

HIGHLIGHTS FROM RECENT SCHOLARSHIP ON LAW STUDENT LEARNING

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Pedagogy Discussion Prof. Eugene Mazo

I. Learning Skills and Deficits of Entering Students

Jennifer Cooper, *Smarter Law Learning: Using Cognitive Science to Maximize Law Learning*, 44 *Cap. U. L. Rev.* 551 (2016).

Summary: Asserts that 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. The article reviews cognitive science research to recommend strategies to improve law student learning.

Key Take Aways: Many students entering law school lack strong critical thinking skills for legal educators to build on. Compared to previous populations, these students often have poor and ineffective study habits, weak critical thinking and writing skills, and are less academically prepared for law study.

- **“Academically adrift with illusions of competence.”** These students have “illusions of competence” in their reading, writing, and study habits, leading them to rely on improvised and ineffective study strategies.
- Law schools have been slow to adapt—expecting to educate modern students with same strategies of the past even though undergraduate studies are not adequately preparing them.
- Students enter universities not only poorly prepared for the academic tasks but also with attitudes, norms, and behaviors that are counterproductive to academic commitments. **Despite their lack of preparation, students arrive at colleges and universities with strong convictions about their abilities** and with illusions of competence. These students have high academic expectations and professional ambitions but **fail to realistically appreciate** the necessary steps to achieve their goals.

- Empirical research shows the amount of time spent studying is unrelated to academic performance. The critical factor is the actual task or behavior. **Three study strategies correlate with academic success:** retrieval, self-testing, periodic review.
- Students mistakenly believe that material is well learned when the learning is “easy.” The opposite is true: when learning is harder, it lasts longer.
- Ineffective study strategies commonly used by students are passive: re-reading, highlighting, memorizing. Problem is that **repetition and re-reading (as with memorizing a course outline) create an illusion of fluency:** the belief that if information is familiar and easy to recall, then it is well-learned.
- Re-reading/memorizing **also creates the illusion of mastery of the underlying ideas.** Fluency lulls learners into believing they learned and understood the material. “Information that is easy to process is judged to have been learned well.” This also leads students to prematurely terminate studying.
- **Retrieval and self-testing destroy the illusions of fluency, competency, and mastery.**
- Because students are unaware of the ineffectiveness of their selected study behaviors, **they remain committed to poor study habits—they cannot gauge their own learning.**
- Students therefore **need direct, explicit instruction** on effective learning strategies.
- Targeted **instruction on learning methods leads to substantial improvement** in academic performance.

This article recommends the following:

- 1) Include a calendar with specific study steps with the course syllabus (in addition to assigned readings, includes dates for review, outlining, and incorporating practice questions into study).
- 2) Model effective case reading techniques and case synthesis in class.
- 3) Give brief multiple choice or short essay practice questions or quizzes in class.
- 4) Model effective use of a course outline in class.

Patti Alleva and Jennifer A. Gundlach, [*Learning Intentionally and the Metacognitive Task*](#), 65 J. Legal Educ. 710 (2016).

Summary: Research shows that many students leave high school and college with insufficient understanding of how to learn effectively, despite prior educational successes. The upshot is that **any number of students may be entering law school without an in-depth understanding of how to learn.** This suggests that law schools must undertake a systematic response to this problem by targeting improvement of the learning process itself. **It is imperative that we equip our students with the skill set necessary to learn effectively and efficiently, not only in law school, but in law practice.**

Key Take Aways: Article focuses on the concept of meta-cognition. Although the term has been used across disciplines and sometimes with different variations, it is generally agreed that metacognition involves both “students’ *awareness* of the processes they need to successfully complete a task, and . . . students’ cognitive *monitoring*—the ability to determine if the task is being completed correctly and make corrections as appropriate.”

- The specific benefits for law students of developing metacognitive skills are many. First, there is notable support for the theory that **integrating the teaching of metacognitive skills with the teaching of substantive content can improve students’ deep learning of the subject matter.** Second, encouraging law students to think about how they think better prepares them, in a broader sense, for the higher-level skills required for sound academic and professional judgments, including analysis, synthesis, and critical thinking. Third, metacognition also supports the transfer of learning. **A professor’s integration of the explicit teaching of metacognitive skills within a doctrinal course ultimately serves to position students to be successful, self-regulated learners in that class.**
- Students begin law school with varying levels of metacognitive proficiency. A recent study aimed at measuring the metacognitive aptitude of students at one law school confirmed that **even top students in the entering class did not exhibit well-developed metacognitive skills.**
- *Being Explicit About Metacognition.* Teachers who want to “teach for, of, and about thinking” must pave the way by establishing a climate for doing so. Being explicit about metacognition increases the likelihood that students will take greater responsibility for practicing these skills.
- *Modeling Metacognitive Skills.* Students benefit from practicing metacognitive skills when that practice has been modeled first by their teacher. Sometimes referred to as a professor’s “think-aloud,” **legal educators have recognized the value of sharing the thinking steps that an expert follows to successfully complete a specific learning task.**

- *Providing Questions to Encourage Metacognition.* After laying the groundwork by modeling it, the professor can reinforce the critical metacognitive skill of self-questioning by encouraging students to engage in it on their own in order to build awareness about their learning. Strategic self-questioning is not necessarily innate, and may need to be developed and refined. Teachers can **provide a list of targeted questions designed to facilitate deeper metacognitive sensitivity** by asking students to self-diagnose their grasp of difficult material in order to determine what they understand, and to monitor where they are struggling, and why.
- *Using Assessment to Encourage Monitoring of Learning.* Particularly in classes that include only a final exam and perhaps a midterm, students often lack enough extrinsic opportunities to monitor their learning. To help remedy this problem, **teachers can offer benchmarks, such as grading rubrics or checklists of expected skills, for students to use as the basis for self-assessment of their learning.** Likewise, a formative assessment, such as a practice test, can be used as a platform to further students' metacognitive understanding of their content learning.

Rebecca Flanagan, [*The Kids Aren't Alright: Rethinking The Law Student Skills Deficit*](#), 2015 BYU Educ. & L.J. 135 (2015).

Summary: Research suggests that incoming law students are less prepared than previous generations of law students. Undergraduate education has changed over the last forty years. Many of today's college graduates do not have the fundamental thinking and reasoning skills necessary to master the law school curriculum. **Law schools can no longer assume all students enter post-graduate legal training with the academic preparation, proficiency in critical thinking, or time management skills necessary to master "thinking like a lawyer."**

Key Take Aways: College students spend less time studying during their undergraduate years. College students expect higher grades with considerably less effort than previous generations. However, there is little institutional evidence law schools have been aware of the empirical research on the decline in skills acquisition at the undergraduate level.

- Success in law school requires at least two hours of reading for each hour of class time. Full-time law students need to spend at least thirty hours a week preparing for class. **Students who are used to studying less than five hours a week during their undergraduate years are going to have a rougher adjustment to the thirty hours of reading time required to keep up with law school classwork,** and will have an even more difficult adjustment to the outlining, practice exams, and study group work that requires an additional five to seven hours week.

- Students have a **“customer orientation.”** The change from student-as-learner to student-as-customer has strong negative implications for motivation and personal investment in the learning process. The consumer orientation, and corresponding extrinsic motivations, “radically alters” the fundamental nature of education. Students no longer see themselves as partners in a relationship designed to further growth; **consumer orientation frames the relationship between student and teacher as customer and service provider, with the customer expecting satisfaction.**
- Students who view education as an economic transaction become preoccupied with their GPA, sacrificing “deeper, critical analytic learning” in pursuit of a credential they can exchange on the market. Students expect “to be given high grades in return for paying tuition and showing up.”
- Because an essential element of legal education is the ability to “grapple with uncertainty in order to develop professional judgment,” college student’s consumer orientation leaves them unprepared for the pedagogical challenges they must face as law students.
- Grade inflation at the undergraduate level has a role in the decline of study time, reduced learning, and student under-preparedness, because students no longer need to study long hours to earn respectable grades. **Students, accustomed to very high grades in return for little work during their undergraduate careers, are unprepared for the amount of work required to receive a passing grade in a law school class.** Adding to students’ frustration, they have not gained the fundamental thinking skills necessary to master the more complex reasoning and analysis law school requires to earn the grades they are accustomed to receiving.
- **The lack of rigor in the undergraduate curriculum lulls students into a false sense of competency.** Students who have only received A’s and B’s, through little effort, are unprepared for the challenge of law school academics. Students are less likely to understand that being admitted to law school is not enough to succeed in law school.
- Most entering law students know less than prior generations of law students. Students have found that maximizing grades, minimizing study time, and focusing on the credentialing aspect of college education results in a more pleasurable, less stressful experience, but one that leaves them ill-prepared for acquisition of higher-level intellectual tasks.

II. Providing Feedback

Daniel Schwarcz and Dion Farganis, *The Impact of Individualized Feedback on Law Student Performance*, 67 J. Legal Educ. 139 (2017).

Elizabeth Ruiz Frost, [Feedback Distortion: The Shortcomings Of Model Answers As Formative Feedback](#), 65 J. Legal Educ. 938 (2016).

Summary: Using model answers as a method of providing feedback can be effective, depending on the pedagogical goal. If the professor’s goal is simply corrective—for example, conveying that intent is an element of assault—a correct model can convey that. However, **for most purposes where the pedagogical goal is more complex, providing a model answer in the absence of individualized feedback will not further student learning.** Typically, while even strong students will struggle with model answers, the students who perform least well on assessments—and who therefore need feedback most—will get the least from a model answer. The more flawed a student’s understanding of the information is, the less likely the model is to help correct that understanding.

Key Take Aways: Providing model answers as a method of providing feedback is an offshoot of the Vicarious Learning and Self-Teaching models of education, which have pervaded legal teaching. Under the Vicarious Learning Model, students are supposed to learn in class by watching other students interact with the professor. A professor who provides a model answer as feedback engages in the Vicarious Learning Model, too. In both cases, the professor intends that a single student’s knowledge and learning will “rub off” on the remainder of the class. Even if the professor writes the model answer herself, she will be performing in the role of the outstanding student, and the vicarious learning theory is the same.

- **With model answers as feedback, professors expect a student to know what theory or skills he needed to have learned and to decipher what was effective about the model.** Then, based on the model, the student must assess his own work. That requires the student to work on three levels: First the student needs to determine which skill was of value in the model. Is the model effective because it came to the right conclusion? Because it identified the right cases to explain the law? Because it was organized clearly? Because it was grammatically correct? Second, with the valued skill in mind, the student must then determine why it was correctly demonstrated in the model. Third, the student must be able to compare and contrast his own work to the model answer.

- **Feedback should be designed to meet the professor’s instructional goals and further student learning objectives.** Each law school course, unit within the course, or lesson within a unit has a purpose; in ABA parlance, this purpose is called a learning goal. A learning goal might be something concrete, such as, “students should be able to identify the elements of first-degree burglary,” or it could be more abstract: “A student should be able to extract an implicit rule from a case.” When professors assess students, the goal is to determine whether each student met or achieved the learning goal. The form of assessment should be tied closely to the learning goal. And in turn, the feedback that a student receives in response to the assessment ought to identify areas of strength and weakness related to that learning goal.
- **Model answers are a common method for delivering feedback to students, but they are not particularly effective.** A number of students—particularly the weaker students most in need of formative feedback—will be unable to accurately glean the standard or goal exemplified by the model answer or to distinguish their own work from the model. **Model answers can provide effective feedback for questions of factual knowledge and concept identification. But with assessment that requires higher-order thinking, where students are required to demonstrate a thought process, models are not as effective.**
- **Regardless of student characteristics and learning goals, students themselves do not think model answers provide helpful feedback, despite frequent requests for them.** Students prefer individualized feedback and admit that they do not learn as well from a model. Whether a model answer can effectively convey formative feedback depends, in part, on the characteristics of the student reading it. Some students may be able to glean the relevant information and improve their own learning from reviewing a model answer, but many cannot.
- Metacognition is the “knowledge of one’s own cognitive processes (i.e., knowing what one knows) and state of knowledge.” Metacognitive skills give us the ability to evaluate our own academic capability, to self-assess. **Students who perform well on assessments tend to have stronger metacognitive skills.** They can tie their level of confidence to successful performance with fair accuracy; they are pretty good at identifying what they do know and do not know.
- **In contrast, those who perform poorly on assessments generally tend to have the weakest metacognitive skills—they are least able to accurately self-evaluate.** That means students who perform at the bottom of a law school course would be least accurate in predicting how much of the course material they knew and how well they knew it. Poor performers tend to convey a sense of confidence in their knowledge that belies their actual knowledge. Whereas top performers underestimated their abilities, **performers in the bottom quartile tended to overestimate their performance by an average of fifty percentage points. Owing to their lack of expertise, poor performers are first unable to produce a skilled or correct response, and then, through that same lack of expertise, unable to see that their work is inadequate.**

- The lack of self-awareness among poor performers is a “double curse.” A student who lacks the skill to perform well on the paper or exam would also lack the ability to evaluate the success of his performance. That means that the weakest students, who lack the ability to distinguish between the standard exemplified by a model answer and their own work—will learn the least from a model answer. **Metacognitive research suggests that if a person lacks the skills to perform well initially, he would also be unable to differentiate between his own or another’s right and wrong answers.** Despite reviewing a representative sample of their peers’ work—including tests that were superior to their own—poor performers continued to overestimate their own ability and performance.
- **Adding to the problem of misplaced confidence is the related concept of perceptual fluency. Perceptual fluency is the familiarity or ease one feels when material is presented to him.** A person can gain perceptual fluency with material just by repeated exposure to it; repeated exposure to a term will create the perception of knowledge of the term. That repeated exposure is an example of superficial priming. For example, in a law school setting, a student studying for his contracts exam might gain repeated exposure to the term “illusory promise.” That repeated exposure would create in the student a perceived sense of familiarity with the term. **But that perceptual fluency is a subjective feeling that is not necessarily tied to an objective ability** to identify situations where illusory promise exists, to explain the law relevant to illusory promise in that setting, or to argue coherently in favor of or against illusory promises or defenses. So despite the repetition exposure, the student would not necessarily have a nuanced understanding of illusory promise or how it could be applied, despite feeling a sense of confidence that he does. Moreover, the student would be unaware that his perceptual fluency was attributable to superficial priming and not actual, internalized learning.
- Not only might a student with a fixed mindset misinterpret a comparison between a model answer and his own work because of that defensiveness, deflection, and distortion, or simply reject papers or exams as learning opportunities, students with a lower sense of self-efficacy are simply less capable of implementing the cognitive strategies necessary to self-assess using a model answer.
- The effectiveness of a model answer as a method of providing feedback depends largely on the instructional goal. **A feedback message to a student should tell the student not solely whether he was correct or incorrect, but how to remediate his knowledge or skills.** A model answer as the sole feedback message can provide correct answer feedback in some circumstances, but in most circumstances it cannot provide guidance for skill remediation or continued learning.

- A model answer is best-suited for short-answer questions that test factual knowledge or very short problem-solving exercises in which student action is limited to naming or identifying. In those contexts, a student can determine whether he was correct or incorrect by determining whether his answer matches the model answer. In a law school course, then, model answers could be an appropriate method of providing feedback when the professor seeks to assess factual knowledge or the ability to identify concepts. For example, on a law school exam, a professor might require students to identify the elements of the crime of burglary; that question tests factual knowledge. A model answer that correctly identified the elements of the crime would be instructive for the student who had answered incorrectly.
- **For assessment that requires higher-order thinking, where students are required to demonstrate a thought process, a model answer might not be as effective.** For example, an assessment might require students to recognize burglary as a possible charge based on facts, to synthesize authorities to develop rules for key elements, and to apply those rules to the current facts. That type of assessment requires higher-order thinking. Reviewing a model answer will not improve their understanding of the material or their skills. They may be no better at spotting issues, synthesizing rules, and applying rules than before the feedback. If the professor's goal in evaluating a student's work is to provide formative feedback on problems that require higher-order thinking, merely providing a model answer is ineffective for many students. Moreover, while correct-answer feedback, which could come in the form of a model answer, will improve a student's factual knowledge, it by itself will not improve higher-level comprehension of the material.
- Researchers have tested the value of correct-answer feedback versus elaborative feedback (which provides the correct answer together with either an explanation of why the correct answer is correct or a restatement of the original course material from which the answer was drawn). **The additional feedback information in elaborative feedback helps a student move beyond superficial knowledge to a deeper understanding of the material.**
- Even so, model answers can still be an important pedagogical tool in a professor's toolbox. **For a model answer to provide a meaningful representation of the goal or assignment, it should be annotated. An annotated sample tells the student not just what a good exam or good paper looks like, but why it's good.** Many professors use margin comments to annotate a model answer so that students can gauge what the professor thought about and valued as she read (or composed) the answer. **Those annotations will act as a guide through the document, offering students insights into its organizational, analytical, and mechanical strengths.** Rather than simply annotating a model answer with "Here, the student applied the law well," a professor should describe what specifically made the rule application exemplary. For example, "This application is successful for three reasons. First, the facts explained in the case illustrations are discussed in logical order here, following the order of the explanation above. Second, the writer has compared and contrasted those facts to the legally relevant facts in his own case. Third, the organization of the analogical reasoning is clear and

logical; the writer has started each comparison with a statement of the point of the comparison, restated the facts from the precedent cases and introduced the facts from his case, explained why they are similar, and explained the legal significance of that similarity.”

- **A model answer should be paired with individual comments on a student’s work to provide more effective formative feedback.** Using a model answer as a reference point in the individual comments can make individual commenting more efficient. A professor can simply instruct students to review a particular portion of the model answer to put an individual comment into context.
- **Rather than simply handing a model answer off to a student to review passively, a professor can create tasks for the student to engage in during his review of the model answer.** For example, a professor can ask the student to explain each of the errors in his own product, which requires the student to think critically about the course material and his own product. In addition, a professor might ask the student to list the skills he failed to demonstrate, focusing the student on the broader learning objectives of the course, which promotes transfer.
- **Knowing that the student will make limited use of model answers on his own, a professor might instead schedule windows of time for small groups of students to review the models and their own exams together.** A group of students working through model answers and one another’s work (perhaps even assisted by guiding questions from the professor as discussed above) will better identify the standards or goals of the assignment and can better distinguish their work from the model than an individual student could.

III. Skill Development

Joni Larson, *To Develop Critical Thinking Skills and Allow Students to be Practice-Ready, We Must Move Well Beyond the Lecture Format*, 8 *Elon L. Rev.* 443 (2016).

Summary: While lecturing has been a staple in the law school classroom, it comes with limitations. The most important limitation is that it does not create an opportunity for students to actively engage with the content or acquire the skills they will need to practice law. A student does not develop skills just because he is attending class. Skills must be intentionally incorporated as part of an active learning environment.

Key Take Aways: To enable the students to develop critical thinking skills and be practice ready, **the classroom focus needs to shift from information delivery to knowledge and skills acquisition** surrounding that information.

- Advocates using checklists, flowcharts, concept maps in the classroom to engage students in active learning.

Christine P. Bartholomew, *Time: An Empirical Analysis of Law Student Time Management Deficiencies*, 81 *U. Cin. L. Rev.* (2013).

Summary: The modern undergraduate lacks time management skills. Rather than learning how to handle the time pressures associated with challenging course loads and outside demands, many students instead learn how to simplify their academic life. **College students are studying significantly less than prior generations.** In the 1970s, two thirds of students studied about two hours per day, with twenty-five percent of students hardly studying at all. By the early 2000s, there was a notable decline. Forty-five percent of college seniors reported studying a mere ten hours per week or less. **Despite the increased ease and reduced effort devoted to education, college students already complain of time famine.** Law schools should help teach students how to effectively manage time to promote learning.

Key Take-Aways: The seeds of time famine that begin sprouting in undergraduate education continue to grow during law school. First, law school's time demands are far higher than in college. Second, students are entering law school with less foundational preparation than prior generations. Third, law school requires students to learn a new way of thinking, which takes time to develop. Finally, legal education takes a toll on students emotionally, further exacerbating time famine.

- Students are coming into law school less prepared, particularly in terms of analytical, writing, and research skills. **A recent study found that forty-five percent of students made no significant improvement in their critical thinking, reasoning or writing skills during the first two years of college. After four years, thirty-six percent showed no significant gains in these higher order thinking skills.**
- These students are also less prepared for legal education’s reading load. Overall, Americans are reading less, and the current generation of law students is the demographic that, as young adults, read the least.
- This lack of foundational skills takes its toll in law school. Strong fundamental reading abilities are essential. A deficit in basic reading skills forces law students to devote extra time to meet even baseline expectations.
- The average law school class structure does little to help. End-of-course exams force future-orientated thinking, with limited attention to what needs to be done on a given day to prepare for end-of-semester exams, let alone post-graduation success. Students are working without sufficiently identified incremental and end goals. This disconnect creates time management problems.
- Without high-quality goals in place, the entire time management process fails. **In the education setting, goals focused on the learning process, not performance outcomes, are best.** Accordingly, setting a goal to get an “A” in a class is not as useful to goal achievement as a goal to understand a given subject matter. The more specific the goal, the easier it is to gauge progress.
- **Law students have poor time management mechanics.** Student surveys showed that at least half the students do not plan out activities sufficiently in advance. In fact, for approximately forty percent of the class, scheduling one week out is a rarity. In addition, more than fifty percent of 1Ls do not frequently structure activities to fall into a particular pattern.
- Time management training can be effective. However, for it to work, it has to be more than a self-directed, minimal involvement program. Instead, an approach across the law school curriculum is needed. This ensures students see time management as a vital part of their academic development. **These skills need to be reinforced throughout law school’s curriculum all three years** to ensure the most prepared students possible.
- **The critical instruction falls into three categories: teaching students to break down tasks, teaching time allocation skills, and teaching techniques to implement those allocations.** First, a strong syllabus can play a large part in breaking down a course. A syllabus provides an opportunity for the professor to show the relationship between parts and a whole. Second, students need instruction on what the course objectives are, and there is no one better to define those objectives than the professor. Then, using these objectives to generate long term goals, **students should be encouraged to set individual short term goals aimed at achieving the larger objectives.**

- Incremental and attack outlines (or frameworks) provide a strong teaching opportunity for goal setting. Incremental outlines help ensure students generate short term learning goals regarding specific course concepts.
- **Note taking is a basic study and time management skill with application in law school and in practice. Yet, it is also an area where students need further instruction.** This is particularly true in the computer age, where the tendency is for students to transcribe lectures rather than take notes. Strong note taking skills are analogous to prioritizing—which is a key part of goal setting. Traditional note taking skills require students to sort and prioritize information. Details are left out with the emphasis placed on higher priority information.
- **There are multiple different ways a professor can develop note taking skills.** First, professors should consider giving at least some assignments orally, even just readings or exercises. No written details for the assignment should be handed out: unless the student takes accurate notes, the assignment should be difficult to complete. This way, students are required to take accurate notes and begin developing note taking skills. Second, for each lecture, a professor should collect notes from a designated person or group of people depending on class size. Submitting notes ensures students develop note taking, while also having the added benefit of potentially increasing students' interest in the course. This allows the professor to gauge potential areas of confusion as well as weak students. It also lets professors provide feedback on mechanics. In reviewing the notes, look for whether students are identifying the primary propositions. Strong notes consistently identify more concepts as a whole, but additionally place emphasis on the important concepts.
- The last part of teaching time management is encouraging students to cogitate on their personal time management techniques. **Professors should encourage students to reflect on their time allocations, “to-do” lists, and calendars to see what is working, and more importantly, what isn’t.** This type of reflection has two main benefits. First, it helps students become more aware of their specific time issues, as well as forcing the type of self-reflection necessary to modify their behavior going forward. Second, it helps students see the link between time management and their learning outcomes. This link is essential to motivating students to continue using these skills, despite the learning curve inherent in developing a new skill.

IV. Laptops in the Classroom

R.W. Patterson and R.M. Patterson, *Computers and Productivity: Evidence from Laptop use in the College Classroom*, *Economics of Education Review* 57, 66-79 (2017).

Summary: Authors present quasi-experimental evidence of the impact of computer use in college classrooms on academic outcomes. **Their results show that computer use decreases course grades by between .17 and .46 standard deviations.** Authors state that they are “confident that our results indicate that computer use worsens student academic outcomes.”

Key Take-Aways: The efficacy of classroom learning is increasingly important as the ratio of class to study time has increased to the point where **the average college student spends more time in the classroom that studying outside of it.**

- Previous studies have established that taking notes by hand generates better recall than by computer.
- Studies that examine the correlation between computer use and academic performance in college find that **students who use computers in classrooms perform worse than students who do not.**
- Students who multi-task (engage in non course-related web activities during class time) **reduce their own academic performance and that of students who are able to see the multi-tasker’s computer screen.**
- Authors also note that the **presence of laptops in the classroom may create distractions for students who are not using them and foster an unproductive learning environment by making it more difficult for the instructor to engage with the class.**

Susan Ravizza et al., *Logged in and Zoned Out: How Laptop Internet Use Relates to Classroom Learning*, 28(2) *Psychological Science* 171-180 (2017).

Summary: The authors directly monitored student internet use during class without relying on self-reporting, and concluded that “nonacademic internet use was frequently observed and was inversely related to performance on the cumulative final exam.” The authors also concluded that “accessing the internet for academic purposes during class was not related to a benefit in performance.”

Key Take-Aways: Several studies have shown that **using portable devices for nonacademic purposes during class is related to diminished learning**, and this conclusion remains true regardless of intellectual ability.

- **Despite this link, students downplay this relationship and report little or no effect of their portable device use on learning** class material.
- Data did not support the idea that students with greater intellectual capability were better multi-taskers.
- **Study found no association between academic use of laptops and classroom learning** (e.g., logging on to class website, accessing additional course information on the web, taking notes on downloaded PowerPoint slides). This type of student laptop use was limited to passive processing of information.
- Students using the internet for nonacademic purposes may be unable to inhibit internet browsing even though they believe it to be harmful to their learning.

Susan Payne Carter et al., *The Impact of Computer Usage on Academic Performance: Evidence from a Randomized Trial at the United States Military Academy*, *Economics of Education Review* 56 (2017).

Summary: The results of the authors' study suggests that **permitting computers in the classroom reduced final exam scores by .18 standard deviations**. The effect is as large as the average difference in exam scores for two students whose cumulative GPAs at the start of the semester differ by one-third of a standard deviation.

Key Take-Aways: Despite the potential benefits of computers in the classroom, **evidence suggests that permitting computers negatively impacts student learning**. Several studies suggest that potential distractions from nonacademic internet use have negative effects, and bringing a laptop to class increases multi-tasking.

- Multiple laboratory-style studies **demonstrate negative effects of laptop multi-tasking on test performance**.
- While distractions and multi-tasking are one potential channel through which computers may negatively impact performance, **another potential channel is that students recall less information when they are required to take notes with computers rather than by hand**.
- Their results suggested that computer devices can reduce students' knowledge of the material gained during the semester, either because they are distracted by using the internet or because they are not taking notes by hand.
- The authors stated that they did not relate their results to a class where laptops were deliberately used in classroom instruction.

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