load with the intrinsic cognitive load to "create [a] challenging, but not overwhelming, learning environment[]."  *Id.*  Multimodal learning means one learns new information through a variety of means; research strongly indicates that students learn better through a multimodal approach, as it increases initial learning and retention for higher-order thinking tasks. *Id.* at 45.  *See also supra* notes 133-134 and accompanying text.

202.  *See* Burgess, *supra* note 74, at 44 (noting visual aids can aid professors in teaching smaller, more discrete units at a time).

203.  *Id.* at 44; *see* Kim, *supra* note 160, at 102-03.

204.  Burgess, *supra* note 74, at 47-48 (internal quotation marks omitted).  Further research has shown that students remembered information better when they studied it from graphic organizers rather than from outlines, indicating that students would greatly benefit from professors augmenting their outlines with visual aids.  *Id.*

205.  *See id.* at 48.

206.  *See* Anderson, *supra* note 59; Richard E. Mayer & Roxana Moreno, *Nine Ways to Reduce Cognitive Load in Multimedia Learning*, 38 EDUC. PSYCHOLOGIST 43, 46 tbl. 3 (2003) (distinguishing cognitive overload types and presenting ways to reduce cognitive overload).

207.  *See* Anderson, *supra* note 59; Mayer, *supra* note 206, at 44, 46 tbl. 3; Roxana Moreno & Alfred Valdez, *Cognitive Load and Learning Effects of Having Students Organize Pictures and Words in Multimedia Environments: The Role of Student Interactivity and Feedback*, 53 EDUC. TECH. RES. DEV. 35, 36 (2005).

208.  *See* Burgess, *supra* note 74, at 51.

209.  *See id.* (discussing research proving students encode information better when they "create meaning rather than take meaning").

create their own meaning and therefore not encode the material to learn it.[210] To make these exercises even more valuable as learning tools, students should do an exercise, engage in the metacognitive process of evaluating their own work, and then receive feedback from their professor.[211]

### 3. Use of More Assessments

As discussed above, retrieval practice, or testing, is a proven method for successful learning.[212] "The testing effect is an effect whereby the mere act of taking a test on to-be-remembered material produces a powerful positive effect on memory for that material."[213] Moreover, this testing effect holds true across different formats and types of questions, suggesting that professors should be quizzing and testing as much as is feasible, because "[a] course with a dozen low-stakes exams or quizzes, and plenty of homework, will do a much better job of promoting retention of course material than a class with only two or three high-stakes exams."[214] In addition, making class more interactive and "requir[ing] students to respond, and respond frequently" will greatly enable students to use their cognitive skills and retain the material.[215] These classroom exercises should mimic what students will be asked to do in assignments and exams.[216] Students should be practicing the same memory retrieval or other skills they will be asked to perform on their tests or assignments: "[s]tudents who have to produce essays should be writing in class; students who have to take multiple-choice exams should be responding to questions with clickers. . . ."[217]

As similarly explained above, many law school classes have only a midterm and final, or even just a final exam which constitutes the entire grade, yielding an assessment system which directly conflicts with learning theory.[218] "Assessment plays an important role in fostering learning, measuring student achievement, and evaluating the effectiveness of instruction."[219] Law professors must act to add more assessment into their classes to allow both professor and student to know what has been taught.[220] This will also foster students' metacognitive assessment

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210. *See id.*

211. *See id.* at 53; Moreno, *supra* note 207, at 43. As discussed *infra*, the Author acknowledges that providing individual feedback in large classes can be a daunting, if not an impossible, task. In large classes, professors can use peer review, small group discussion, and provide sample answers that are discussed in detail on an overhead camera or PowerPoint to provide such feedback and allow students to determine how well they are learning.

212. *See supra* note 179 and accompanying text.

213. Miller, *supra* note 61, at 121 (emphasis in original).

214. Lang, *supra* note 178 (explaining practicing memory retrieval through testing improves learning).

215. *Id.* (internal quotation marks omitted).

216. *See id.*

217. *Id.*

218. *See* Hess, *supra* note 188, at 88 (noting that the final exam's primary purpose is to weed out students and rank students for future employers); Moppett, *supra* note 21, at 80 (arguing more frequent feedback necessary for improving academic achievement).

219. Hess, *supra* note 188, at 86 (citing BEST PRACTICES, *supra* note 146, at 235; illustrating several justifications and requirements for diverse assessment methods).

220. *See* Niedwiecki, *supra* note 152, at 62-63.

of their own skills.[221] These assessments can take many forms and need not be overly burdensome to professors. Some easily incorporated assessments include: group feedback on practice exams, comments on drafts of papers, computer feedback, audience response systems, conferences with students, posting of quizzes or papers on a class website, podcasts discussing a problem or issue from class or going over a sample answer, one minute papers, student surveys and many, many more.[222] Nevertheless, it is critical that students receive some feedback on the assessment in order for it to further their learning.[223]

Self-assessment also plays an important role in the learning process.[224] Self-assessment requires students to be aware of their learning and monitor it to make adjustments.[225] It also forces students to consider metacognition as it applies to a particular class and learning process, rather than on a general level (as previously discussed). Self-assessments can occur at the beginning of a course, "where students articulate what they bring to the class, including their past learning experiences, their own skill set, their cognitive abilities and preferences, and which skills the course requires."[226] Self-assessment is also a useful tool for students to perform after they have completed an assignment, where students would be asked to identify the strengths and weaknesses of their work.[227] Assessing after a grade or critique is received requires students to internalize the feedback and identify gaps in their learning which they should address before the next task is completed.[228] Finally, self-assessment can be used at the end of the course, "focus[ing] on the student's growth, areas of concern, and areas of improvement."[229] All of these assessment measures will produce a powerful memory effect for students.

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221. *See* Hess, *supra* note 188, at 90; David J. Nicol & Debra Macfarlane-Dick, *Formative Assessment and Self-Regulated Learning: A Model and Seven Principles of Good Feedback Practice*, 31 STUD. IN HIGHER EDUC. 199, 208 (2006) (discussing the important role professor feedback plays in students' learning and self-assessment).

222. *See* Hess, *supra* note 188, at 90-91; Moppett, *supra* note 21, at 104-30; Niedwiecki, *supra* note 152, at 65-69.

223. *See* Nicol, *supra* note 221, at 205. Assessment and feedback processes help foster higher self-regulating learners who, research shows, are more effective learners. *Id.* The authors advance seven principles of good feedback practice, such that the feedback:

> 1) helps clarify what good performance is (goals, criteria, expected standards); 2) facilitates the development of self-assessment (reflection) in learning; 3) delivers high quality information to students about their learning; 4) encourages teacher and peer dialogue around learning; 5) encourages positive motivational beliefs and self-esteem; 6) provides opportunities to close the gap between current and desired performance; and 7) provides information to teachers that can be used to shape teaching.

*Id.*

224. *See generally* Niedwiecki, *supra* note 153, at 181-93 (citing self-assessment tools used in other areas of education).

225. *See* Nicol, *supra* note 221, at 205; Niedwiecki, *supra* note 153, at 184 (implying that self-assessment implicates metacognition).

226. Niedwiecki, *supra* note 153, at 186.

227. *See id.* at 188.

228. *See id.* at 189-91.

229. *Id.* at 192.

## V. CONCLUSION

Widespread criticism of the legal education system, together with the evolving characteristics of law students, has created a situation where students are not maximizing their ability to learn. Lawyers must be expert learners to address the demands of lawyering where the law is always evolving and no two cases are alike. Using the knowledge gained from cognitive science, psychology, and education can strengthen students' ability to be the kind of self-directed learners the practice of law requires. While change is never easy, educators can themselves reap rich rewards by employing the techniques discussed, as both students and teachers become more engaged in the learning process.

Lara Law Student sits down for torts class, puts away her phone, and takes out the chart she did for her homework. Her professor asked the class to create a chart, identifying the similarities and differences in the cases' discussion of the duty element of negligence. Lara and her study group had worked on the chart individually and then met to compare and discuss their work, so Lara had already made some changes to the chart before class and felt she knew the material well. When the professor asked for a volunteer to discuss the cases, Lara confidently raised her hand and answered. After eliciting discussion from the class, the professor put a copy of her own chart on the overhead projector, and the students were able to compare their own analysis to what the professor had intended. Lara saw that she had done a good job of identifying the key differences in the cases, but that she had not sufficiently identified the reasoning. The professor then described a hypothetical situation and asked the students to predict what a court would do, using the reasoning from the cases to justify the prediction. After discussion of the predictions, Lara realized class was nearly over. She was so engaged in the class that the time passed quickly, and she did not even think of texting, emailing, or surfing the web.