2016

Smarter Law Learning: Using Cognitive Science to Maximize Law Learning

Jennifer M. Cooper

SMARTER LAW LEARNING: USING COGNITIVE SCIENCE TO MAXIMIZE LAW LEARNING

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I. INTRODUCTION

Legal educators do not need empirical research to tell them what they already know: many students coming to law school are ill-prepared for the academic rigors of law study.[1] Undergraduate institutions are failing to teach greater numbers of students how to study and learn, how to self-regulate their learning, and how to think critically.[2] To make matters worse, fewer qualified candidates are applying to law school, forcing many law

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[1] *See* RICHARD ARUM, JOSIPA ROKSA & ESTHER CHO, IMPROVING UNDERGRADUATE LEARNING 3–4 (2011) [hereinafter IMPROVING UNDERGRADUATE LEARNING]; RICHARD ARUM & JOSIPA ROKSA, ACADEMICALLY ADRIFT: LIMITED LEARNING ON COLLEGE CAMPUSES (2011) [hereinafter ACADEMICALLY ADRIFT]; Michele Goodwin, *Law Professors See the Damage Done by 'No Child Left Behind'*, CHRON. HIGHER EDUC. (Mar. 12, 2013), http://chronicle.com/blogs/conversation/2013/03/12/law-professors-see-the-damage-done-by-no-child-left-behind ("Very bright students now come to college and even law school ill-prepared for critical thinking, rigorous reading, high-level writing, and working independently."); Christine Bartholomew, *Time: An Empirical Analysis of Law School Time Management Deficiencies*, 81 U. CIN. L. REV. 897, 904 (2013) ("It does not help that the overall quality of law school applicants has decreased . . . . Students are coming into law school less prepared, particularly in terms of analytical, writing, and research skills.").

[2] *See generally* IMPROVING UNDERGRADUATE LEARNING, *supra* note 1; ACADEMICALLY ADRIFT, *supra* note 1.

schools to lower admission standards.[3] Law schools are inheriting more less-prepared students for the study of law than ever before.[4]

Many students entering law school lack strong critical thinking skills for legal educators to build on.[5] Moreover, compared to previous student populations, these students often have poor and ineffective study habits, weak critical thinking and writing skills, and are thus less academically

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[3] This is because LSAT scores are declining, combined with a steep decrease in law school applicants. *See* Natalie Kitroeff, *Law School Applications Set to Hit 15-Year Low*, BLOOMBERG (Mar. 19, 2015, 11:38 AM), http://www.bloomberg.com/news/articles/2015-03-19/law-school-applications-will-hit-their-lowest-point-in-15-years. The brightest college graduates are no longer applying to law school. As of January 23, 2015, there were 168,887 applications from 24,097 applicants, representing a 7.3% decline in applicants from 2014. Brian Leiter, *Latest LSAC Report On Law School Applications*, LAW PROFESSOR BLOGS NETWORK (Jan. 29, 2015), http://leiterlawschool.typepad.com/leiter/2015/01/latest-lsac-report-on-law-school-applications.html; Vivian Chen, *Best and Brightest? Or Dumb and Dumber?*, AM. LAW. (Feb. 11, 2015), http://www.americanlawyer.com/the-careerist/id=1202715673998/Best-and-Brightest. Although most top tier schools are less affected and continue to attract high-quality candidates, mid-level and bottom-tier schools will be the hardest hit. *See* Natalie Kitroeff, *Getting Into Law School Is Easier Than It Used to Be, and That's Not Good*, BLOOMBERG BUS., http://www.bloomberg.com/news/articles/2015-01-06/getting-into-law-school-is-easier-than-it-used-to-be-and-thats-not-good (last updated Jan. 9, 2015, 10:57 AM).

[4] *See* Cathaleen A. Roach, *Is the Sky Falling? Ruminations on Incoming Law Student Preparedness (and Implications for the Profession) in the Wake of Recent National and Other Reports*, 11 J. LEGAL WRITING INST. 295, 296–97 (2005).

> [W]e must ask, . . . "is the preparedness level of our incoming law students in the next one to ten years declining, and if so, how dramatically?" In particular, how does less exposure to writing and reading affect what first-year law students bring to our law schools—*regardless of their LSAT standardized test scores?*

Id. Susan Stuart & Ruth Vance, *Bringing a Knife to the Gunfight: The Academically Underprepared Law Student & Legal Education Reform*, 48 VAL. U. L. REV. 1, 41 (2013).

[5] *See* Goodwin, *supra* note 1; Bartholomew, *supra* note 1, at 904.

> At the Association of American Law Schools conference in January, a number of professors voiced concern about these cultural shifts, their impacts in the classroom, and law schools' roles in perpetuating the trends by placing high value on LSAT scores. According to some conference participants, students' writing skills are the worst they have ever encountered.

Goodwin, *supra* note 1.

prepared for the case method and Socratic method.[6] Most alarmingly, these students have "illusions of competence" in their reading, writing, and study habits, leading them to rely on improvised and ineffective study strategies.[7]

These students have also been trained that there is a "right answer" through more emphasis on standardized testing and less emphasis on rigorous reading and writing tasks.[8] These deficiencies result in a reduced

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[6] *See* Stuart & Vance, *supra* note 4, at 41; James Etienne Viator, *Legal Education's Perfect Storm: Law Students' Poor Writing and Legal Analysis Skills Collide with Dismal Employment Prospects, Creating the Urgent Need to Reconfigure the First-Year Curriculum*, 61 CATH. U. L. REV. 735, 737 (2012); Roach, *supra* note 4, at 296–97; Aida M. Alaka, *The Grammar Wars Come to Law School*, 59 J. LEGAL EDUC. 343, 343–44 (2010).

[7] *See* PETER C. BROWN, HENRY L. ROEDIGER III & MARK A. MCDANIEL, MAKE IT STICK: THE SCIENCE OF SUCCESSFUL LEARNING 16–17 (2014) [hereinafter MAKE IT STICK]; BENEDICT CAREY, HOW WE LEARN: THE SURPRISING TRUTH ABOUT WHEN, WHERE, AND WHY IT HAPPENS 82 (2014); ACADEMICALLY ADRIFT, *supra* note 1, at 126–27; Jennifer McCabe, *Metacognitive Awareness of Learning Strategies in Undergraduates*, 39 MEMORY & COGNITION 462, 462 (2011).

> [C]ollege professors routinely encounter students who have never written anything more than short answers on exams, who do not read much at all, who lack foundational skills in math and science, yet are completely convinced of their abilities and resist any criticism of their work, to the point of tears and tantrums: "But I earned nothing but A's in high school," and "Your demands are unreasonable."

Thomas H. Benton, *A Perfect Storm in Undergraduate Education, Part I*, CHRON. HIGHER EDUC. (Feb. 20, 2011), http://chronicle.com/article/A-Perfect-Storm-in/126451.

[8] Critics argue that the rise of standardized testing created students who look for the "right" answer instead of analyzing multiple possible "good" answers. *See* Susan Fanetti, Kathy M. Bushrow & David L. DeWeese, *Closing the Gap Between High School Writing Instruction and College Writing Expectations*, 99 ENG. J. 77, 78 (2010). The most crucial obstacle between test writing and learning:

> Standardized testing, to be standardized, must create questions and answers that leave no room for interpretation. Such rigid questions and answers remove the importance of context from literacy practices and allow for no independent meaning making from students. Yet it is in that moment when an individual makes meaning in writing and reading in a specific cultural context that identity and literacy come together.

Id. (citing Bronwyn T. Williams, *Standardized Students: The Problems with Writing for Tests Instead of People*, 49 J. ADOLESCENT & ADULT LITERACY 152, 154 (2005). *See also* Goodwin, *supra* note 1 ("Teaching to the test overshadows (if not supplants) teaching critical thinking, higher-order reasoning, and the development of creative-writing skills.").

ability to quickly develop critical thinking skills when students are immersed in the law school learning environment and create the need for remediation before the real teaching of legal analysis can begin.[9]

Yet, legal education has been slow to adapt to the modern students' learning habits.[10] Law schools expect to educate students using the same Socratic and case methods designed for a population of students whose undergraduate institutions adequately prepared them.[11] Law schools have a choice: maintain the status quo in legal education and continue lamenting the quality of incoming students, or modernize legal education with meaningful changes that acknowledge students' inadequacies but use cognitive science to improve learning outcomes.

Part II discusses how undergraduate students are "academically adrift," lacking skills in critical thinking and problem solving as well as effective writing and study habits. Part III summarizes the empirical research on study behaviors, specifically which study behaviors are correlated with academic success. Part IV examines how law schools can use these empirical research findings in law school classrooms to maximize law learning.

II. ACADEMICALLY ADRIFT WITH ILLUSIONS OF COMPETENCE

During their undergraduate education, the majority of students are not developing effective critical thinking, analytical reasoning, or written communication skills.[12] Undergraduate students enter law school without truly knowing how to study or learn, leading to improvised study methods,

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[9] *See* Bartholomew, *supra* note 1, at 905 ("This lack of foundational skills takes its toll in law school. For example, strong fundamental reading abilities are essential. A deficit in basic reading skills forces law students to devote extra time to meet even baseline expectations. Reading for law school is notably different than other disciplines."); Roach, *supra* note 4, at 297; Stuart & Vance, *supra* note 4, at 41.

[10] *See* E. Scott Fruehwald, *How to Help Students from Disadvantaged Backgrounds Succeed in Law School*, 1 TEX. A&M L. REV. 83, 83 (2013) ("[L]aw school has changed little in reaction to the new kinds of students it must educate."); Benjamin V. Madison, III, *The Elephant in Law School Classrooms: Overuse of the Socratic Method as an Obstacle to Teaching Modern Law Students*, 85 U. DET. MERCY L. REV. 293, 295 (2007).

[11] *See* Madison, *supra* note 10.

[12] *See* IMPROVING UNDERGRADUATE LEARNING, *supra* note 1, at 1; ACADEMICALLY ADRIFT, *supra* note 1, at 1–2; Kathrin F. Stanger-Hall, Floyd W. Shockley & Rachel E. Wilson, *Teaching Students How to Study: A Workshop on Information Processing and Self-Testing Helps Students Learn*, 10 CBE—LIFE SCIENCES EDUC. 187, 187 (2011) (citing many studies in recent years documenting a lack of critical thinking skills in college students).

over-reliance on ineffective study behaviors, and illusions of competence.[13] Rather than "dumb down" legal education, this Article advocates recognition and acceptance of undergraduate learning methods and creates plans for legal education to bridge deficiencies by looking to empirical research in teaching and learning. Professors can honor the academic rigor of legal education as well as students' efforts by better supporting their learning and enabling their development of critical thinking, problem solving, writing, and study skills.

A. Undergraduate Programs Produce Graduates with Weak Critical Thinking, Complex Reasoning, and Writing Skills

The overall quality of undergraduate learning is in decline because many college programs are not adequately rigorous or demanding.[14] Approximately 45% of undergraduates demonstrate "no improvement in critical thinking, complex reasoning, and writing skills in the first two years of college, and 36% show no progress in four years." [15] A markedly small percentage of college graduates excel in higher order thinking and cognitive skills—specifically 16% in written communication and 28% in critical

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[13] *See* Richard Arum & Josipa Roksa, *Are Undergraduates Actually Learning Anything?*, CHRON. HIGHER EDUC. (Jan. 18, 2011), http://chronicle.com/article/Are-Undergraduates-Actually/125979; E. Ashby Plant et al., *Why Study Time Does Not Predict Grade Point Average Across College Students: Implications of Deliberate Practice for Academic Performance*, 30 CONTEMP. EDUC. PSYCH. 96 (2005); McCabe, *supra* note 7; Keith O'Brien, *What Happened to Studying?*, BOSTON GLOBE (July 4, 2010), http://www.boston.com/bostonglobe/ideas/articles/2010/07/04/what_happened_to_studying.

> In a 2008 survey of more than 160,000 undergraduates enrolled in the University of California system, students were asked to list what interferes most with their academic success. Some blamed family responsibilities, some blamed jobs. The second most common obstacle to success, according to the students, was that they were depressed, stressed, or upset. And then came the number one reason, agreed upon by 33 percent of students, who said they struggled with one particular problem "frequently" or "all the time": They simply did not know how to sit down and study.

Id.

[14] *See* ACADEMICALLY ADRIFT, *supra* note 1, at 18, 31. *See generally* CRAIG BRANDON, THE FIVE-YEAR PARTY: HOW COLLEGES HAVE GIVEN UP ON EDUCATING YOUR CHILD AND WHAT YOU CAN DO ABOUT IT (2010).

[15] Benton, *supra* note 7.

thinking and problem solving[16]—compared to undergraduate students in the 1980s who learned at twice the rate of contemporary college students.[17]

Students enter universities not only poorly prepared for the highly demanding academic tasks but also with attitudes, norms, and behaviors that are counterproductive to academic commitments.[18] More students are entering colleges and universities because of gains in access to education, and many are simply not prepared for the academic work at the college level.[19]

Yet, these students arrive at colleges and universities with strong convictions about their abilities and with illusions of competence, making some students nearly unteachable.[20] These students express high academic expectations and professional ambitions but fail to realistically appreciate the necessary steps to achieve their goals.[21]

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[16] ACADEMICALLY ADRIFT, *supra* note 1, at 143.

[17] IMPROVING UNDERGRADUATE LEARNING, *supra* note 1, at 5.

[18] *See* ACADEMICALLY ADRIFT, *supra* note 1, at 3. Four important findings from ACADEMICALLY ADRIFT are: (1) Undergraduate learning is academically adrift and not adequately prioritized; (2) Gains in student performance are alarmingly low with a pattern of limited learning on undergraduate campuses; (3) Persistent and growing inequality despite gains in access; and (4) Low overall level of learning in and across institutions associated with measurable differences in students' educational experiences. *Id.* at 30.

[19] *See id.* at 33. The Collegiate Learning Assessment (CLA) is a higher-education standardized test. *See* CAE, *CLA+ References*, CAE.ORG, http://cae.org/participating-institutions/cla-references (last visited Apr. 2, 2016). Initial CLA performance and scores track closely with students' family backgrounds, specifically when one of the student's parents had attended graduate or professional school, not just undergraduate school. *See* ACADEMICALLY ADRIFT, *supra* note 1, at 38–39. Higher education reproduces social inequality: this means inequality from "educational experiences" and parenting styles as a result of parents' own education and social status. *Id.* at 40–41. Huge differences in "academic preparation" was one of the significant factors contributing to lower academic outcomes for students from less socioeconomically advanced families, i.e., high school A.P. classes, emphasis on getting good grades in school and on standardized tests, and using preparatory courses. *Id.* at 42–43. Students from less-educated families and racial and ethnic minority groups had overall lower levels of these higher order thinking and cognitive skills as they enter college. *See id.* The researchers found that this inequality was largely preserved—or in cases of African-American students exacerbated—as the students continued in their undergraduate educations. *See id.*

[20] *See* ACADEMICALLY ADRIFT, *supra* note 1, at 126–27; Benton, *supra* note 7.

[21] *See* ACADEMICALLY ADRIFT, *supra* note 1, at 126–27. Multiple factors have led to the decline of learning in undergraduate programs. Students have become adept at the "Art of College Management"—controlling their college academic experience by shaping their

Some critics blame the overuse of multiple choice testing and standardized testing—which leads many students to believe there is a "right" answer—instead of essays or other written assessments that force students to develop critical thinking and problem-solving skills.[22]

B. Reduced Writing and Reading Requirements Result in Underdeveloped Critical Reading and Thinking Skills

Undergraduate students spend an average of fifteen hours per week studying, down from an average of twenty-four hours per week in the 1960s.[23] Only one in four college students devote more than twenty hours a week to studying, which is relatively consistent across demographics.[24] Thirty-seven percent of undergraduate students spend fewer than five hours per week on class preparation.[25] The most troubling findings are related to the minimal amount of classes requiring significant reading and writing assignments—those directly related to the development of critical reading and thinking skills. One-half of the students in the sample did not take a single course requiring more than twenty pages of writing and one-third of the students did not take a course that required more than forty pages of

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schedules, choosing classes with little reading or writing, choosing easy professors, and generally limiting their workload. *Id.* at 4. Many students have a "credentialist-collegiate orientation"; they are earning a degree for the sake of the credential with as little effort extended as possible. *Id.* at 69–70.

[22] Fanetti, Bushrow & DeWeese, *supra* note 8, at 78, 81–82.

[23] *See* IMPROVING UNDERGRADUATE LEARNING, *supra* note 1, at 4; Sarah A. Nonis & Gail I. Hudson, *Performance of College Students: Impact of Study Time and Study Habits*, 85 J. EDUC. FOR BUS. 229 (2010) (This study focuses not just on time spent studying, but on how effectively the student spends time studying that influences academic performance, and uses a modified scale to measure scheduling, ability to concentrate, and access to notes. It also notes that results from the study did not demonstrate a significant direct relationship between the amount of study time and academic performance, which seems to indicate that it comes down to examining specific study habits).

[24] *See* ACADEMICALLY ADRIFT, *supra* note 1, at 3–4; Bartholomew, *supra* note 1, at 903.

[25] ACADEMICALLY ADRIFT, *supra* note 1, at 69. The amount of time students spent preparing for class differed with social and academic background. *See id.* at 70. Students with parents with graduate/professional level educations studied two hours more per week than students with parents from families with no post-secondary education. *Id.* African-American students studied two fewer hours per week than white students. *Id.* The limited hours spent studying is consistent with the college student culture focused on social activities and the art of college management where academic success is achieved through controlling college schedules, taming professors, and limiting workload. *See id.* at 69–70.

reading a week.[26] Even worse, one-quarter of the students did not take courses that required either significant writing or reading.[27]

The combination of significant reading requirements (more than forty pages per week) and writing assignments (more than twenty pages per semester) are critical to improve higher order thinking and cognitive skills.[28] The more time students spend reading and writing, the more the improvement in higher order thinking and cognitive skills is pronounced.[29] Further, increases in studying and homework positively effect a range of academic and cognitive outcomes in higher education than almost any other measure.[30] The quantity of time spent studying is not related to academic success.[31] Therefore, understanding the study behaviors students use compared to effective behaviors is critical.

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[26] *Id.* at 70–71.

[27] *Id.* at 71. The researchers found that social background was closely associated with the degree to which student chose courses with rigorous academic requirements, and race and having parents with prior graduate/professional education created significant differences. *Id.* at 71–72.

[28] *See id.* at 93. Courses that include significant reading and writing (reading more than forty pages per week and writing more than twenty pages per semester) are associated with improvements in higher order thinking and cognitive skills. *See id.* Students reported that high faculty expectations and classes requiring significant reading and writing assignments improved their skills significantly. *See id.*

[29] *See id.* at 98–99.

[30] *See id.* Arum and Roksa recommend that colleges develop a culture of learning and follow these recommendations: clearly state course objectives; clearly present materials; link course content to course objectives; provide students with examples of what is expected; create ample opportunities for students to apply what they have learned; and provide frequent formative assessment. *See id.* at 131 (explaining recommendations by Harvard Project Zero).

[31] *See* Marcus Credé & Nathan R. Kuncel, *Study Habits, Skills, and Attitudes*, 3 PERSP. ON PSYCHOL. SCI. 425, 426 (2008) ("Programs that focus on the acquisition of specific study skills are likely to be particularly useful in light of the consistent finding that the amount of studying (time spent studying) is largely unrelated to academic performance . . . ."); Plant et al., *supra* note 13, at 97 ("[R]esearchers have consistently found a weak or unreliable connection between weekly study time and grade point average (GPA) for undergraduate students . . . .").

III. RESEARCH IN COGNITIVE AND LEARNING SCIENCES: WHICH LEARNING AND STUDY BEHAVIORS WORK

Researchers have devoted vast resources to understanding how undergraduate students study and learn.[32] Thousands of empirical studies examine the study behaviors of undergraduates.[33] The existing comprehensive body of research shows that study behaviors[34] exhibit relationships with academic performance that are as statistically significant as the relationship between academic performance and the two most frequently used predictors: prior academic performance (such as grade point average) and standardized test scores (such as the ACT and SAT).[35] The effectiveness of specific study behaviors will be examined in more detail in the next section.

A. Empirical Research on Specific Study Strategies

The amount of time spent studying is unrelated to academic performance.[36] Instead, the critical factor is the actual task or behavior.[37] Undergraduate researchers have examined which specific learning skills, strategies, and habits are most effective, as well as students' awareness of the effectiveness of these empirically-proven study behaviors.[38] These findings challenge much of what researchers know about the "right" way to study.

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[32] *See generally* JOHN HATTIE, VISIBLE LEARNING: A SYNTHESIS OF OVER 800 META-ANALYSES RELATING TO ACHIEVEMENT (2009).

[33] *See generally id.*; Credé & Kuncel, *supra* note 31. Both works are meta-analyses that synthesize hundreds of individual research projects on learning and study behaviors.

[34] Study behaviors include study skills, study habits, study attitudes, and study motivation. *See* Credé & Kuncel, *supra* note 31, at 427.

[35] *See id.* at 444. Over 50,000 empirical studies have been conducted on undergraduate learning and study habits. *See* HATTIE, *supra* note 32, at 2. Comprehensive meta-analytical studies of these individual research efforts demonstrate a clear link between study behaviors and academic performance. *See id.* at 7. Study skills are the student's knowledge of study strategies and ability to manage time and resources to accomplish the academic task. *See* Credé & Kuncel, *supra* note 31, at 429. Study habits are the degree and regularity with which the student uses specific acts of studying (e.g., reviews of material) in an appropriate environment. *See id.* Study attitudes refer to a student's positive attitude toward studying and acceptance of the education goals. *See id.*

[36] *See* Credé & Kuncel, *supra* note 31, at 436.

[37] *See* Nonis & Hudson, *supra* note 23, at 152 (explaining researchers are beginning to devote more attention to which study behaviors are effective and which are ineffective).

[38] *See* Credé & Kuncel, *supra* note 31, at 427.

Three specific study strategies are highly correlated with academic success:[39] (1) retrieval; (2) self-testing; and (3) periodic review.[40] These learning strategies are incredibly effective, yet are counterintuitive and challenge conventional ideas about studying.[41] Despite this wealth of research, students lack knowledge about effective study methods and over-rely on ineffective and improvised study methods learned through common sense, trial and error, theory, lore, and intuition.[42]

These strategies—retrieval, self-testing, and periodic review—require more effort and planning than other commonly-used study methods such as rereading and cramming.[43] Students mistakenly believe that material is well learned when the learning is "easy."[44] Unfortunately, the opposite is true: when learning is harder, it lasts longer.[45]

Until recently, the majority of research on memory and cognition focused on "encoding"—a term for getting information into memory—and the effects of encoding on learning, rather than the most effective methods of retrieving stored information.[46] Likewise, researchers are focusing on

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[39] Interleaving or varying practice is also a well-established learning strategy and will be discussed with retrieval practice. *See* text accompanying *infra* notes 108–11. The concept of "desirable difficulties" will also be discussed in the context of retrieval, self-testing, and periodic review. *See* text accompanying *infra* note 107; MAKE IT STICK, *supra* note 7, at 4; CAREY, *supra* note 7, at 66.

[40] *See* CAREY, *supra* note 7, at 3–4.

[41] *See, e.g.*, MAKE IT STICK, *supra* note 7, at 3; CAREY, *supra* note 7, at xii.

[42] *See* MAKE IT STICK, *supra* note 7, at 8–9; Robert A. Bjork, John Dunlosky & Nate Kornell, *Self-Regulated Learning: Beliefs, Techniques, and Illusions*, 64 ANN. REV. PSYCHOL. 417, 419 (2013). Our intuitions about how to learn are an unreliable guide as to how we should manage our learning activities. *See id.* We assume that "children and adults do not need to be taught how to manage their learning activities." *Id.* Colleges and universities are more concerned about whether incoming students have necessary background knowledge in important domains (e.g., English, math, etc.) and use tests to assess whether students have acquired this necessary knowledge. *See id.* However, institutions do not test whether students have the necessary skills to effectively learn. *See id.*; Veronica X. Yan, Khanh-Phuong Thai & Robert A. Bjork, *Habits and Beliefs That Guide Self-Regulated Learning: Do They Vary With Mindset?*, 3 J. APPLIED RES. MEMORY & COGNITION 140, 140 (2014).

[43] *See, e.g.*, MAKE IT STICK, *supra* note 7, at 44; CAREY, *supra* note 7, at 94.

[44] MAKE IT STICK, *supra* note 7, at 9.

[45] *See id.*

[46] *See* Jeffrey D. Karpicke & Janell R. Blunt, *Retrieval Practice Produces More Learning than Elaborative Studying with Concept Mapping*, 331 SCIENCE 772, 772 (2011); Jeffrey D. Karpicke & Phillip J. Grimaldi, *Retrieval-Based Learning: A Perspective for Enhancing Meaningful Learning*, 24 EDUC. PSYCHOL. REV. 401, 401 (2012). The emphasis on encoding

what learning strategies produce more long-term learning.[47] The chart below provides an overview of study strategies and their levels of effectiveness.

UTILITY LEVEL OF LEARNING TECHNIQUES EXAMINED[48]		
Technique	***Utility***	***Description***
Retrieval	High	Retrieving information from memory without cues, recalling information without having it in front of the student
Self-testing	High	Self-testing and self-quizzing: taking practice quizzes or tests to learn material. Using study questions at the end of reading material or generating a student's own questions
Periodic review (spacing study)	High	Studying information more than once by spacing study sessions over days or weeks
Interleaving practice	Moderate	Mixing different kinds of problems when studying, instead of having blocks of similar kinds of problems
Elaboration	Moderate	Explaining information in a student's own words and relating material to what he or she already knew about the topic
Generation	Moderate	Attempting to answer a question before being shown the answer, filling in missing information, answering a short-answer question or essay question
Reflection	Moderate	Taking a few minutes to review what was learned in a class or from a text; a combination of retrieval and elaboration
Massing study	Low	Repetition of information in the same study session until material is memorized; "cramming" study
Highlighting	Low	Marking potentially important information while reading
Rereading	Low	Rereading text material after initial reading

and neglect of retrieval in education may be because of a belief that the mind is a place where knowledge is stored and use of common metaphors of knowledge as "constructed" into "structures" with instructors providing "scaffolding" for learning. *Id.* at 403. The education community has paid less attention to the importance of retrieval in learning. *See id.*

[47] *See, e.g.*, Franklin M. Zaromb & Henry L. Roediger III, *The Testing Effect in Free Recall Is Associated with Enhanced Organizational Processes*, 38 MEMORY & COGNITION 995 (2010).

[48] *See* Annie Murphy Paul, *Highlighting Is a Waste of Time: The Best and Worst Learning Techniques*, TIME (Jan. 9, 2013), http://ideas.time.com/2013/01/09/highlighting-is-a-waste-of-time-the-best-and-worst-learning-techniques.

1. Retrieval

"Retrieval" is recalling information without cues, i.e., testing what was learned.[49] The use and effects of retrieval and self-testing have been heavily researched,[50] yet are counterintuitive. As a result, these fundamental principles of cognitive science and psychology are not well known by students—those who need this knowledge most.[51]

Retrieval is a powerful learning tool. The act of retrieving information from memory is different and more difficult than simply seeing the information again, as in rereading.[52] When people retrieve information, they re-store it in their memories in a different way than before.[53] Retrieval is not just a neutral assessment of knowledge; the process of retrieval itself creates learning.[54] Retrieval not only produces learning; it may be a more effective learning activity than encoding itself.[55] The more difficult it is to retrieve the information, the harder the brain works to dig up that information and the greater the learning.[56]

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[49] Practicing retrieval means learning by "recalling information from memory (e.g., learn by taking tests)." Bennett L. Schwartz et al., *Four Principles of Memory Improvement: A Guide to Improving Learning Efficiency*, 21:1 INT'L J. OF CREATIVITY & PROBLEM SOLVING 7, 8 (2011). This act of retrieval is often studied through the use of tests or quizzes. *See id.* "Retrieval-based learning" refers to the process of encoding and retrieving information from memory; it is the key process for learning, and retrieval creates learning rather than neutrally assessing whether learning has occurred. Karpicke & Grimaldi, *supra* note 46, at 404.

[50] *See id.*; Schwartz et al., *supra* note 49, at 8.

[51] *See* Karpicke & Grimaldi, *supra* note 46, at 402; Karpicke & Blunt, *supra* note 46, at 772. Research in cognitive psychology has implications for education, but is typically not within the education context or published widely in the education community. *See* Deborah J. Merritt, *Legal Education in the Age of Cognitive Science and Advanced Classroom Technology*, 14 B.U. J. SCI. & TECH. L. 39, 40 (2008). Retrieval-based learning and other findings from cognitive science are even less known in legal education. *See id.* at 41.

[52] *See* CAREY, *supra* note 7, at 94. Retrieval is not just a read-out of stored knowledge; the act of retrieving itself creates learning. *See* Karpicke & Blunt, *supra* note 46, at 772. Researchers have also found the more difficult it is to retrieve something from memory, or the more effort required to retrieve the information, the more it will stick. *See* MAKE IT STICK, *supra* note 7, at 75.

[53] *See* CAREY, *supra* note 7, at 94.

[54] *See* Karpicke & Grimaldi, *supra* note 46, at 401–02.

[55] *See* Karpicke & Blunt, *supra* note 46, at 772.

[56] *See* CAREY, *supra* note 7, at 82.

2. Self-Testing and the Testing Effect

Closely related to retrieval is the "testing effect," a well-established principle in cognitive science that testing students (i.e., requiring students to engage in retrieval practice) on previously-learned information causes students to retain information more thoroughly and for a longer term than rereading or other studying activities.[57] The testing effect is a robust finding that testing greatly enhances long-term retention compared to restudying or rereading the material.[58] Testing has even been proven to enhance the long-term retention of *untested* information conceptually related to the tested information.[59]

The testing effect also enhances organization and conceptualization of information during subsequent recalls.[60] Testing improves both access to higher-order units and access to items within units compared to studying alone.[61] The testing effect works positively with the organization of information to better understand how the process of mentally organizing information influences learning and retention.[62] "Chunking" is mental repackaging of large quantities of information into smaller chunks that help students to subjectively organize information.[63] When unrelated material can be subjectively grouped, the subjects who created the groups and chunked the material can better remember the information than if arbitrary groups were created.[64] Because of these powerful learning effects, testing and self-testing are effective learning tools, not just assessment tools.[65]

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[57] *See* Henry L. Roediger III & Bridgid Finn, *The Pluses of Getting It Wrong*, SCI. AM. MIND, March/April 2010, at 39.

[58] *See* Zaromb & Roediger, *supra* note 47, at 995. The testing effect has been shown to promote learning rather than just assess learning. *Id.*

[59] *See id.*

[60] *See id.* The experiment tested whether the testing effect extended to conceptual organization, rather than studying alone. *See id.*

[61] *See id.* at 1005. Greater category clustering and information organization are correlated with recall, which shows that organizational processes add to the testing effect on long-term retention. *See id.* at 1002. In all, the testing effect enhances access to higher-order units, access to contents within the units, and organization of the lists themselves. *See id.* at 1006.

[62] *See id.*

[63] *See id.* at 995.

[64] *See id.*; Katherine A. Rawson & John Dunlosky, *Optimizing Schedules of Retrieval Practice for Durable and Efficient Learning: How Much Is Enough?*, 140 J. EXPERIMENTAL PSYCHOL.: GEN. 283, 283 (2011).

[65] *See* Henry L. Roediger III & Andrew C. Butler, *The Critical Role of Retrieval Practice in Long-Term Retention*, 15 TRENDS COGNITIVE SCI. 20, 20 (2011).

3. Periodic Review and Spacing Study

Periodic review is strongly correlated to academic success and durable learning.[66] Periodic review, also known as "spacing study," is the opposite of cramming or "massing study."[67] Spacing study means reviewing material more than once, but with time—days or weeks—between practice sessions to allow for forgetting before the next retrieval attempt.[68] Periodic review is more effective than massing study, and the distribution of study over multiple sessions spread out or spaced out over time is far superior to massing of studying in any single session.[69]

Spacing study is one of the most robust findings in educational psychology.[70] It is significantly more effective than massing study, but feels less effective as students have to work harder to retrieve information from days or even weeks ago.[71] Massing study creates an illusion of competence as material that is easier to recall is judged as better learned than material that is more difficult to recall.[72] In fact, students mistakenly believe that massing creates more learning because it creates "retrieval fluency"—information is easier to recall during massed study sessions, which is perceived as better learning.[73]

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[66] *See* Jonathan A. Susser & Jennifer McCabe, *From the Lab to the Dorm Room: Metacognitive Awareness and Use of Spaced Study*, 41 INSTRUCTIONAL SCI. 345, 346 (2013).

[67] *Id.* at 345–46.

[68] *See* MAKE IT STICK, *supra* note 7, at 203. Spacing requires enough time to forget some information so retrieval will be more effortful but not so much space or forgetting that students must relearn the material. *Id.* at 63–64. Because time periods between learning, including sleeping, helps material consolidate, at least a day in between review sessions is necessary. *Id.*

[69] *See id.* at 263–64. The "spacing effect" is one of the most robust findings in educational psychology. Nate Kornell, *Optimising Learning Using Flashcards: Spacing Is More Effective Than Cramming*, 23 APPLIED COGNITIVE PSYCHOL. 1297, 1297 (2009). The spacing effect is the creation of long-term learning from spacing study sessions over a longer period of time versus cramming or massing study sessions. *Id.* Spacing out the study of material is more effective to promote long-term learning than massing study. *Id.* at 1298. For a review of literature on spacing effect in memory, see N.J. Cepeda et al., *Distributed Practice in Verbal Recall Tasks: A Review and Quantitative Synthesis*, 132 PSYCHOL. BULLETIN 354 (2006).

[70] *See* Susser & McCabe, *supra* note 66, at 345–46.

[71] *See* MAKE IT STICK, *supra* note 7, at 205.

[72] *See id.* at 204–05.

[73] Kornell, *supra* note 69, at 1312. In massed study, students pay less attention to the second presentation of an item, but pay more attention to the second presentation of an item

Yet, students fail to understand the effectiveness of spaced study and continue to rely on massed studying or cramming.[74] Even when students performed better following self-testing, students still chose to reread or restudy the material versus relying on self-testing.[75]

Because spacing study and optimal intervals are not intuitive, researchers examined the optimal intervals for spacing individual study sessions on the same material,[76] provided in the table below. First, determine the time until the test: how long you have until the exam or how long you wish to remember the material.[77] Second, use the corresponding study intervals to space your study sessions leading up to the exam.[78] For example, law students will spend two to three months (depending on the quarter or semester system) learning material that will be on an exam. With an exam roughly three weeks away, law students should space out their study sessions in four to five day intervals, give or take a few days on either side.[79] If law students started preparing earlier in the quarter or the semester, when the exam was three months away, such as in preparing course outlines and working through practice problems, a student could space those sessions two weeks apart.

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in spaced study. *Id.* In massed study, the material is familiar the second time it is presented and students are often more accurate the second time, requiring less effort the second time the material is presented. *Id.*

[74] Focusing on micro-level decisions in the study process, Kornell and Bjork found that even though students quizzed themselves about the material, few students viewed retrieval or self-testing practice as a method to enhance learning. *See* Nate Kornell & Robert A. Bjork, *The Promise and Perils of Self-Regulated Study*, 14 PSYCHONOMIC BULLETIN & REV. 219, 221–22 (2007). "Even in studies where participants have shown superior results from spaced learning, they don't perceive the improvement; they *believe* they learned better on the material where practice was massed." MAKE IT STICK, *supra* note 7, at 47.

[75] *See* Bjork, Dunlosky & Kornell, *supra* note 42, at 242.

[76] CAREY, *supra* note 7, at 76.

[77] *Id.* at 77.

[78] *Id.* at 77–78. The intervals are not exact but are reliable guidelines. Instead of a rigid seven day spacing for one week, a student might choose to study material every five days or even every nine days depending on the student's comfort with the material or personal schedule.

[79] Assume that first-year law students have final exams at the end of a semester in these subjects: Civil Procedure, Contracts, Criminal Law, and Torts. With three weeks leading up to each exam, the student might adopt the following intervals for spacing study four days apart: Civil Procedure on Days 1, 5, 9, 13, 17, and the day before the exam; Contracts on Days 2, 6, 10, 14, 18, and the day before the exam; Criminal Law on Days 3, 7, 11, 15, 19, and the day before the exam; and Torts on Days 4, 8, 12, 16, 20, and the day before the exam.

Optimal Study Intervals[80]

Time Until The Test	Study Intervals (Time between sessions)
1 Week	1–2 Days
1 Month	5–7 Days
3 Months	2 Weeks
6 Months	3 Weeks
1 Year	1 Month

Self-regulated study requires students to make many time management decisions when they study on their own.[81] Realistically, a student must choose which items to study, how long to study before moving on to another item, and when to stop studying.[82] Students are responsible for scheduling their study tasks and selecting specific strategies to use when learning course material.[83]

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[80] The information in this table is summarized from CAREY, *supra* note 7, at 77.

[81] *See* Kornell & Bjork, *supra* note 74, at 219.

[82] *See id.* at 221 (focusing on micro-level decisions in the study process). Kornell and Bjork listed several popular study behaviors—including self-testing, copying notes, underlining reading material, outlining, and diagramming—but focused on two specific strategies: spacing practice and self-testing, both considered desirable difficulties that enhance long-term learning. *Id.*

[83] *See* Marissa K. Hartwig & John Dunlosky, *Study Strategies of College Students: Are Self-Testing and Scheduling Related to Achievement?*, 19 PSYCHONOMIC BULLETIN & REV. 126, 126 (2012). A large-scale study published in 2011 investigated differences in specific study habits of high and low achieving students. *Id.* at 127. Researchers targeted *when* students scheduled their study tasks and *which* specific strategies the students used to learn the course material. *Id.* at 127–29. They surveyed students about their regular use of specific, concrete study strategies and their rationale for using them to assess a wider range of commonly-used study strategies such as underlining while reading, making outlines or diagrams, as well as to assess how students schedule their study—when they study, whether they space or mass, as well as the relationship between students' reported use of these strategies and their grades. *Id.* at 127.

B. Ineffective Study Strategies Compared to Retrieval, Self-Testing, and Periodic Review

The most commonly-used study method is rereading.[84] Students steadfastly believe that the best way to learn something is to read and reread until the material is well engrained and "memorized."[85] Students are often convinced this studying method creates more learning and that testing merely measures what was learned.[86] Instead, this repetition and rereading create an illusion of fluency: the belief that if information is familiar and easy to recall, then it is well-learned.[87]

Rereading not only creates an illusion of fluency but also an illusion of mastery of the underlying ideas.[88] Fluency lulls learners into believing they learned and understood the material.[89] If rereading is a warm, cozy blanket, then retrieval is a cold, hard wake-up call.

Retrieval and self-testing destroy illusions of fluency, competency, and mastery by exposing a person's actual knowledge and understanding.

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[84] *See* Jeffrey D. Karpicke, A.C. Butler & H.L. Roediger III, *Metacognitive Strategies in Student Learning: Do Students Practice Retrieval When They Study on Their Own?*, 17 MEMORY 471, 474 (2010). Rereading, highlighting, underlining and poring over notes and texts are the most commonly used study strategies. *See* MAKE IT STICK, *supra* note 7, at 15.

[85] "The finding that rereading textbooks is often labor in vain ought to send a chill up the spines of educators and learners, because it's the number one study strategy of most people—including more than 80 percent of college students in some surveys—and is central in what we tell ourselves to do during the hours we dedicate to learning." MAKE IT STICK, *supra* note 7, at 10.

[86] *See id.* at 12. Many students believe that studying means rereading material over and over and that "practicing" or "self-testing" is only to assess what one has learned through rereading. *See id.* The choice to repeatedly read and reread material is logical if learning is only the process of encoding or inputting information, and if retrieval is only a way to assess prior learning. To study for an upcoming test, students were given a choice: after reading through notes and the texts, either: (a) go back and restudy the material (all or parts); (b) try to recall the material; or (c) do some other study activity. *See* Jeffrey D. Karpicke, *Retrieval-Based Learning: Active Retrieval Promotes Meaningful Learning*, 21 CURRENT DIRECTIONS PSYCHOL. SCI. 157, 158 (2012). The majority of students chose to reread their notes or the text, although some students chose to do another study activity, and few students attempted to recall the material. *See id.*

[87] *See* CAREY, *supra* note 7, at 80–83; MAKE IT STICK, *supra* note 7, at 13–22.

[88] *See* MAKE IT STICK, *supra* note 7, at 16.

[89] *See id.* at 17.

Retrieval and self-testing expose gaps in knowledge and understanding, which is critical for assessing how well a person learned something.[90]

> Rereading has three strikes against it. It is time consuming. It doesn't result in durable memory. And it often involves a kind of unwitting self-deception, as growing familiarity with the text comes to feel like mastery of the content. The hours immersed in rereading can seem like due diligence, but the amount of study time is no measure of mastery.[91]

Rereading alone does not work. The more times students reread material, the more they believe they have learned it, but the opposite is true: the more times students test themselves about what they read, the better they learn the material.[92] The testing effect challenges the assumption that students only learn via class lectures, reading, highlighting, and rereading, and that testing should only be used to "measure" what students have learned.[93]

Students avoid testing themselves about learned material because of the fear of failure. Many students perceive errors as failures in learning, not as a critical part of mastery of new material.[94] When learners make errors and receive corrective feedback (i.e., the correct answer), the error itself is not learned.[95]

Mistakes are learning opportunities. The testing effect works even when students make mistakes during retrieval and receive prompt feedback with the correct response or an opportunity to discover the correct response.[96] Unsuccessful retrieval attempts promote encoding and learning because every retrieval attempt itself modifies memory.[97] Retrieval efforts promote

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[90] *See* CAREY, *supra* note 7, at 83.

[91] MAKE IT STICK, *supra* note 7, at 10.

[92] *See* Karpicke, Butler & Roediger, *supra* note 84, at 471.

[93] *See id.* at 473. The testing effect is a recent finding that retrieval, recalling information from memory without using cues, creates better long-term retention than restudying the same material for the same amount of time. Roediger & Butler, *supra* note 65, at 21.

[94] *See* MAKE IT STICK, *supra* note 7, at 90. "[I]n our Western culture, where achievement is seen as an indicator of ability, many learners view errors as failure and do what they can to avoid committing them." *Id.*

[95] *See id.* Instructors possibly reinforce an aversion to failure under the belief that students may actually learn the errors. *Id.*

[96] *See* Roediger & Finn, *supra* note 57, at 40–41.

[97] *See* Phillip J. Grimaldi & Jeffrey D. Karpicke, *When and Why Do Retrieval Attempts Enhance Subsequent Encoding?*, 40 MEMORY & COGNITION 505, 505 (2012).

better learning even without feedback, but feedback increases the benefit of retrieval and self-testing.[98] Failed tests and retrieval attempts followed by immediate feedback lead to greater long-term learning.[99]

Retrieval and self-testing activities include reflection, elaboration, pretesting, generation, and interleaving information.[100] The most effective retrieval schedules for long-term retention require spacing of retrieval attempts.[101] Retrieval-based learning activities can be integrated into "group discussions, reciprocal teaching, and questioning techniques (both formal ones, such as providing classroom quizzes, and informal ones, such as integrating questions within lectures)."[102] Both open-book and closed-book tests produce the desired testing effect.[103]

Students can test themselves to determine whether they understand the material by reflecting and elaborating on reading material: reading, then covering the read material, and summarizing it or explaining what they just read. Or, students could try to write down what they recall from the reading without looking at it, while summarizing key points.[104] Only by testing their knowledge and understanding can students know what they actually learned and understood.[105]

A more recent and radical idea demonstrates the power of testing to promote learning even before students are taught the material. If given a test before a student learns the material, the majority of students will likely

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[98] *See* Roediger & Butler, *supra* note 65, at 25.

[99] *See* Matthew Jensen Hays, Nate Kornell & Robert A. Bjork, *When and Why a Failed Test Potentiates the Effectiveness of Subsequent Study*, 39 J. EXPERIMENTAL PSYCHOL.: LEARNING, MEMORY & COGNITION 290, 294 (2013); Lindsey E. Richland, Nate Kornell & Liche Sean Kao, *The Pretesting Effect: Do Unsuccessful Retrieval Attempts Enhance Learning?*, 15 J. EXPERIMENTAL PSYCHOL.: APPLIED 243, 252 (2009).

[100] *See* Karpicke, *supra* note 86, at 162.

[101] *See* Roediger & Butler, *supra* note 65, at 22. This is true, even if some errors are made. *Id.* Retrieval practice and the testing effect lead to more long-term retention and knowledge transfer than other metacognitive exercises such as generating self-explanations. *See* Douglas P. Larsen, Andrew C. Butler & Henry L. Roediger III, *Comparative Effects of Test-Enhanced Learning and Self-Explanation on Long Term Retention*, 47 MED. EDUC. 674, 680 (2013).

[102] Karpicke, *supra* note 86, at 162.

[103] *See* Pooja K. Agarwal et al., *Examining the Testing Effect with Open- and Closed-Book Tests*, 22 APPLIED COGNITIVE PSYCHOL. 861, 871 (2008). Researchers found the maximum benefits with testing (both open and closed-book tests) present when students had access to feedback. *Id.*

[104] *See id.*

[105] *See* Karpicke, *supra* note 86, at 157.

fail.[106] Depending on the difficulty of the content, they might not understand a single question. This use of pretesting is not intended to measure learning. But, this *pretesting* is an effective learning strategy that actually primes the brain for material a student will learn.[107]

Varying retrieval practice, or interleaving,[108] is also highly beneficial to learning. Interleaving two or more subjects is also a type of spacing and helps students to discriminate between different types of problems and selecting the correct strategy to apply.[109] Interleaving is also more difficult, requires more effort, and feels slower; therefore, it is unpopular and seldom used.[110] Interleaving prepares the brain for the unexpected by not only reviewing material but also by requiring the learner to make quick decisions and shift strategies.[111]

Trying to solve a problem and getting it wrong is still better than memorizing the answer without first attempting a solution.[112] Generating responses is another form of self-testing.[113] Trying to answer a question

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[106] *See* Richland, Kornell & Kao, *supra* note 99, at 245–46 (conducting an experiment in which participants were tested before studying, resulting in 95% of the questions being answered incorrectly).

[107] *See* CAREY, *supra* note 7, at 95. These "unsuccessful retrieval attempts" prime the brain, increasing successful retrieval on later attempts. *See id.* These acts of guessing engage the mind and create desirable difficulties. *See id.* Pretesting is most effective when prompt feedback—i.e., the correct answer—is given. *See, e.g.*, Richland, Kornell & Kao, *supra* note 99, at 253.

[108] Interleaving means "mixing related but distinct material during study." CAREY, *supra* note 7, at 163.

[109] *See* MAKE IT STICK, *supra* note 7, at 65; M.S. Birnbaum et al., *Why Interleaving Enhances Inductive Learning: The Roles of Discrimination and Retrieval*, 41 MEMORY & COGNITION 392, 401 (2013).

[110] *See* MAKE IT STICK, *supra* note 7, at 47. The mixing of material, skills, and concepts during study, especially over the long term, helps not only to see distinctions but also helps to grasp individual concepts. *See id.* at 65.

[111] *See* CAREY, *supra* note 7, at 156. "Interfering with concentrated or repetitive practice forces people to make continual adjustments, . . . building a general dexterity that, in turn, sharpens each specific skill." *Id.* Researchers believe it also enhances transfer. *Id.*

[112] MAKE IT STICK, *supra* note 7, at 88.

[113] *See id.* at 87. Generation is the act of attempting to answer a question or solve a problem by providing the information, rather than being presented with information. *Id.* For example, it is more beneficial to provide the answer to a short answer question or fill in a blank, rather than selecting a response from a multiple-choice prompt. *Id.* Writing a short essay is an even more effective form of generation requiring students to engage in higher-order thinking tasks instead of passively receiving knowledge. *Id.*

when a student is not presented with possible solutions, such as being required to supply an answer instead of selecting from multiple-choice options, increases retrieval and learning.[114]

Reflection also involves several cognitive activities leading to more durable learning: retrieval, elaboration, and generation.[115] After class or a reading assignment, students can reflect by asking themselves: "What were the most important points?"[116] An additional question students should ask: "How does this information relate to what I already know about this topic?"[117]

Retrieval, self-testing, spacing study, and interleaving challenge learners and create "desirable difficulties."[118] According to this theory, certain kinds of interference or added difficulty disrupts fluency, which increases comprehension and learning.[119] Memory is enhanced when the brain is forced to work harder to recall information, especially when the information is not right in front of the learner.[120] This increased effort results in stronger storage and retrieval.[121]

To achieve both efficient and durable learning, students need to use retrieval practice to a higher initial level, instead of terminating practice after one correct recall, as the effects of the initial learning attempt substantially diminish after relearning.[122] The "3+3 schedule" is most effective: practicing to three correct recalls during the initial learning session, followed

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[114] *See id.*

[115] *See id.* at 88–89.

[116] *See id.*

[117] *See id.*

[118] Elizabeth L. Bjork & Robert A. Bjork, *Making Things Hard on Yourself, But in a Good Way*, *in* PSYCHOLOGY AND THE REAL WORLD 55, 58 (Morton Ann Gernsbacher et al. eds., 2011).

[119] *See* MAKE IT STICK, *supra* note 7, at 87.

[120] *See* Rawson & Dunlosky, *supra* note 64, at 286. "[T]he retrieval effort hypothesis states that memory will be enhanced by successful but effortful retrieval during practice." *Id.*

[121] *See id.*

[122] *See id.* Lower initial criteria for retrieval led to more retrieval failures in subsequent relearning sessions. *Id.* Even if the student does not restudy or relearn, he or she will still benefit from the initial learning. *See id.* This higher initial level requires more practice trials during the initial learning phase, but the gains in memory development are substantial. *Id.* at 300. They also found that more relearning is better and that increasing the number of relearning sessions results in more long-term retention. *Id.* at 286.

by three subsequent spaced relearning sessions.[123] The ideal times for spacing retrieval practice will be discussed in the following section.

The learning process requires time for learning, storage, forgetting, retrieving, and consolidating information.[124] At first, learning is disorganized as the learner encodes new information, taking it in through reading or listening, not sure of how all of the information fits together.[125] The newly-learned information is then stored and consolidated, where it is reorganized and connected to past experiences and knowledge already in long-term memory.[126] Prior knowledge is required to make sense of new learning.[127] During consolidation, new information is connected to prior knowledge.[128] When information is retrieved after a lapse of time, the act of retrieving information from long-term storage strengthens the memory and enables it to be connected to more recent learning.[129] This reconsolidation is how retrieval practice makes learning more durable.[130]

Under time pressure, such as when studying for exams, most students choose to study easier material before more difficult material.[131] Students must also decide how long to persist in studying before moving on to different material and when to stop studying altogether.[132] Students do not choose to study information they believe they have already learned.[133]

Research shows that passive study strategies (rereading, memorizing, and cramming) create the false sense that material is learned, resulting in premature termination of study. Retrieval practice, self-testing, and spacing

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[123] *Id.* at 283. Students need to stop relying so heavily on single-session study sessions with fixed amounts of practice. *Id.* at 301. Relearning and spacing have positive, cumulative effects on developing knowledge and memory. *Id.* Researchers found that expanding the interval between relearning sessions may improve the durability and the efficiency of learning, and these findings also relate to the effectiveness of both time management and spaced practice which will be discussed later this this section. *Id.*

[124] *See* MAKE IT STICK, *supra* note 7, at 100.

[125] *See id.* at 72.

[126] *See id.* at 73.

[127] *See id.*

[128] *See id.*

[129] *See id.* at 75.

[130] *See id.* at 74. Reconsolidation means to revive a memory and then store it again, as is done in retrieval practice. *Id.*

[131] *See* Kornell & Bjork, *supra* note 74, at 219.

[132] *See id.*

[133] *See id.*

study provide accurate judgments of learning and result in true knowledge and understanding gains.

C. Students Lack Awareness of Effective Study Strategies

Students must take charge of their own learning, embrace the reality that learning should feel difficult, include mistakes, and require effort, but understand effortful learning changes the learner's brain. Students receive little, if any, instruction about empirically-proven study habits and strategies.[134] Students are mostly unaware of empirically-proven study strategies: retrieval practice, self-testing, and periodic review.[135] The most common study strategies used by students are reading, rereading, rote memorization, and cramming.[136] Students are not only overconfident in self-selecting study behaviors but are also unaware of the ineffectiveness of their selected study behaviors.[137]

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[134] *See* John Dunlosky et al., *Improving Students' Learning with Effective Learning Techniques: Promising Directions from Cognitive and Educational Psychology*, 13 PSYCHOL. SCI. PUB. INT. 4, 35 (2013) (students' education is more concerned with content delivery than developing effective study and learning strategies); Kornell, *supra* note 69, at 1298; Kornell & Bjork, *supra* note 74, at 219 (finding a majority of students improvise their method of studying, "presumably on the basis of intuition rather than on research . . . ."); Maribeth Gettinger & Jill K. Seibert, *Contributions of Study Skills to Academic Competence*, 31 SCH. PSYCHOL. REV. 350, 350–51 (2002) ("Although some students develop study skills independently, even normally achieving students may go through school without having acquired effective approaches for studying.").

[135] *See* Yana Weinstein, Kathleen B. McDermott & Henry L. Roediger III, *A Comparison of Study Strategies for Passages*, 16 J. EXPERIMENTAL PSYCHOL.: APPLIED 308, 308 (2010). The study also examined metacognition—the students' awareness of study methods—and the efficiency of study strategies in general. *See id.* Subjects were asked to predict the amount of information that they would remember after completing each type of study task. *See id.* The learning created by generating and answering one's own questions and answering questions generated by a teacher or third party were comparable study techniques and were far superior than the learning created by rereading alone. *See id.* While generating and answering one's own questions benefited retention the most, the technique was also the most time consuming; therefore, researchers recommend using questions generated by a teacher or a third party due to time limitations. *See id.*

[136] *See* Aimee A. Callender & Mark A. McDaniel, *The Limited Benefits of Rereading Educational Texts*, 34 CONTEMP. EDUC. PSYCHOL. 30, 31–32 (2009) (rereading text was not more effective in producing learning than reading the material once).

[137] *See* McCabe, *supra* note 7, at 462. A study examining undergraduate students' metacognitive awareness of six empirically-supported study behaviors (three from cognitive load theory and three metacognitive) revealed that undergraduates have little to no awareness

The study advice that students do receive is often incorrect or based more on "common sense," trial and error, theory, lore, and intuition, rather than empirically-proven research.[138] Once students find a study strategy they believe is effective, they rarely experiment with other study techniques.[139] This lack of instruction, combined with students' reliance on improvised and ineffective study habits, leads to entrenched reliance on poor study habits.[140]

Students have difficulty gauging their own learning.[141] To judge awareness of students' own learning and memory performance, they must make a "judgment of learning."[142] A judgment of learning is the relationship between a student's predicted performance and actual performance using a metacognitive judgment, i.e., how much a student thinks he or she has learned compared to evidence of what the student actually learned.[143]

"Information that is easy to process is judged to have been learned well."[144] Yet, research shows that when information is easy to process, it is typically due to retrieval fluency as well as illusions of competence and mastery.[145] Individuals unaware of their own lack of knowledge develop "illusions of knowledge," the belief that one knows more than he or she actually does.[146] Learners who are overconfident in their knowledge make

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of empirically-proven effective study behaviors, especially testing (versus rereading or restudying) or spacing study (versus massing study or cramming). *See id.* Students have a metacognitive awareness of the memory advantage of generating one's own study materials (self-generation), but consistently endorse the non-empirically supported study behaviors, suggesting little to no awareness of the effectiveness of the study behaviors. *See id.*

[138] *See* Kornell, *supra* note 69, at 1298; MAKE IT STICK, *supra* note 7, at 8.

[139] *See id.* at 1313.

[140] *See id.*; MAKE IT STICK, *supra* note 7, at 8.

[141] MAKE IT STICK, *supra* note 7, at 3. "We are poor judges of when we are learning well and when we're not. When the going is harder and slower and it doesn't feel productive, we are drawn to strategies that feel more fruitful, unaware that the gains from these strategies are often temporary."

[142] Alan D. Castel, David P. McCabe & Henry L. Roediger III, *Illusions of Competence and Overestimation of Associative Memory for Identical Items*, 14 PSYCHONOMIC BULLETIN & REV. 107, 107 (2007).

[143] *See id.*

[144] Nate Kornell et al., Abstract, *Ease-of-Processing Heuristic and the Stability Bias: Dissociating Memory, Memory Beliefs, and Memory Judgments*, 22 PSYCHOL. SCI. 787, 787 (2011).

[145] *See* Lisa K. Son & Nate Kornell, *The Virtues of Ignorance*, 83 BEHAVIOURAL PROCESSES 207, 208 (2010).

[146] *See id.*

poor choices compared to learners who are uncertain about their knowledge (or aware of a lack of knowledge).[147]

Too much information can be dangerous for monitoring learning progression.[148] Researchers found that sometimes providing individuals with less information can result in more learning because it allows a learner to identify what is known and what is unknown.[149] However, it is not enough for students to be aware that they lack information on a specific topic; they must also know whether information can be gained in a realistic amount of time so as not to waste time studying what is impossible to learn.[150]

Identifying ignorance, lack of knowledge, and mistakes in understanding is critical to learning; overconfidence in knowledge creates illusions of competence and mastery, which are barriers to learning.[151] Repetition or rehearsal-based study strategies (repetition, rereading, rote memorization, cramming) are useful for storing small amounts of information for the short-term, but are not effective for meaningful, long-term retention.[152] These tried and true study methods of rereading text and massed practice also lead to illusions of competence, yet students heavily rely on these methods.[153] Students may not be self-testing because they are

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[147] *See id.* at 207.

[148] *See id.* at 208–09. For example, consider the situation in which a student is using flashcards to study important terms. Students often have the cue word on one side of the flashcard with the explanation or definition on the other side. *Id.* Ideally, students would look at the cue word and fully attempt to retrieve the definition. *Id.* However, students often turn the card too quickly and read the definition or explanation without fully recalling or retrieving the information. *Id.* Students interpret their response as "correct," creating the illusion that the word is "learned." *Id.*

[149] *See id.* at 209.

[150] *See id.* at 211.

[151] *See id.*

[152] *See* Gettinger & Seibert, *supra* note 134, at 355 (classifying study skills into four broad categories: repetition-based, procedural study skills, cognitive-based, and metacognitive).

[153] *See* MAKE IT STICK, *supra* note 7, at 3; Karpicke, Butler & Roediger, *supra* note 84, at 476, 478; Son & Kornell, *supra* note 145, at 208. Students' judgments of learning are often wrong and predict that the opposite will result: that restudying will produce the most long-term retention and that retrieval practice will produce the least long-term retention. *See also* Karpicke & Blunt, *supra* note 46, 772. When relying on rereading rather than self-testing to learn material, students experience an "illusion of competence," a mistaken belief that they know the material better than they really do. Karpicke, Butler & Roediger, *supra* note 84, at 478.

not aware of the benefits for studying or because it is difficult and involves substantially more mental effort than rereading and review.[154]

Because of the lack of awareness of effective study strategies and continued reliance on ineffective study strategies, students need explicit instruction in strategies supported by empirical evidence. Direct, explicit instruction improves academic performance and critical thinking across multiple academic domains.[155] Targeted instruction on effective study strategies and learning methods leads to substantial improvement in academic performance.[156] Learning how to learn is critical for success in education, but the task of becoming a self-regulated or metacognitively sophisticated learner requires using methods that may seem counterintuitive and against standard practices.[157]

IV. LEGAL EDUCATORS CAN USE COGNITIVE SCIENCE RESEARCH TO MAXIMIZE LAW LEARNING

Legal scholars have explored interdisciplinary research on learning theory, cognition, metacognition, and expert learners, but not the research on study behaviors.[158] Just as research from cognitive science on metacognition and learning theories has benefited legal educators, the wealth of research on undergraduate study behaviors can inform and

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[154] *See* Weinstein, McDermott & Roediger, *supra* note 135, at 308–09; Karpicke, Butler & Roediger, *supra* note 84, at 478.

[155] *See* Deborah Zalesne & David Nadvorney, *Why Don't They Get It?: Academic Intelligence and the Under-Prepared Student as "Other"*, 61 J. LEGAL EDUC. 264, 272 (2011); Gettinger & Seibert, *supra* note 134, at 358–59.

[156] McCabe, *supra* note 7, at 462, 469–72, 474. Students receiving targeted instruction on the learning methods, such as testing, spacing, and generation, outperform students who did not receive instruction in learning methods. *Id.* at 476.

[157] *See* Kornell & Bjork, *supra* note 74, at 223. This is especially critical because of the rapidly changing nature of education to online and web-based learning environments where learners are more dependent on their own abilities to manage their learning without supervision or direction. *Id.*

[158] *See* Merritt, *supra* note 51, at 40–41. "Cognitive scientists have made major advances in mapping the process of learning, but legal educators know little about this work." *Id.* at 40. Many legal scholars have examined metacognition, expert learning theory, and self-regulated learning, but few have specifically analyzed law student study skills and their relationship to academic success. *Id.* at 40–41; Cassandra L. Hill, *The Elephant in the Law School Assessment Room: The Role of Student Responsibility and Motivating Our Students to Learn*, 56 HOWARD L. J. 447, 471 (2013); Leah M. Christensen, *Legal Reading and Success in Law School: An Empirical Study*, 30 SEATTLE U. L. REV. 603, 603 (2007).

influence better practices in law school.[159] Legal educators can learn what is effective and incorporate these research findings to improve law school learning.

Many of the studies described in Part III are highly relevant for legal education, particularly the studies detailing the effectiveness of retrieval, self-testing, and periodic review.[160] Similarly, the research demonstrates rereading and other rote study techniques, although used frequently by beginning law students, are ineffective.[161]

If undergraduate students are unaware of effective study habits, so are incoming and current law students.[162] More importantly, most faculty are unaware of these findings.[163] These empirically-proven study strategies are incredibly important for legal education,[164] especially in light of the prevailing use of the case method and Socratic method and the lack of explicit skills instruction in the majority of law school classrooms.[165] These research findings, combined with legal scholars' research on critical reading skills,[166] provide powerful tools in bridging the study skills gap that students bring to law school.

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[159] *See* Merritt, *supra* note 51, at 67, 70.

[160] *See supra* note 39 and accompanying text. Law students are confronted with a larger volume of information than previously encountered, and the persistent use of a single, summative assessment at the end of the semester or quarter requires law students to keep up with their studying and review over a much longer period of time. Bartholomew, *supra* note 1, at 903–04, 925; Carol Springer Sargent & Andrea A. Curcio, *Empirical Evidence that Formative Assessments Improve Final Exams*, 61 J. LEGAL EDUC. 379, 379–80 (2012).

[161] *See* Merritt, *supra* note 51, at 41.

[162] *See* Karpicke, Butler & Roediger, *supra* note 84, at 476–77.

[163] *See* Merritt, *supra* note 51, at 40–41.

[164] *See id.* at 67, 70.

[165] *See* Bartholomew, *supra* note 1, at 898; Madison, *supra* note 10, at 295.

[166] For legal scholarship on critical reading skills, see, e.g., RUTH ANN MCKINNEY, READING LIKE A LAWYER 51–55 (2d ed. 2012); Elizabeth M. Bloom, *Teaching Law Students to Teach Themselves: Using Lessons from Educational Psychology to Shape Self-Regulated Learners*, 59 WAYNE L. REV. 311, 338–39, 343 (2013); Christensen, *supra* note 158, at 603–04; Leah M. Christensen, *The Psychology Behind Case Briefing: A Powerful Cognitive Schema*, 29 CAMPBELL L. REV. 5, 6 (2006); Laurel Currie Oates, *Leveling the Playing Field: Helping Students Succeed by Helping Them Learn to Read as Expert Lawyers*, 80 ST. JOHN'S L. REV. 227, 227–28 (2006); Debra Moss Curtis & Judith R. Karp, *"In a Case, in a Book, They Will Not Take a Second Look!" Critical Reading in the Legal Writing Classroom*, 41 WILLAMETTE L. REV. 293, 293–95 (2005); Laurel Currie Oates, *Beating the Odds: Reading Strategies of Law Students Admitted Through Alternative Admissions Programs*, 83 IOWA L. REV. 139, 140, 158 (1997) [hereinafter Oates, *Beating the Odds*]; Peter Dewitz, *Legal*

Other legal scholarship on evidence-based learning has examined metacognition and self-regulation.[167] Metacognition and self-regulation are intimately related with the study habits and strategies students employ,[168] but the need for correction is urgent and requires knowledge of specific strategies to employ.

Students are often entirely confused on the appropriate study method for the law school level, and, unfortunately, researchers struggle to answer this question because of lack of data.[169] The "How to Study in Law School"

Education: A Problem of Learning from Text, 23 N.Y.U. REV. L. & SOC. CHANGE 225, 225 (1997).

[167] For legal scholarship discussing cognition and metacognition, see, for example, MICHAEL HUNTER SCHWARTZ, EXPERT LEARNING FOR LAW STUDENTS (2d. ed. 2008); Anthony Niedwiecki, *Teaching for Lifelong Learning*, 40 CAP. U. L. REV. 149, 152, 155 (2012); Leah M. Christensen, *Enhancing Law School Success: A Study of Goal Orientations, Academic Achievement and the Declining Self-Efficacy of Our Law Students*, 33 LAW & PSYCH. REV. 57, 76 (2009); Michael Hunter Schwartz, *Teaching Law Students To Be Self-Regulated Learners*, 2003 MICH. ST. U. DCL L. REV. 447, 452, 468 (2003); 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, 375–76 (2001); Paula Lustbader, *Construction Sites, Building Types, and Bridging Gaps: A Cognitive Theory of the Learning Progression of Law Students*, 33 WILLAMETTE L. REV. 315, 324 (1997).

[168] Niedwiecki, *supra* note 167, at 152, 155; Lustbader, *supra* note 167, at 324–25.

[169] There are few published empirical studies specifically examining law student study habits. A small number of legal educators have investigated law student study habits, but compared to the wealth of empirical research at the undergraduate level, legal education is behind in understanding the study behavior of its students. *See* Bartholomew, *supra* note 1, at 919 ("To date, no published studies on time management have analyzed law students."); Karol Schmidt, *Learning from the Learners: What High-Performing Law Students Teach Us About Academic Support Programming*, 4 PHOENIX L. REV. 287, 289–309 (2010). Schmidt's research is a good start in understanding law student study behaviors, but Schmidt used surveys produced for the undergraduate learning environment, not surveys specifically tailored to the unique learning environment of law school using the case method and Socratic method. *See id.*; Rolando J. Díaz et al., *Cognition, Anxiety, and Prediction of Performance in 1st-Year Law Students*, 93 J. EDUC. PSYCHOL. 420, 420–22 (2001); Ian Gallacher, *"Who Are Those Guys?": The Results of a Survey Studying the Information Literacy of Incoming Law Students*, 44 CAL. W. L. REV. 151, 151–54 (2007); Edward L. Kimball et al., *Ability, Effort, and Performance Among First-Year Law Students at Brigham Young University*, 1981 AM. B. FOUND. RES. J. 671, 671–73 (1981) (studying the relationship between first-year law students' study time, time management, and their performance in first-year courses); Guy R. Loftman, *Study Habits and Their Effectiveness in Legal Education*, 27 J. LEGAL EDUC. 418, 419 (1976); Robert Stevens, *Law Schools and Law Students*, 59 VA. L. REV. 551, 551–60

books published for law students offer anecdotal, not evidence-based, advice.[170] These books offer the same conventional and cliché advice: read for class, brief all of your cases, outline the course material, memorize the rules, do practice questions, and get some rest.[171] The authors of these books were successful law students who often went on to become successful law professors—all expert law learners.[172] These authors wrote about what worked for them and what made them successful.

Legal educators need evidence-based information about what study behaviors are effective for law students. Until such empirical research on law student study behaviors is available, legal educators should use the wealth of undergraduate empirical research to better understand and teach students.

The burdensome reading and the struggle just to keep up easily overwhelm law students who never learned how to study during their undergraduate education.[173] These are exactly the students who quickly resort to "old" study habits that "worked" in their undergraduate studies, but were not effective study habits (i.e., rereading, rote memorization, and cramming).[174] Like undergraduate students, law students develop illusions of competence and mastery of law school material.[175] Their over-reliance on rote learning habits such as memorization and cramming leads to poor

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(1973); Michael J. Patton, *The Student, the Situation, and Performance During the First Year of Law School*, 21 J. LEGAL EDUC. 10, 10–12 (1968).

[170] The vast majority of "how-to" books for law school do not include empirical evidence except a few books that incorporate empirical studies in their advice to law students. *See, e.g.*, SCHWARTZ, *supra* note 167; MCKINNEY, *supra* note 166; LEAH M. CHRISTENSEN, LEARNING OUTSIDE THE BOX: A HANDBOOK FOR LAW STUDENTS WHO LEARN DIFFERENTLY (2010); LEAH M. CHRISTENSEN, "ONE L OF A YEAR": LEARNING STRATEGIES FOR MAXIMIZING YOUR SUCCESS IN LAW SCHOOL (2012).

[171] *See, e.g.*, MCKINNEY, *supra* note 166.

[172] *See* UALR William H. Bowen School of Law, *Michael Hunter Schwartz*, http://ualr.edu/law/faculty/michael-hunter-schwartz (last visited Feb. 19, 2016); UNC School of Law, *Ruth Ann McKinney*, http://www.law.unc.edu/faculty/directory/mckinneyruthann (last visited Feb. 19, 2016); Thomas Jefferson School of Law, *Leah Christensen*, T. JEFFERSON SCH. L., http://www.tjsl.edu/directory/leah-christensen (last visited Feb. 19, 2016).

[173] *See* Bartholomew, *supra* note 1, at 905 ("This lack of foundational skills takes its toll in law school. For example, strong fundamental reading abilities are essential. A deficit in basic reading skills forces law students to devote extra time to meet even baseline expectations. Reading for law school is notably different than other disciplines.").

[174] *See id.* at 906.

[175] *See* Gallacher, *supra* note 169, at 180–81.

academic performance, anxiety, and—for many—academic probation and dismissal.[176]

This Article is an opportunity for legal educators to gain insight from thousands of empirical studies on study strategies and behaviors to assist law students in becoming better law learners. By recognizing and accepting that poor learning methods have inhibited today's law students, legal education can better serve today's law learners through use of cognitive science. Empirical research can bridge deficiencies and honor the academic rigor of legal education. Students' study efforts are better supported by legal educators who understand how to teach students to develop the critical thinking, problem solving, writing, and study skills they lack.

Many schools are attempting to bridge the gaps in weaker student skills through more comprehensive academic support programs.[177] But, academic support programs alone cannot correct this systemic problem. Law schools as institutions must recognize that if incoming students are academically adrift, it is the institutions' responsibility to provide students with necessary support to develop skills.

Undergraduate research reveals that retrieval, self-testing, and periodic review are highly correlated with academic success.[178] It also reveals that students continue to rely upon ineffective and improvised study strategies and continue to experience illusions of competence and mastery of the material.[179]

Legal educators need concrete tools to put undergraduate research to use in their law school classrooms. Professors cannot assume students are able to perform these skills on their own without explicit instruction. Explicit instruction in retrieval, self-testing, and periodic review can be included in the law school classroom, whether a skills or doctrinal course, with little additional burden on the professor.

The following techniques and exercises incorporate both explicit instruction and findings from undergraduate research and can be used by all

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[176] *See id.* at 195.

[177] *See, e.g.*, *Academic Support Program*, BERKLEYLAW, https://www.law.berkeley.edu/student-life/student-services/academic-support-program (last visited Feb. 19, 2016); *Academic Success Program*, CAP. U. L. SCH., http://law.capital.edu/AcademicSuccessProgram (last visited Feb. 19, 2016); *Academic Support Program*, PENNLAW, https://www.law.upenn.edu/academics/support (last visited Feb. 19, 2016); *Academic Support Program*, U. WASH. SCH. L., https://www.law.washington.edu/Students/AcademicSupport (last visited Feb. 19, 2016).

[178] *See* Schmidt, *supra* note 169, at 303–09.

[179] *See id.* at 305–09.

legal educators in their classrooms, especially first-year doctrinal courses such as contracts, criminal law, torts, and property:

(1) Include a calendar with specific study steps with the course syllabus;

(2) Model effective case reading techniques and case synthesis in class;

(3) Brief multiple choice or short essay practice questions or quizzes in class; and

(4) Model effective use of a course outline in class.

These techniques are simple, incorporate law school learning activities that students should—and may—be doing on their own, and do not create much additional burden on the individual professor.[180] These techniques are discussed in more detail below.

A. Multi-Month Calendar Including Specific Study Steps in Addition to the Course Syllabus

Law professors already provide a course syllabus to their students. The syllabus will define the order in which a professor plans to cover topics and usually incudes reading assignments. A syllabus will also likely include dates and times for important events, such as exams or presentations, but probably does not include explicit and timely study suggestions.

First semester students especially need help transitioning from their undergraduate student experience to law school.[181] At the undergraduate level, students had more frequent tests and assessments, and more opportunities for feedback, than they do in law school.[182] Law school is often the first time students are completely and independently responsible for how and when to study.[183]

In many law schools, especially in doctrinal courses, law students only have one cumulative, summative exam at the end of the semester.[184] With only one exam at the end of the semester or course, the amount of information covered is overwhelming, and law students often fail to develop

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[180] *See* Bartholomew, *supra* note 1, at 941–52.

[181] *See id.* at 906.

[182] *See id.* at 906–07.

[183] *See id.* at 906.

[184] *See* MCKINNEY, *supra* note 166, at 54.

skills to determine what they should do on a given day to prepare for the end of the semester.[185]

Specific study steps can be noted on the calendar at key points in the semester. For example, the calendar could include assigned reading from the syllabus, as well as dates for review, outlining, and practice questions (essay and multiple choice). The calendar could go even further and include specific questions from a linked supplement (such as *Examples & Explanations*[186] or *Questions & Answers*[187]) relevant to the specific topic.

Law students are consumed by keeping up with the reading, but should take professors' specific recommendations about practice materials seriously. First-year students would find these recommendations about when to study and how to study particularly helpful, and it would help these students better transition to be more self-regulated studiers in their second and third years.[188]

Including this type of calendar will help implement all of the research findings.[189] Such a calendar acts as a scaffold for law students to develop self-regulated learning activities and better learn not only what case information they need but also how to recall information from memory (retrieval and self-testing) and when to review (periodic review).[190] Because of the amount of reading alone, many students concentrate only on reading and outlining, and often leave review and practice until right before an exam, which is too late in light of the amount of information covered.

Providing a calendar that shows students how to schedule and manage all of the study steps needed for mastery of the material is not much of a burden for a law professor. A sample calendar is provided at the end of this Article.

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[185] *See* Bartholomew, *supra* note 1, at 925 ("The average law school class structure does little to help [with law student time management deficiencies]. End-of-course exams force future-oriented thinking, with limited attention to what needs to be done on a given day to prepare for end-of-semester exams.").

[186] *See Examples & Explanations*, WOLTERS KLUWER, http://www.wklegaledu.com/series/examples-explanations (last visited Apr. 2, 2016).

[187] *See Questions & Answers Series Category*, LEXISNEXIS STORE, http://www.lexisnexis.com/store/catalog/catalog.jsp?id=cat80144 (last visited Apr. 2, 2016).

[188] *See id.*

[189] *See id.*

[190] *See id.* at 925.

B. Modeling Effective Case Reading Techniques and Case Synthesis in Class

Effective case reading and case synthesis is critical for success in law school. Yet, research demonstrates that students lack experience reading dense, complex material and struggle with critical reading and thinking skills.[191] New law students often take long hours over months of reading cases to develop an effective case reading method, while some students never truly develop effective case reading strategies.[192]

Effective case reading is not intuitive and differs from effective case briefing.[193] Simply rereading is not effective and leads to illusions of competence and mastery.[194] Legal educators can model an effective reading strategy that helps students test whether they understand the reading, drawing from research on retrieval and self-testing techniques.

Legal educators need to be explicit with students by explaining how expert readers use different techniques when they read—they survey, skim, scan, question, rephrase, and connect new information to prior knowledge.[195] Legal scholars have identified the importance of engaging with the text in reading cases.[196]

Luckily, the effective reading strategies found in *Reading Like a Lawyer*[197] or SQ3R (Skim/Survey, Question, Read, Recite/Rephrase & Review) are simple and easy to employ.[198] For example, the professor can

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[191] *See* JOHN C. BEAN, *Helping Students Read Difficult Texts*, *in* ENGAGING IDEAS 133, 133 (Jossey-Bass, 2d ed. 2011), http://www.case.edu/writing/pedsem/Bean_ReadingDifficultTexts.pdf. "Many of today's students are poor readers, overwhelmed by the density of their college textbooks and baffled by the strangeness and complexity of primary sources and by their unfamiliarity with academic discourse." *Id.*

[192] *See supra* Part III.C.

[193] *See supra* notes 169–73 and accompanying text.

[194] *See* Karpicke, Butler & Roediger, *supra* note 84, at 474. Rereading, highlighting, underlining and poring over notes and texts are the most commonly used study strategies. *See* MAKE IT STICK, *supra* note 7, at 15.

[195] *See* Christensen, *supra* note 166, at 16–17.

[196] *See id.* at 11.

[197] MCKINNEY, *supra* note 166.

[198] *See* JOHN S. HEDGCOCK & DANA R. FERRIS, TEACHING READERS OF ENGLISH 168 (2009).

> [T]he SQ3R process captures the connection between surveying, or previewing, which are somewhat passive activities, and questioning or predicting, which are active. At this stage of the pre-reading experience, students take information gathered from schema development and

lead students through an SQ3R activity with a new case in class. First, the professor can instruct students to skim only a specific case section in a new case in class to get a general sense of what the case contains. The professor can advise students to remember to look at the markers on the page of the casebook, such as the section title, to orient the student to where the case fits in to the topic. The professor can then call on students to discuss what they noticed from skimming the text and what the students might expect the case to be about from the skimmed reading.

Second, the professor can ask students to develop questions based on observations when skimming the case, and then call on students to share questions they formulated about the case. Third, the professor can instruct the students to read the case in class, with the background information in mind.

The professor should also talk with students about reading tactics, specifically how expert readers do not read a case from the first word to the last, known as "reading linearly." Instead, expert readers skim, looking for the case rule, then read closely, such as reading for case analysis.[199] Expert readers often skim items at the beginning of the case, such as facts, until reaching a relevant portion, then read closely.[200]

Expert readers read every case as if for legal research—truly searching the case for information, reading with a specific purpose, skimming and scanning material, and questioning the text—whether that case is in a casebook, a reporter, or from an online source.[201] Many law students develop this reading for research skill once they have more experience with legal research, which typically occurs months into the first semester, at the earliest.[202] Because the cases are in a casebook, students often read them differently, starting at the beginning and reading to the end, without a purpose, without questioning the text, and without reviewing whether a

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> previewing activities and formulate predictions or questions about what they are preparing to read. To the degree that their predictions are later confirmed, such activities can build student confidence both in their own comprehension abilities and in the previewing strategies they have been taught. However, when predictions are contradicted or questions prove to be off-target, the mismatches teach learners that careful reading, not just quick assumptions or guessing, is critical.

Id.

[199] Oates, *Beating the Odds*, *supra* note 166, at 140–41.

[200] *See id.*

[201] *See id.*

[202] *See id.*

reading objective has been satisfied.[203] By modeling effective case reading strategies used by expert readers in the casebook during class, the professor can help students more quickly develop expert reading strategies.

Working through this type of reading strategy in class gives the professor an opportunity to both model effective reading techniques and intervene early or redirect those students struggling with the case material. The professor can also actively model the technique with a previously assigned case to show students a more effective method. The professor can then use the exercise to bridge reading individual cases with hypothetical questions and extracting case rules.

Finally, the Professor can take advantage of the notes and questions typically following cases in students' casebooks, modeling ways students can use these notes and questions during their own study to test their understanding and mastery of the material. Alternatively, the professor may choose to use the notes and questions as a brief, low-stakes quiz on the reading material in class. A short quiz provides formative assessment and gauges students' understanding.

These techniques teach not only effective reading strategies students may lack, but also self-testing, retrieval practice, and self-regulated study as students begin using the reading strategy in their own reading.

C. Frequent Quizzing: Using Multiple Choice, Short Answer, and Notes and Questions in Class

Practice quizzes and short answer essay questions given weekly, or as students finish a topic, aid students in learning the material.[204] Practice tests are more effective when spaced, i.e., some time has passed since the material was presented or initially learned.[205] Few legal educators include short quizzes or practice questions in their classroom teaching, but it should be more widely implemented.[206]

Legal educators can use quizzing in many different ways supported by research on effective learning strategies (pre-testing, retrieval, reflection, elaboration, etc.). The quizzing should force students to rely entirely on their own memory (i.e., closed book) to force students to engage in retrieval practice. Legal educators could incorporate quizzing in class at any of the following times: Before any instruction on the topic, after assigned reading

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[203] *See* Christensen, *supra* note 166, at 21.

[204] *See* Sophie M. Sparrow, *Using Individual and Group Multiple-Choice Quizzes to Deepen Students' Learning*, 3 ELON L. REV. 1, 12–13 (2011).

[205] *See* Dunlosky et al., *supra* note 134, at 35.

[206] *See* GARY A. MUNNEKE, HOW TO SUCCEED IN LAW SCHOOL 91 (2008).

to test comprehension, after class discussion to test students' ability to synthesize rules, after class discussion to test students' ability to apply rules to new facts, or a week after the topic was discussed in class to promote retrieval and connect to new related information.

Although professors may balk at more grading, the act of the student retrieving information from memory is the most critical learning strategy. Correct answers do need to be provided promptly, but the quizzes do not need to be individually graded.[207] Professors can instead provide correct answers or model answers for students to grade and assess themselves.

Multiple-choice questions, in particular, are very useful for retrieval, self-testing, and periodic review.[208] However, law students often do not understand how to incorporate multiple-choice questions in their regular semester study.[209]

A legal educator could give a practice multiple-choice question at the beginning of class and give the students three to five minutes to guess from the answer choices. The professor could then give students the correct answer and discuss it with the class. The professor could also direct the students to write an IRAC answer to the multiple-choice prompt (with or without providing the correct answer in advance). This technique gives students multiple-choice practice and practice writing IRAC answers to single-issue questions, while also providing students with an incentive to use multiple-choice questions in their daily and weekly study.

Low-stakes quizzes and practice questions in class give students opportunities to practice retrieval as well as periodic review. Professors can even call the short quizzes "reviews" to lower expectations. These reviews provide a tool allowing a professor to gauge comprehension of the material and allow the professor to remediate confusion or provide additional review.[210] By providing frequent practice questions in class, professors model effective retrieval, self-testing, and periodic review, as well as assist students in dispelling illusions of competence and mastery in course material.[211]

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[207] *See* Roediger & Butler, *supra* note 65, at 22.

[208] Multiple-choice questions are available from multiple sources such as *Questions & Answers* (LexisNexis), *Siegel's* series (Aspen), multistate bar exam (MBE) style questions from the *Finals: Law School Exam Series*, *The Finz Multistate Method (Strategies & Tactics Series)*, *Emanuel*, Kaplan, and in many CALI lessons.

[209] *See* Sparrow, *supra* note 204, at 12–13.

[210] *See* MAKE IT STICK, *supra* note 7, at 44.

[211] *See supra* Part III.B; Sparrow, *supra* note 204, at 6.

D. Periodic Review of Course Material

Most professors offer end of term reviews prior to final exams, which are beneficial to students.[212] But, this is only a single event, "massed" at the end of the term. Research shows that spacing study and periodic review of learned material is more effective than massed study.[213]

Professors could offer periodic reviews of course material by reviewing at the end of each week or each topic. Professors, teaching assistants, or even students can lead these reviews. Effective periodic review of course material could force the students to retrieve the structure of the law—rules, elements, tests, policy, examples, etc.—as well as testing students' application of the law to new facts using practice questions (see prior section on frequent quizzing).[214]

E. Modeling Effective Use of Course Outlines in Class

While most professors do not teach outlining techniques, most professors do expect students will outline their course materials by extracting rules from cases read for class, synthesizing rules from related cases, breaking rules into elements, including examples, explanations, and policies.[215] Although some doctrinal professors provide bare bones skeletal outlines for students to fill in course material as the semester progresses, these skeletal outlines do not encourage a student to effectively create their own outline.[216]

Outlining is a critical step in synthesizing and consolidating such a large amount of information, but it is not enough for students to merely create an outline.[217] Students must also learn to *use* their outline. Professors can encourage or require students to bring their outlines to class and then offer hypos for students to actively use their outlines. Given an opportunity to use

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[212] *See 20 Tips for Success in Law School*, CHAP. U. FOWLER SCH. L., http://www.chapman.edu/law/student-resources/achievement-program/20-tips-success.aspx (last visited Feb. 19, 2016).

[213] *See* MAKE IT STICK, *supra* note 7, at 47.

[214] *See supra* Part IV.C.

[215] *See* Danielle B. Kocal, *Law School Outlining—Why, When and How To Do It*, BLOOMBERG L. (Aug. 9, 2013), http://www.law.pace.edu/sites/default/files/academic_success/Kocal_Outlining_Bloomberg.pdf.

[216] *See* Eric A. DeGroff, *The Dynamics of the Contemporary Law School Classroom: Looking at Laptops Through Learning Style Lens*, 39 U. DAYTON L. REV. 201, 216 (2014).

[217] *See* Michael T. Gibson, *A Critique of Best Practices in Legal Education: Five Things All Law Professors Should Know*, 42 U. BALT. L. REV. 1, 11 (2012).

outlines as a tool in class, fewer students will wait until just before exams to create the document.[218]

Modeling the effective use of course outlines and providing opportunities for students to use outlines in the classroom teach students the importance of the outline as a vital tool in practicing application of the law, not just a tool for memorization when studying for an exam. Professors do not need to create course outlines for their students. Encouraging or requiring students to bring their own self-created course outlines to class does not create an additional burden on the professor. This technique builds on the research findings that self-testing—practice in application of law to facts—is critical to meaningful learning.[219]

V. CONCLUSION

Law schools are inheriting academically adrift students with weak critical thinking, problem solving, and writing skills because these students were not challenged by sufficiently rigorous reading and writing requirements in their undergraduate studies.[220] In addition, these students have poorly-developed study skills and rely on improvised, ineffective study skills such as highlighting and rereading.[221]

Empirical evidence from undergraduate research reveals that retrieval, self-testing, and periodic review are highly correlated with academic success.[222] Legal educators can incorporate these research findings into their law school classrooms with some simple techniques such as providing law students with a calendar including study strategies in addition to case reading assignments, modeling effective case reading in class, providing practice opportunities in class through quizzes, more frequent review of course material, and modeling effective uses of course outlines to practice applying the law.

More empirical research into the study habits of law students is needed. However, until legal educators know more about the study habits of law students, legal educators should maximize the wealth of research findings from undergraduate institutions.

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[218] *See* Kocal, *supra* note 215, at 2.

[219] *See* Schwartz et al., *supra* note 49, at 9–10; Karpicke & Grimaldi, *supra* note 46, at 404.

[220] *See* Roach, *supra* note 4, at 302; IMPROVING UNDERGRADUATE LEARNING, *supra* note 1, at 4.

[221] *See* McCabe, *supra* note 7, at 462–63.

[222] *See supra* Part III.B.

	MON	TUES	WED	THURS	FRI	SAT	SUN
August	25 *Classes Begin* Class prep: read & brief cases	26 Class prep: read & brief cases	27 Class prep: read & brief cases	28 Class prep: read & brief cases	29 Class prep & Review notes	30 Review Civ Pro & Property LW I Research	31 Review Torts & Contracts LW I Draft
September	1 Class prep + review questions	2 Class prep + review questions	3 Class prep + review questions	4 LW I Client Letter Due	5 Class prep + review questions	6 Start Outlines: Civ Pro & Property	7 Start Outlines: Torts & Contracts
	8 Class prep + review questions	9 Class prep + review questions	10 Class prep + review questions	11 Class prep + review questions	12 Class prep + review questions	13 Review & Update Outlines	14 LW I Research Memo
	15 Class prep + review questions	16 Class prep + review questions	17 Class prep + review questions	18 LW I Rough Draft of Memo Due	19 Class prep + review questions	20 Review & Update Outlines + Practice Essays Q's	21 Review & Update Outlines + Practice M/C Q's
	22 Class prep + review questions	23 Class prep + review questions	24 Class prep + review questions	25 Class prep + review questions	26 Class prep + review questions	27 Review & Update Outlines + Practice Essays	28 LW I Revise Memo
	29 Class prep + review questions	30 Class prep + review questions	1 Class prep + review questions	2 Class prep + review questions	3 Class prep + review questions	4 Review & Update Outlines	5 LW I Revise Memo
October	6 Class prep + review questions	7 Class prep + review questions	8 Class prep + review questions	9 LW I Memo Due	10 Class prep + review questions	11 Review & Update Outlines + Practice Essays	12 Review & Update Outlines + Practice M/C Q's
	13 Class prep + review questions	14 Class prep + review questions	15 Class prep + review questions	16 Class prep + review questions	17 Class prep + review questions	18 Review & Update Outlines	19 Review Profs' Past Exams
	20 Class prep + review questions	21 Class prep + review questions	22 Class prep + review questions	23 Class prep + review questions	24 Class prep + review questions	25 Review & Update Outlines	26 LW I Research Memo 2

	27 Class prep + review questions	28 Class prep + review questions	29 Class prep + review questions	30 Class prep + review questions	31 Class prep + review questions	1 Review & Update Outlines + Practice Essays	2 Review & Update Outlines + Practice M/C Q's
November	3 Class prep + review questions	4 Class prep + review questions	5 Class prep + review questions	6 LW I Memo 2 Draft Due	7 Class prep + review questions	8 Review & Update Outlines	9 LW Revising
	10 Class prep + review questions	11 Class prep + review questions	12 Class prep + review questions	13 Class prep + review questions	14 Class prep + review questions	15 Review & Update Outlines	16 Practice Essays + Practice M/C Q's
	17 Class prep + review questions	18 Class prep + review questions	19 Class prep + review questions	20 Class prep + review questions	21 Class prep + review questions	22 Review & Update Outlines	23 LW II Revise Memo 2
	24 Class prep + review questions	25 LW I Memo 2 Due	26 Class prep + review questions	27 **Thanksgiving Break**	28	29 Finish Outlines: Civ Pro & Property	30 Finish Outlines: Torts & Contracts
December	1 Practice Questions & Past Exams, Consolidate Outlines, Make Checklists & Attack Plans	2	3	4	5	6	7 Review Property Outline + Practice Q's
	8 Property practice essays & M/C Q's	9 Property I FINAL	10 Review Civ Pro Outline + Practice Q's	11 Civ Pro practice essays & M/C Q's	12 Civ Pro I FINAL	13 Review Contracts & Torts Outline	14 Review Torts Outline + practice essays
	15 Torts practice essays & M/C Q's	16 Torts I FINAL	17 Review Contracts Outline	18 Contracts practice essays & M/C Q's	19 Contracts I FINAL	20	21