ARTICLES

A Game Changer: Assessing the Impact of the Princeton/UCLA Laptop Study on the Debate to Ban Law Student Use of Laptops During Class

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INTRODUCTION

In this Article, I discuss the impact on legal education of a recent study conducted at Princeton University and UCLA, which compared the levels of comprehension and retention of class lectures by those students who handwrote their class notes with those students who typed their notes onto their laptop computers.

The study involved three separate experiments. In each test, the subjects using laptops had no access to the Internet, and were only permitted to use their laptops for taking class notes. Thus, all possible laptop distractions were eliminated. In all three experiments, those students who handwrote their notes outperformed their counterparts who chose to type their notes on assessments administered between thirty minutes and one week after the lectures.

This study raises another chapter in the continuing debate over whether students should be permitted to use their laptops in class. Prior to the Princeton/UCLA study, the debate primarily centered around the


I would like to express my gratitude to Dean Camille Nelson, Suffolk University Law School, for her valued support of this Article. I am also grateful to Dr. Vivien Perge and Professor Kathy Vinson for their valued and insightful comments in reviewing earlier drafts of this Article. I would also like to note my appreciation for the work of Pam Mueller and David Oppenheimer who, through their study, have provided the empirical data to support what many of us in the profession have believed for some time to be the adverse educational effects of student laptop use in class. And last, but most certainly not least, I would like to thank Professors June Entman and Kevin Yamamoto for being among the first in the legal academy to publicly question the educational value of allowing our students to use their laptop computers in class.
distractive effects laptops had on both laptop users engaged in activities unrelated to what was being discussed in class, and on those who were distracted by the visuals and sounds emanating from laptops. Such distractions included surfing the Internet, playing video games, and emailing others in the class.

This study reveals that even if these distractions are removed, students who use their laptops for note taking tend to simply type the words of their professor verbatim without trying to understand their meaning. As a result, their comprehension and retention suffers.

In light of this study, I suggest in this Article that as legal educators, we need to reevaluate the prevalent policy of allowing students complete access to their laptops during class sessions. I explain why I believe attempts to monitor how students are using their laptops in class, such as professors walking up and down the class aisles to observe students’ computer screens, are ill advised and ineffective. I then suggest that student laptop use should be permitted in class only if the professor is using them for a specific educational purpose. Otherwise, the use of laptops should be banned.

In response to those who have argued that most students would not favor such a policy, I offer survey results from four of my first-year classes, all of which indicated that while at the beginning of the course a large segment of my students opposed my policy of banning all laptop computer use, by the end of the course that opposition had significantly decreased. Indeed, the number of students who ultimately favored the policy markedly increased over the course of the semester. I conclude that given the adverse effects of laptop distractions on note taking, we, as legal educators, need to question whether we are fulfilling our responsibilities to our students by permitting them to use their laptop computers during class sessions. And if we are not, then we need to ban or seriously limit their in-class access their laptop computers.

I. THE DUAL ADVERSE CONSEQUENCES OF STUDENT LAPTOP USE IN CLASS

Since law student use of laptop computers during class became a prevalent practice around the turn of the century,¹ concerns have been

1. See Kristen E. Murray, Let Them Use Laptops: Debunking the Assumptions Underlying the Debate Over Laptops in the Classroom, 36 OKLA. CITY. U. L. REV. 185 (2011). I first noticed my students using laptops in class during the mid-1990s. At that time, it was just a few students typing away on a strange, new device. After receiving complaints from a few of my students that the clicking sound of the keyboard was distracting them, I arranged to have the few laptop users sit in a specific section of the classroom so as to reduce the level of noise. In 1999, my law school moved into a new building, which had Wi-Fi outlets at every seat in every classroom and in the law library. The implicit (if not explicit) message we were sending prospective students was that the law school encouraged the practice of bringing and using laptops in class. Not surprisingly,
raised about whether their use has had an adverse effect on student performance levels. Most of these concerns have dealt with the distractions that result from students using their laptops for non-class related purposes, while simultaneously trying to comprehend what is being discussed in class. Examples of this type of multitasking include but are not limited to students using their laptops to: surf the Internet, shop, play video games, instant message one another, and responding to emails. In fact, these practices are so prevalent that one study involving law students revealed that nearly 90% of laptop users were engaged in online activities unrelated to their course work for at least five minutes per class, and roughly 60% were so engaged for half of the class. Not surprisingly, numerous studies have proven that when students engage in these multitasking activities during class their comprehension levels suffer.

In addition, these activities not only distract the laptop user from engaging in class, but also interfere with the concentration of those who are not engaging in those activities. Indeed, students who do not use laptops in class often complain that the noises emanating from the laptop, the visuals from the display screen accompanying those noises, and the verbal and other physical reactions of the laptop user all interfere with their ability to

from that point on, a clear majority of my students used their laptops in class until I banned such use in 2006. Thus, for about ten years, I allowed students to use their laptop computers in my classes.

In hindsight, there was never any discussion at my law school about whether allowing student access to laptop computers during class was an educationally-sound decision. Rather, it was merely accepted as one of the technological advances which our school, to remain competitive, sought (and needed) to embrace—a sentiment and experience which I suspect was shared by many other law schools at the time.


3. See Yamamoto, supra note 2, at 485–86; see also Murray, supra note 1, at 210.

4. Cindy May, A Learning Secret: Don’t Take Notes with a Laptop, SCIENTIFIC AMERICAN (June 3, 2014), http://www.scientificamerican.com/article/a-learning-secret-don-t-take-notes-with-a-laptop/; see also James AM. Kraushaar & David C. Novak, Examining the Affects of Student Multitasking with Laptops During the Lecture, 121 J. INFO. SYSTEMS EDUC. 241, 245 (2011) (study found students multitasking during class on the laptops with non course-related software approximately 42% of the time). Indeed, even proponents of laptop use in class concede that they do pose a potential distraction in class. See generally Murray, supra note 1, at 185–210 (In one survey cited by Professor Murray, 55.6% of the students polled indicated that they occasionally engaged in non-class related laptop uses, 21.3% reported that they usually do, and 5.9% reported that they always do.).

focus and comprehend what is being taught in class. There have also been reports of students downloading pornographic pictures, and of male students emailing each other offensive comments concerning female classmates during class.

However, the question all of these concerns ignore is, even if all these distractions were eliminated, would there still be a difference in the performance levels of those students who handwrite their notes and those who choose to do so on their laptops?

For years I suspected that laptop note taking, in and of itself, had a deleterious effect on many, if not most students’ understanding of what was being discussed in class. Frequently, I would call on students using their laptops to answer a question and would often get a puzzled, startled look from them. A few seconds later they would ask me to repeat my question. At first, since I had noted that they were busily typing on their keyboards, I assumed that they were engaging in some form of non-class related activity. But then, when I went over to them and looked at their screen, I saw that they were typing, almost verbatim, everything I was saying in class. And yet, when asked a question about what they had been diligently typing away at, they had absolutely no clue of either the question being posed to them or how to respond. The student was physically present, paying attention to literally every word that was said, and yet was learning nothing.

I also began to note that once the use of laptops became more prevalent, the level of student participation in class diminished (not surprising since many of those using their laptops were either using them for unrelated activities or were so busy typing everything I said that they had no chance to digest the contents of the class discussion). As other professors have noted, it was disconcerting to have students’ faces replaced with the backs of their laptop screens. As a result, my ability to gauge whether my students actually understood the class materials by simply observing their facial expressions was seriously compromised. Eye-to-eye contact became a more rare occurrence as students’ eyes were transfixed on their laptop display screens. Indeed, students began to pay more attention to my words than to my emphases; my notes on the white board were merely copied, not understood. As a consequence, the human connection between my students and me was being eroded. I could not

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6. Sana et al., supra note 4, at 30; see also Yamamoto, supra note 2, at 487.
7. See E-mail from Kate Day, Professor of Law, Suffolk University Law School, (Aug. 3, 2014) (on file with author) (Professor Day confirmed that in 2007 she received complaints from a number of her female students that offensive visual images and comments about women in her class were being posted and exchanged by male students during class sessions. To end such practices, Professor Day banned the use of laptops in her classes.).
8. See infra note 10.
help but believe that all of this had to have an adverse effect on the students’ learning experience and related comprehension processes.

And, in fact, as I began to conduct research on the incoming classes attending my law school after the implementation of our relatively new laptop computer usage policy, my observations and concerns regarding the adverse effects of laptop use on students’ learning and comprehension processes were confirmed. In the early 2000s, even though the entering law school classes had LSAT scores equal to or higher than the preceding classes, I noted an increased superficiality in their exam essay answers, as well as in their responses to my questions during class discussions. I also noted that as the level of in-class engagement with my students decreased, so too did my enjoyment of teaching, which, admittedly, I believe adversely affected my own effectiveness as an instructor.

Then, in 2006, I read a news report about Professor June Entman, a law professor at the University of Memphis Law School who had implemented a no-laptop policy during her class sessions. Professor Entman’s policy led a student to file a complaint with the ABA, claiming that her policy violated the ABA’s endorsement of the use of technology in legal education. Although the complaint was ultimately dismissed, I was particularly impressed with how Professor Entman justified her policy:

My concern was that they [the students] were focusing on trying to transcribe every word that [I] was [sic] saying, rather than thinking and analyzing . . . . The computers interfere with making eye contact.

You’ve got this picket fence between you and the students.11

After reading Professor Entman’s comments, I realized that my observations and concerns were shared by at least one other professor.12 Thus, validated and emboldened, in the fall of 2006, I also imposed a similar laptop ban in my classes. Since then, I have never regretted my decision. And, as I will later discuss in Part III B of this Article, thanks to the anonymous surveys of my students, I am convinced that most of them also favor the ban.

However, when I voiced my concerns to many of my colleagues about our law school’s endorsement of students’ laptop use in the

11. Id.
12. I do not mean to suggest that back in 2006, Professor Entman and I were the only two professors who shared these concerns and observations. See Yamamoto, supra note 2, at 483–84. In his law review article, Professor Yamamoto cites numerous law professors throughout the country who implemented laptop bans around the same time.
classroom, my observations were mostly dismissed. I was told that these were merely anecdotal observations, and lacked any empirical evidentiary support.

My colleagues were correct. While numerous studies had documented the distractive effects of non-class related laptop usage on the learning processes of both the laptop user and fellow classmates, no studies had addressed whether the use of laptops for note taking had a deleterious effect when the computers were being used solely for the purpose of understanding lecture content.

That is, until now. In 2014, two educational psychology researchers, Pamela A. Mueller from Princeton University and Daniel M. Oppenheimer from UCLA, have provided such empirical evidence. In their article, entitled The Pen is Mightier Than the Keyboard: Advantages of Longhand Over Laptop Note Taking, the authors describe three different studies they conducted, which compared the short-term and long-term retention and comprehension levels of students who handwrote their class notes as opposed to those who chose to use their laptops to type them. I will discuss this study in great detail in Part II of this Article, but for now I will simply quote a segment of its conclusion:

The studies we report here show that laptop use can negatively affect performance on educational assessments, even—or perhaps especially—when the computer is used for the intended function of easier note taking.

My Article flows in large part from the Mueller/Oppenheimer study.

The premise of my Article is simple—allowing students to have unfettered access to their laptops during class sessions has two adverse consequences. First, as discussed above, it results in many of them using their laptops for unrelated and distractive purposes. Second, based upon the Mueller/Oppenheimer studies, students who use their laptops for the approved purpose of typing their notes have a poorer conceptual understanding of the course materials as compared to their counterparts who handwrite their notes. Consequently, laptop users tend to perform less successfully on their exams than those students who handwrite their notes.

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13. See Yamamoto supra note 2 at 485.
15. Id. at 8 (emphasis added).
16. The decision to ban laptops is, of course, not limited to law school professors. In fact, at Dartmouth College, professors who teach computer programming have also banned laptops from their classes. See Dan Rockmore, The Case for Banning Laptops in the Classroom, THE NEW YORKER (June 1, 2014), http://www.newyorker.com/tech/elements/the-case-for-banning-laptops-in-the-classroom.
Based upon this premise, I suggest that legal educators need to re-examine the prevailing policy of allowing students unrestricted access to laptops during class. I conclude that laptops should only be permitted when they are necessary for the successful implementation of a specific classroom exercise, and that once that exercise is completed, students should be required to put their laptops away.

II. HOW NOTE TAKING CAN ENHANCE OR IMPede LEARNING: THE PROCESSES OF ENCODING, EXTERNAL STORAGE, AND METACOMPREHENSION

In order to assess and compare the efficacy of handwriting class notes with typing them on a laptop, one must first identify the cognitive benefits of effective note taking. By identifying these benefits, one can then measure the degree to which they are attained by the two modes of note taking, which provide the subject of this Article.

In their study, Mueller and Oppenheimer identified two primary benefits of effective note taking. The first purpose of classroom note taking is for the student to begin the learning process while taking the notes. As the student is listening to the professor, he is absorbing what is being said. However, for him to understand the import of the spoken words, he must translate the professor’s words into his own. This process is called encoding. After the mental process of encoding occurs, the student is in a better position to memorialize his thought processes by note taking. These notes usually take the form of paraphrasing, summarizing, diagramming, or otherwise transcribing what the professor has said.

The crucial element of encoding is that it forces the student, while he is in class, to begin the thinking process. To encode successfully, the student must at least have some notion of what is being conveyed by the professor in class. Essentially, when the learner has taken the initiative

Indeed, it appears that the idea that handwriting notes may be a more effective mode of learning than typing on a laptop has spread outside of academia. This past year, the new coach of the National Football League’s Cleveland Browns instituted a policy forcing his players to eschew their tablet computers and, instead, handwrite the team plays. When asked to discuss his thoughts on the newly implemented policy, one of the players, a Harvard graduate, acknowledged that handwriting causes you to “actively use your brain more.” See Kevin Clark, The Cleveland Browns’ Strategy: Write This Down—Why Cleveland Prefers Pen and Paper to Technology: ‘To Write Is to Learn,’ WALL ST. J. (Aug. 11, 2014), http://www.wsj.com/articles/the-cleveland-browns-strategy-write-this-down-1407795873.

17. Id.

necessary to link “the material to his existing cognitive structure[,] he has made it meaningful.”

In their study, Mueller and Oppenheimer hypothesize that the use of laptops for note taking works against successful encoding because when students type their notes they tend to type the material much faster than they can write it. As a result, the inclination is for students to simply type what is being said in class verbatim. The encoding process is severely undermined since the laptop user, in the process of typing his notes, is not able to absorb the material being conveyed by the instructor. Essentially, the laptop user’s only concern is to type everything that has been said—no paraphrasing, summarization or translation has occurred, no prioritization of what has been said has been attempted, and no memorialization of the student’s thought processes have been initiated. If engaged in at all, the laptop user puts off the vital process of encoding, hopefully to be reinitiated at some later time. On the other hand, students who handwrite their notes cannot do so with the same speed as typing. Therefore, it is imperative that such students listen carefully to and comprehend the discussion material in order to strategically write down the key emphases being relayed throughout the course of the class discussion.

Studies not involving laptops have demonstrated that students who take verbatim handwritten notes have a more superficial understanding of the materials than those who engage in thoughtful and discerning note taking. Not surprisingly, those students perform less successfully on evaluative exercises than those students who implement the encoding process into their note taking practices.

This is not to suggest, however, that enhanced encoding will occur just by handwriting notes. For example, if a student simply handwrites verbatim notes, the encoding process is likely to still be negatively impacted. In fact, in their study, Mueller and Oppenheimer noted that, regardless of whether students handwrote or used their laptops, those students whose notes contained less verbatim content performed better.

The point is that, regardless of the mode of note taking, students must still engage in the active process of translating what the professor says into meaningfully tailored notes. Accordingly, it is important to understand that laptop note taking, in and of itself, does not necessarily have a deleterious effect on learning; but rather, if laptop use encourages verbatim note taking, it has a strong likelihood of interfering with the encoding process.

19. Id.
21. Id.
22. Id.
23. Id.
24. Id. at 3.
Likewise, verbatim note taking is also not, *per se*, reflective of poor note taking practices. Certain phrases and words should be copied verbatim, particularly when so stressed by the professor. For example, in my Civil Procedure course, I stress to my students that such terms as *minimum contacts* and *purposeful availment*, as well as their definitions, should be written down verbatim.

The second benefit of classroom note taking is that it enables students to review what had been discussed in prior classes. This benefit is referred to as *external storage.* 25 While there are numerous reasons why students would want to review prior class materials, the most important one would be for the purpose of studying for exams. As noted in the Mueller/Oppenheimer study, the correlation between effective note taking and the benefits that pass to the students who later rely on those notes for exam study (external storage) are “robust and uncontroversial.” 26 Accordingly, actively engaging in the process of encoding while taking in-class notes not only provides an immediate educational benefit, but it also provides more specifically tailored notes, which will prove to be much more useful when the student later references them when he is preparing for exams.

While not expressly discussed in the Mueller/Oppenheimer study, note taking can serve a third purpose—providing the student with the opportunity to assess how well he has understood the materials discussed in class. This process is commonly referred to as *metacomprehension*, which is “a person’s ability to judge his or her own learning and/or comprehension of text materials.” 27 Note taking can serve that purpose because if, while taking and reviewing class notes, the student finds that she is unable to comprehend what she has written or typed, such a realization provides that student with the feedback necessary to dissect his understanding of the class discussion materials. 28

III. **THE MUELLER/OPPENHEIMER STUDY**

A. **Methodologies and Results of the Study**

When conducting their experiment, Mueller and Oppenheimer designed their testing methods to measure differences in the degree of encoding and external storage when students handwrote their notes as

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25. *Id.* at 1; see also *Di Vesta & Gray, supra* note 19, at 8; Kenneth A. Kiewra, *A Review of Note-Taking: The Encoding Storage-Paradigm and Beyond, 1 Educ. Psychol. Rev. 147, 148 (1989).


28. The effect of metacomprehension on note taking is discussed in greater detail in Part IV of this Article.
opposed to when they used their laptops to take notes. Specifically, their study was comprised of three separate studies.

The first study compared the effects of laptop note taking and handwritten note taking on students’ ability to encode class lecture materials.\(^29\) Given the high correlation between verbatim note taking and poor encoding, this study focused on the degree of verbatim note taking between the two note taking modes.\(^30\) The study found a significantly higher rate of verbatim note taking by laptop users, which ultimately and predictably had an adverse effect on their ability to encode the material in a meaningful way.\(^31\)

The second study attempted to decrease the amount of verbatim note taking by laptop users by specifically instructing them not to do so.\(^32\) This study found that such instructions had minimal effect on the laptop users’ verbatim note taking.\(^33\)

While the first two studies focused on encoding, the third focused on the effect which handwriting and laptop note taking had on external storage.\(^34\) This study found that those students who had handwrote their notes and then studied from them prior to taking the exam performed significantly better than those who had typed their notes using a laptop.\(^35\)

1. Study 1

a. Methodology

The first trial consisted of sixty-five Princeton University students.\(^36\) The student participants listened to a fifteen-minute lecture that had been projected onto a screen in the front of the room. The lecture covered topics that were considered to be “interesting but not common knowledge.”\(^37\) The rooms were outfitted with either laptops or notebooks, according to the condition students had been placed in.\(^38\) All laptops were disconnected from the Internet.\(^39\) Most of the students participated two at a time, though some participated in the study alone.\(^40\) Students were instructed to use

\(^{29}\) See Mueller & Oppenheimer, supra note 14, at 2.

\(^{30}\) See generally id.

\(^{31}\) Id. at 3.

\(^{32}\) Id. at 5.

\(^{33}\) Id.

\(^{34}\) See id. at 5–8.

\(^{35}\) See id. at 6.

\(^{36}\) Id. at 2.

\(^{37}\) Id.

\(^{38}\) Id.

\(^{39}\) Id.

\(^{40}\) Id.
their normal note taking practices throughout the study.41 Once the film lecture started, the experimenter left the room.

When the lecture was over, the students were taken to another room where they were given two different exercises designed to distract them from the previous lecture.42 After thirty minutes had elapsed from the end of the lecture, the students were given questions designed to test their factual recall and conceptual application of the information conveyed in the taped lecture.43

Two raters independently scored all of the student participants’ responses.44 The first rater was one of the study’s authors and the second was an independent rater who was unaware of the purpose of study’s purpose.45 Both raters were blind to whether students using laptops or handwritten notes completed the questions they were grading, as the longhand notes were transcribed into typed notes before the questions were scored.46 The two raters agreed on 89% of their initial grades and, through discussion, agreed on the grades of the remaining 11%.47

b. Results

The study revealed that there was little difference on factual recall questions between those students who handwrote and those who used laptops.48 On conceptual questions, however, the laptop users performed significantly worse than the longhand note takers.49 While the score of both sets of note takers was affected by which taped lecture the students had watched, the results within each lecture group were consistent with the overall performance levels.50 Thus, regardless of the lecture viewed, there was little variance between the two groups of note takers on factual content questions, but there was a significant difference between the two groups with respect to how well they answered the conceptual content questions.51

The authors then analyzed the content of the laptop and handwritten notes.52 Not surprisingly, students using laptops typed

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41. Id.
42. Id.
43. Id.
44. Id.
45. Id.
46. Id.
47. Id. at 2.
48. Id. at 3.
49. Id.
50. Id.
51. Id.
52. Id.
significantly more words than those who handwrote their notes.\textsuperscript{53} While more note taking is generally indicative of greater evaluative performance, that benefit, for the reasons discussed in Part I, is undercut when the student excessively relies on verbatim notes. Next, the authors analyzed the students’ notes to measure the level of verbatim note taking between the two groups.\textsuperscript{54} Here, they found that the notes of laptop users had, on average, a 14.6% verbatim overlap with the lecture as compared to an 8.8% overlap by those who chose to handwrite their notes.\textsuperscript{55}

As a result of this study, the researchers’ concluded that students who used laptops took more notes than those who handwrote their notes, and that they were much more likely to copy down their notes verbatim than those who wrote their notes.\textsuperscript{56} The study also showed that handwritten note takers performed significantly higher on the conceptual questions given thirty minutes after the end of the lecture than did laptop note takers.\textsuperscript{57} Accordingly, at least on conceptual questions, handwritten notes had a positive effect on the students’ encoding process.\textsuperscript{58}

2. \textit{Study 2}

c. \textit{Methodology}

Study 1 had determined that laptop note takers had a greater tendency to copy their notes verbatim from the lecturer than did longhand note takers, and that the former group performed less successfully on an evaluative test administered soon after the lecture had been completed. Consequently, based on earlier studies that concluded that verbatim note transcription tended to have an adverse effect on student learning and retaining materials,\textsuperscript{59} the researchers postulated that there was a correlation between the poorer performance by the laptop users and their greater reliance on verbatim note taking.\textsuperscript{60}

Based on this theory, the second study tested whether there would be a difference in the performance of laptop note takers if those students were explicitly instructed not to take verbatim notes.\textsuperscript{61} This experiment included 149 student participants from UCLA.\textsuperscript{62} The procedure differed slightly from the first study. Here, students were divided into three groups and were instructed to watch the lecture on individual monitors

\begin{itemize}
\item \textsuperscript{53} \textit{Id.}
\item \textsuperscript{54} \textit{Id. at 3.}
\item \textsuperscript{55} \textit{Id.}
\item \textsuperscript{56} \textit{Id.}
\item \textsuperscript{57} \textit{Id.}
\item \textsuperscript{58} \textit{Id. at 3–4.}
\item \textsuperscript{59} \textit{Id. at 2.}
\item \textsuperscript{60} \textit{Id. at 4.}
\item \textsuperscript{61} \textit{Id.}
\item \textsuperscript{62} \textit{Id.}
\end{itemize}
while wearing headphones. The first two groups were divided the same way they were in Study 1—students who handwrote their notes and those who used their laptops. A third group of students used their laptops with the following instruction:

We're doing a study about how information is conveyed in the classroom. We'd like you to take notes on a lecture, just like you would in class. People who take class notes on laptops when they expect to be tested on the material later tend to transcribe what they are hearing without thinking about it much. Please try not to do this as you take notes today. Take notes in your own words and don't just write down word-for-word what the speaker is saying.

After the three groups finished listening to the lecture, the researchers administered distractive exercises similar to the ones conducted in Study 1, and then the student participants were tested on questions from the lecture. Once again, all longhand notes were transcribed so the raters could not determine from the format of the notes which method of note taking the students had used.

d. Results

This study revealed that there was no significant difference in the level of verbatim note taking between laptop users given the no-verbatim instruction and those who were not. Consequently, the researchers concluded that the warning was completely ineffective at reducing verbatim content. They also noted that there was no significant difference between the two groups’ performance on factual and conceptual questions. Thus, the authors concluded that issuing such warnings had little, if any, effect on laptop-user performance.

Also, replicating the results from Study 1, the laptop note takers in both groups took significantly more verbatim notes than did the longhand note takers. And, once again, the longhand note takers performed significantly better on conceptual questions (though not on factual questions) than both groups of instructed and uninstructed laptop users, thereby confirming the overall correlation between the level of verbatim
note content and those students’ negative performance on conceptual questions.\textsuperscript{73}

3. Study 3

The first two studies focused on the effects of laptop and longhand note taking on the encoding process. The third study examined the effects of the two forms of note taking on the external storage process—that is, how useful were the notes for students to reference when used to prepare for exams administered a week after listening to the lecture and taking the notes.\textsuperscript{74} Having noted in the first two studies that laptop use tended to have an adverse effect on encoding, in this particular study, the researchers examined the possibility that because the laptop note takers were taking more notes, albeit with a higher verbatim content, perhaps the greater amount of notes taken would have a positive effect on performance levels when participants used those notes to study.\textsuperscript{75}

e. Methodology

The study included 109 UCLA students.\textsuperscript{76} A graduate student, acting as a professor, lectured on four subjects that the graduate student read from a teleprompter.\textsuperscript{77} Each lecture ran approximately seven minutes and purposely included seductive details—facts which, while interesting, were unimportant to the students’ understanding of the lectures.\textsuperscript{78} The students were informed that they would be tested on all four lectures the following week.\textsuperscript{79}

In addition to being broken down into laptop/longhand groups, each group was split into subgroups separated by those who were permitted to review their notes for ten minutes prior to the exam and those who were not allowed any time to study their notes prior to the exam.\textsuperscript{80} All four groups—laptop/study, laptop/no-study, longhand/study, and longhand/no study—were administered the same exam.\textsuperscript{81} The exam contained both factual and conceptual questions and was comprised of roughly ten questions from each of the four lectures the students had previously listened to.\textsuperscript{82} Once again, handwritten notes were transcribed into laptop

\textsuperscript{73} Id.
\textsuperscript{74} Id. at 5–6.
\textsuperscript{75} Id. at 6.
\textsuperscript{76} Id.
\textsuperscript{77} Id.
\textsuperscript{78} Id.
\textsuperscript{79} Id.
\textsuperscript{80} Id.
\textsuperscript{81} Id.
\textsuperscript{82} Id.
format so that the exam graders were blind to whether a student via longhand or typing took the exam.83

f. Results

The group of longhand/study students significantly outperformed all three other groups on both factual and conceptual questions.84 From these results the authors concluded that longhand notes were more useful than laptop notes since those who studied from their handwritten notes performed substantially better on both forms of questions than did those who studied from their laptop notes.85 The external storage benefit of the handwritten notes was further demonstrated by the fact that the longhand/study group also outperformed the longhand/no study group.86

Perhaps even more striking is comparing the performance levels of the laptop/study group with the longhand/no study group. Despite the advantage of being allowed to review and study before the exam, this group of laptop note takers actually performed significantly worse on the conceptual questions than did the longhand/note taker group with no opportunity to review their notes.87 Thus, the encoding benefits of handwriting notes would seem to outweigh the external storage benefits of studying from laptop notes.

Further reinforcing the apparent ineffectiveness of laptop note taking for external storage purposes was the finding that there was no significant difference between the combined performance of the laptop/no study group and their counterparts who were permitted to study from their notes on the factual and conceptual questions.88

B. Overall Conclusions of the Mueller/Oppenheimer Study

To summarize the conclusions to be drawn from the three studies conducted by Mueller and Oppenheimer:

1. All three studies demonstrate that using laptops for note taking results in a greater use of verbatim content than when students take taking longhand notes.89

2. Since verbatim note taking has been found in other studies to have a negative effect on encoding and external storage, one would expect, in light of the above finding, that laptop note taking would be less effective for encoding and external storage than handwritten notes.

83. Id.
84. Id.
86. Id. at 7, Figure 5.
87. Id.
88. Id. at 7.
89. Id. at 8.
Study 1 supports this theory since it found that longhand note takers significantly outperformed laptop note takers on conceptual questions asked thirty minutes after the corresponding class lecture.  

3. Study 2 demonstrates that the use of verbatim notes by laptop users does not decrease when they are given specific instructions not to do so; thus, their performance level on conceptual questions continued to fall below that achieved by longhand note takers.  

4. Study 3 demonstrates that those studying from handwritten notes taken a week prior to an exam outperformed those studying from laptop notes on both factual and conceptual questions.  

C. The Implications of the Mueller/Oppenheimer Study for Legal Education  

While the UCLA and Princeton student participants in the Mueller/Oppenheimer study were not law school students, the results should still be applicable to law students. This is especially true for first-year law students who typically have classes in lecture format, thereby replicating the instructional format of the three studies simulated by the study’s researchers.  

Moreover, the study’s finding that the difference between the performance levels of the two groups of note takers was most significant when the students were asked conceptual, as opposed to factual questions, clearly has direct implications for law students. Indeed, most of what we teach and test involves understanding and analyzing legal concepts; rather than rote memorization of facts.  

As a result, I submit that the question is not whether the results of this study are relevant to the pedagogy of legal education, but rather how we, as legal educators, should be using these results to adapt our teaching strategies in a way that enhances our students’ learning experiences. Educating our students on how to improve their note taking skills will serve them not only while they are attending law school but also when they are studying for the bar and when they are practicing law.  

The need for the legal academy to take these steps is only compounded by the recent decline in law school enrollments, which have

90. Id. at 4.  
91. Id. at 4–5.  
92. Id. at 8.  
93. Id.  
94. Indeed, the lack of empirical evidence existing prior to the Mueller/Oppenheimer Study to support the theory that laptop use encouraged poor note taking skills led at least two proponents of in-class laptop use to question the assumptions that laptop users tend to use more verbatim notes than do those who take longhand notes and that verbatim notes are a detriment to student learners. See Yamamoto, supra note 2, at 490; see also Murray, supra note 1, at 201.
forced almost every law school to dip deeper into the applicant pool in an attempt to maintain their enrollments. Over the past three years, entering class LSAT scores have dramatically declined. As a result, lower-tier law schools are enrolling students who are at a much greater risk of failing law school or, if able to graduate, failing the bar exam. Therefore, it is imperative that we identify those factors having an adverse effect on our students’ ability to understand course materials. Accordingly, if the way most of our students use their laptops to take class notes impedes their learning, then we need to recognize that fact and start implementing new classroom strategies.

IV. ASSESSING STRATEGIES TO ADDRESS THE DUAL ADVERSE EFFECTS OF IN-CLASS LAPTOP USE

As noted throughout this Article, the two major concerns of students using laptops in class are:

1. The distractive effects of the non-class-related use of laptops on both the student using the laptop and those students surrounding him; and

2. The adverse impact laptop note taking has on encoding and external storage.

Consequently, any assessment of the efficacy of various strategies to deal with these two concerns must consider the extent to which such proposals successfully address these issues. Using these criteria, I will examine two groups of strategies. I will first review those strategies that do not entail banning laptops in class, and then I will examine those strategies that would either prohibit in-class laptop use or limit the use of laptops to only specific class projects.

D. Strategies Which Do Not Ban Laptop Use

4. Do Nothing

This proposal would allow students to use their laptops for any purpose they choose, knowing that no institutional consequences would flow from unrelated class uses. Proponents of this strategy rely upon the argument that to impose a restriction or ban of laptop use is paternalistic and authoritarian and, thus, unfair to students. In his article, Professor Yamamoto, obviously not an adherent of this position, described this sentiment:

As adults, law students should be able to decide for themselves how they use their time during class. Students who choose not to listen and instead shop for shoes may find that choice reflected in their final grades. In this view the students are the consumers. If they pay for the education they can spend their time in class as they choose.96

The flaws with this strategy are self-evident: doing nothing would accomplish just that, nothing. Distractions from the unauthorized use of the laptop would continue. Additionally, those distractions not only affect the student surfing the Internet but also, as demonstrated earlier, adversely affect students nearby who are trying to pay attention but are distracted by the noise and visuals emanating from the laptop.97 These students are also consumers and are paying quite a lot of money for their education. As their teachers, we have the responsibility to ensure they have a classroom devoid of such unnecessary distractions.

Furthermore, without taking any action, the inefficient note taking practices identified by the Mueller/Oppenheimer study will only continue to hinder laptop note takers. Since they are likely unaware of the adverse effects of their note taking practices, students who choose to use their laptops to take notes are likely not making a conscious decision to impair their learning processes. Therefore, at the very least, we as their teachers should inform them of the possible, if not likely, adverse consequences of using a laptop computer to type their notes instead of handwriting them.

5. Shutting Off Internet Access in Class

Of course, shutting off Wi-Fi access in class would eliminate the problem of students using their laptops to access the Internet for non-class-related purposes. In fact, in 2008, the University of Chicago Law

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96. Yamamoto, supra note 2, at 482.
97. SANA ET AL., supra note 5, at 30; see also Yamamoto, supra note 2, at 487.
School shut off the Wi-Fi access in most of their classrooms, citing its
distRACTive effects as the University’s main reason for doing so. 98

However, the effectiveness of this strategy is questionable. Even
though students are unable to access the Internet via the school's Wi-Fi
connection, they can still do so by using their own Network provider. 99
And, given that most students today have Wi-Fi access through their
Smart Phones or other personal devices, the flaw of this strategy becomes
readily apparent.

Moreover, by simply prohibiting access to the Internet, students would
still be allowed to use their laptops for note taking. Thus, this strategy
does not address the adverse effects of laptop note taking that were
identified in the Mueller/Oppenheimer studies.

6. Creating Laptop-Free Zones in Class

Another strategy proposed entails allowing only students who
handwrite their notes to occupy the first few rows of a class. By
separating the laptop users from those who choose to handwrite their notes,
the distractive effects of the laptops would be contained to just the area of
the room where the laptops were being used. 100

To some extent, that is probably true. However, this strategy fails on
a number of levels. First, it neither prevents the student using the laptop
from being distracted by his own non-class activities nor does it limit the
distractions to that one student since that student can email or
communicate with other students in the class. Also, the noise and visuals
associated with playing games and other forms of Internet entertainment
could be a distraction to nearby laptop note takers who are trying to pay
attention to the class. The strategy also presumes that the classrooms are
large enough to allow a sufficient number of rows of seats to remain
unoccupied and provide an adequate buffer between the laptop and non-
laptop users. And, once again, this strategy does not address the learning
issues identified by the Mueller/Oppenheimer study.

7. Professors Monitoring Students Use of Laptops

This strategy calls for professors to monitor their students’ laptop use
to ensure that they are only being used for specific educational purposes.

98.  University of Chicago Law School Eliminates Internet Access in Some Classroom,
i nternet-access-some-classrooms.

(2009).

100. Id. at 989; see also Erping Zhu, Matthew Kaplan, R. Charles Dershimer & Inger
Bergom, Use of Laptops in the Classroom: Research and Best Practices, 30 center res.
This monitoring usually takes the form of the professor walking up and down the aisles, checking students’ screens while simultaneously leading the class discussion and lecture.101

However, I believe there are a number of drawbacks associated with this strategy. First, it puts the professor in the position of constantly policing student use of laptops. Such monitoring cannot help but distract the professor from devoting all of her concentration to actually teaching her students.

Second, I question just how effective this strategy is in decreasing the amount of non-class-related laptop use. Over the years, I have observed a good number of classes taught by professors who utilize this approach. What I have noticed is that students who are using their laptops for unrelated purposes quickly return to their note-taking screens when they see the professor approaching. A cat and mouse game ensues, which must have some adverse effect on the learning environment.

Furthermore, this approach is particularly impractical in large classes, since it requires monitoring the activities of roughly sixty to eighty students. Since most first-year courses are taught in large classes, one can argue that ensuring adequate student attention is most important in the first year considering that most of those courses provide the foundations for upper-level courses, as well as introduce students to the analytical skills they will need regardless of the area of law they pursue.

8. Using the Threat of Grade Demerits to Deter Students from Using Their Laptops for Non-Class-Related Purposes

At my law school, professors are permitted to award a half-grade raise (bump) in students’ final grades in recognition of their classroom participation. An approach I have noted by a few of my colleagues is to announce that if a student is found using a laptop for purposes unrelated to class, that student would be disqualified from receiving the bump. Obviously, this strategy is premised on the belief that such a warning will deter students from using their laptops for such purposes.

Once again, I question the efficacy and wisdom of this approach. First, it will have no effect on those students who do not participate in class. Since they know they will not be eligible for the half-grade raise, they risk absolutely nothing by surfing the Internet.

Second, the only students whose laptop use might be affected by this sanction are those who do regularly participate, and thus may be deterred from their unauthorized use for fear of losing the possible grade bump. However, if such a student is not deterred and is caught using her laptop for unauthorized purposes, does it make sense to punish her in a way that will likely reduce her inclination to continue her valued class

participation? By doing so, not only is the offending student punished but so too is the rest of the class who, through that student’s input, have benefited from her class participation. Accordingly, I would suggest that, if this strategy is employed, some other form of disciplinary action should be imposed—one that would not stifle a student’s desire to participate in classroom discussion.102

Third, adopting this policy is likely to subject the professor to greater demands by her students to monitor the class for impermissible laptop use. Once one student is punished, it will behoove the professor to ensure that all other offenders are also caught and punished accordingly. One has to question whether we want our professors to devote significant time and attention to policing how their students use their laptops during class rather than devoting their entire attention to educating their students.

9. Instructing Students on Effective Classroom Note Taking

Of all the strategies discussed in this part, this is the only one which would attempt to deal with the encoding and external storage deficiencies associated with laptop note taking that were raised in the Mueller/Oppenheimer study. Such instruction, if it could reduce the level of verbatim content in the notes and teach students how to discern what information discussed in class was important to write down, would likely enhance the usefulness of note taking for both encoding and external storage purposes.103 Moreover, the lessons from this form of instruction would not only improve the quality of laptop note taking but would also help those students who choose to handwrite their notes.

This instruction would have to be comprehensive. As noted in Mueller and Oppenheimer’s Study 2, merely telling students to avoid verbatim note taking has no effect on the level of such content.104 Thus, to be successful, a program such as this would have to consist of a number of classes where students would have their notes reviewed by instructors

102. This strategy could be changed so that the grade demerit would not be placed on the extra credit for participation but onto any student’s final grade if they are found to be using the computer for non-class-related purposes. In this way, all students, not just those who participate, would be deterred from using their laptops for unauthorized purposes. Furthermore, even if a student who may be deserving of the bump is discovered violating the policy, she would still be eligible for the grade increase. Indeed, the student may even be more motivated to continue her class participation since she has already seen her final grade reduced by a half grade. However, this approach still forces the professor to spend his time policing his classroom to ensure that all violators are identified and similarly penalized for their transgressions.


104. Mueller & Oppenheimer, supra note 14, at 5.
who would provide the students with individualized feedback. Questions such as when the instruction would take place (though it would seem that it should be as early as possible in the first year, either at orientation or during the first few weeks of classes) and who would teach these classes would have to be dealt with. Nevertheless, such an expenditure of time and perhaps funds would be justified if student performance levels improved.

However, while this strategy, unlike all of the others discussed, deals with the encoding and external storage drawbacks of students using laptops to take notes, it does not address the other concern—the distracting effects of laptops. Even if students are taught how to take better notes, if laptop note takers continue to use their laptops for other purposes in class, they, along with their classmates, will likely suffer from the distracting effects of such uses.

E. Proposal to Ban Laptops in Class

This strategy prohibits all use of laptops in class, except for those students who require laptops as an accommodation under the American with Disabilities Act. 105 It is simple in its application and enforcement. Any student observed using her laptop will be instructed to put it away. As noted in the introduction to this Article, 106 I adopted this policy in 2006 and continue to use it in all of my classes. I primarily teach two first year courses: Torts and Civil Procedure.

One of the advantages of this policy is that it directly addresses both of the concerns raised by laptop use. First, by banning their use, all in-class distractions associated with laptops have been eliminated. Second, by forcing students who would otherwise type their notes on laptops to handwrite their notes, the level of their verbatim note taking will decrease, thereby increasing the encoding and external storage benefits associated with effective note taking.

The major objection to this strategy is that it is unfair to those students who wish to use their laptops only for purposes of taking notes. 107 In fact, at the time I adopted this policy, one of my colleagues warned me that if I set such a policy I would face a student revolt similar to the one discussed against Professor Entman at the University of Memphis Law School.

My response to this objection is the same one I had back in 2006. My obligation as a teacher is to draw upon my expertise, experience, and judgment to create a learning environment that maximizes the learning potential of my students. As such, while I am always attentive to my students’ comments and concerns, ultimately I rely on my own judgment.

106. See Yamamoto, supra note 2, at 483–84.
107. See supra note 1; see also supra note 47 with accompanying text.
when deciding how and what to teach. Thus, after a decade of allowing laptop use in my classes, I became concerned that such a policy could be adversely affecting my students’ education. Consequently, I decided to experiment with the no-laptop policy.

As noted in this Article’s introduction, I immediately noted a positive change in class participation and student exam performance. And, for six years, I never had a complaint from a student regarding the policy. In 2012, however, a few students in my day section of Civil Procedure expressed their opposition to the ban. They also mentioned that several other students shared their opinion. While I still believed the policy was both justified and necessary, I was concerned that many of the students considered the ban to be adversely affecting their learning.

Consequently, I decided to survey the class to ascertain students’ reactions to the policy. I distributed a poll (set out below), which contained two questions. It was administered at the end of the course and was prefaced by my statement that, in light of the negative comments I had heard, I was conducting the survey to ascertain whether I should continue the laptop ban in future classes. I also stated that I would give very serious consideration to student responses when deciding whether to keep the policy. The student responses were anonymous.

My survey contained the following two questions:

**Question 1 - At the beginning of the course, when informed of the no laptop policy I:**
A. Opposed it
B. Favored it
C. Did not care

**Question 2 - At the end of the course, I:**
A. Opposed it
B. Favored it
C. Did not care

The results were:

**2012 Day Section of Civil Procedure: 76 students responding**

<table>
<thead>
<tr>
<th>Question 1 - Beginning of the course</th>
<th>Question 2 - End of the course</th>
</tr>
</thead>
<tbody>
<tr>
<td>Opposed - 28 students (37%)</td>
<td>Opposed - 13 students (18%)</td>
</tr>
<tr>
<td>Favor - 11 students (14%)</td>
<td>Favor - 32 students (47%)</td>
</tr>
<tr>
<td>Did not care - 37 students (49%)</td>
<td>Do not care - 29 students (35%)</td>
</tr>
</tbody>
</table>

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108. 76 students responded to this survey. However, two student responses were not recorded for Question 2 because they answered both that they Did Not Care and were in Favor of the policy.
When I recorded the results of the survey, I was rather astonished at the extent of positive student reaction to the laptop ban. By the end of the course, 82% of the class either favored the policy or had no opinion either way. I was also impressed by how many students had switched their opinion from opposing the ban at the beginning of the course (37%) to only 18% at the end of the course.

I was curious whether the results from this class were representative of the opinions of the students in my other first-year classes. Accordingly, I decided to administer the same survey to them as well. Here are their results:

**2012 Day Section of Tort: 61 Students Responding**  
**Question 1 - Beginning of the course:**  
- Opposed - 27 students (44%)  
- Favor - 8 students (12%)  
- Did not care - 26 students (44%)  

**Question 2 - End of the course:**  
- Opposed - 14 students (24%)  
- Favor - 29 students (49%)  
- Do not care - 16 students (27%)  

**2012 Evening Section of Torts: 56 Students Responding**  
**Question 1 - Beginning of the course:**  
- Opposed - 21 students (37%)  
- Favor - 11 students (20%)  
- Did not care - 24 students (42%)  

**Question 2 - End of the course:**  
- Opposed - 12 students (21%)  
- Favor - 21 students (37%)  
- Do not care - 23 students (42%)  

This year, in anticipation of writing this Article, I decided to conduct another survey to determine whether there had been any significant change from the three surveys conducted in 2012. The results were:

**2013 Day Section of Civil Procedure: 72 Students Responding**  
**Question 1 - Beginning of the course:**  
- Opposed - 25 students (35%)  
- Favor - 11 students (15%)  
- Did not care - 36 students (50%)  

**Question 2 - End of the course:**  
- Opposed - 15 students (20%)  
- Favor - 41 students (57%)  
- Do not care - 16 students (23%)  

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109. Sixty-one students responded to this survey. However, two responses for Question 2 were not recorded. One student responded both “Opposed” and “Did Not Care;” the other responded that he favored the policy, as well as that he did not care (“Do Not Care”) either way.
g. **Analysis of Survey Results**

Thus, in total, I surveyed four different first-year classes: two Civil Procedure and two Torts classes. Analyzing these results reveals the following:

1. Opposition to the policy in the four classes at the beginning of the course ranged from between 34-44%, but by the end of the course student opposition had subsided almost 50%, to between 18-24%.

2. Conversely, while only between 12-20% of the students favored the policy at the beginning of the course, by the end of the course, the approval rate had at least doubled (from 11% to 21% in the 2012 Evening Torts class) and, in one class, increased almost four fold (from 15% to 57% in the 2013 Civil Procedure class).

3. The increase in the approval of the laptop ban came not only from students who opposed the policy at the beginning of the course but also from those students who initially indicated that they did not care whether the policy was implemented or not. In all but one of the classes (the 2012 Evening Section of Torts where there was no change in the percentage of students who did not care from the beginning to the end of the course), from the beginning to the end of the course, there was a substantial decrease in the percentage of students who indicated they did not care either way (from 49% to 35% in the 2012 Day section of Civil Procedure; 44% to 27% in the 2012 Day Section of Torts; and 50% to 23% in the 2013 Day Section of Civil Procedure).

h. **Survey Conclusions**

Simply stated, I believe these surveys indicate that, at least in my classes, when students are forced to forego the use of laptops, even though there is initially strong opposition to the ban, the sentiment is dramatically reduced by the end of the course. Not only do these surveys reveal that many students will change their mind about being forced to handwrite their notes but also that, if given the choice, most students at the beginning of the course would not decide on their own to give up typing their notes. I draw this conclusion based on the significant opposition which initially existed against the policy.

This reluctance to change should not come as a surprise. Most of our students today have been encouraged to use laptops throughout their entire education. To ask them to try a different method of note taking from what they have been used to, especially when they are starting a new course of study (in our case, law school), would naturally cause a good deal of anxiety among some students. Thus, my response to those who

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110. The student responses to all four surveys are on file with the author.
111. See Murray, supra note 1, at 196.
would argue that students are in the best position to know whether handwriting or typing notes works best for them is that they are simply, wrong. As evidenced, at least by my student surveys (where a substantial number of students who initially opposed the ban changed their opinions by the end of the course), until and unless students are required at least to try handwriting their notes, they are not in the position to make an informed decision regarding which form of note taking will help them learn better.

F. Limiting the Use of Laptops to Specific Classroom Exercises

In light of the significant adverse effects associated with student laptop use in class, one might ask whether there are any beneficial reasons to permit our students to use them. If indeed there are no reasons to permit their use, it would seem that a mandated school-wide ban would be warranted.

For a number of reasons, I would strongly oppose any such suggestion. First, while I believe the Mueller/Oppenheimer Study has raised some serious questions regarding the harmful effects of laptop note taking (and does confirm my own observations), it is the only study to-date that has examined the precise issue of comparing the value of longhand to laptop note taking.\textsuperscript{112} Therefore, relying purely on this study to justify a school-wide ban is premature.

Moreover, such a ban would, in my opinion, constitute an impermissible intrusion upon educators’ academic freedoms. Absent extraordinary circumstances, I believe it ultimately must be left up to the individual professor’s discretion whether her students’ education can be enhanced in any way by incorporating in-class laptop use.

Finally, and most importantly, just because laptops are distracting when used for purposes unrelated to class and can have a deleterious effect on most students’ comprehension levels when used for note taking, does not necessarily lead to the conclusion that in-class access to laptops and to the Internet can never serve a useful educational function. If such access can actually enhance students’ learning experience without giving rise to the negative consequences discussed throughout this Article, then, under those very limited circumstances, student laptop use is warranted and should be encouraged.

I believe such uses do exist. For example, in an article from the University of Michigan’s Center for Research on Learning and Teaching (CRLT), the authors recommend that laptops be used for students to engage in experiential learning, such as problem-solving sessions involving materials discussed earlier in class.\textsuperscript{113}

\textsuperscript{112} See Mueller & Oppenheimer, supra note 14, at 8.

\textsuperscript{113} ZHU ET AL., supra note 50, at 5.
Based on this suggestion, one class project could entail the professor splitting the class into small groups and distributing the same problem based upon materials the students previously discussed in class. Each group would discuss the problem and then type its answer onto their laptops. They could then send their answers to the other groups. From there, the professor could lead a discussion evaluating each of the group’s answers.

Under this methodology, laptops would likely enhance classroom learning in a way that could not be accomplished as effectively without their use. At the same time, the professor could impose certain restraints to prevent the students from using their laptops for note taking and any other non-class-related purposes.

For example, in order to curtail Internet surfing, the CLRT report recommends that such exercises be devoted to assignments of sufficient difficulty, requiring both peer and instructor input. In that manner, students would not have the time to use their laptops for purposes other than for the assigned project.

I would add another requirement. The professor should expressly limit student use of laptops to solely those classroom exercises for which their use is justified. Thus, when the specific classroom exercise was completed, the professor would instruct her students to put the laptops away. With the purpose of the laptops having been served, there would no longer exist a reason for allowing students continued access to them.

Using the laptop in this manner recognizes it for what it is—a tool which serves specific purposes, some of which lend themselves to classroom application. However, once the educational purpose for the tool has been accomplished, the need for its continued use dissipates.

Therefore, I suggest that, when deciding whether to allow students access to their laptops in class, professors need to ask themselves the following questions:

1. Does it serve an educational purpose to allow my students unfettered, in-class laptop access in light of the reality that many of them will likely hinder their comprehension of course materials by using their laptops for unrelated class purposes for at least some period of the class?

2. If the reason for permitting students to have limited laptop access is to further a specific educational purpose, can that goal be attained just as well, if not better, by using other pedagogical tools, such as the professor writing notes on the whiteboard or distributing hard copy handouts?

In answering the first question, I would argue that for most professors, especially those teaching large first-year classes, the answer will

114. Id.
be no. As for the second question, here is an example. Returning to the problem-solving assignment discussed above, the necessity for laptops depends upon how the professor intends to use students’ answers. If the professor will call on students to discuss their groups’ answers, then I would suggest that student laptop use is unnecessary. The problems can be distributed in hard copy during the class. The students can handwrite their answers, and then the professor can then call on individual volunteers to discuss their answers. Then the professor can write those points on the white board for the students to discuss. Consequently, there is no reason for laptops to be available for this type of exercise.

If, on the other hand, the professor wishes to have the groups’ written answer projected onto a large screen in the front of the classroom so that the entire class can analyze and comment on it, allowing the class to type their answers onto their laptops is necessary. Similarly, if the professor wants the students to access outside sources to answer the problem, laptops would be necessary. The point here is simple—if the laptop is needed for the specific lesson, then let the students use it. If not, then do not.

Also, I recognize another benefit which laptops may offer my students, though this benefit does not necessarily justify their in-class use. In my first-year courses, I strongly suggest that students who want to keep their notes on their laptops take the time as soon as possible after the class ends to review, organize and revise their handwritten notes before typing them onto their laptops.

In addition to allowing the students to organize and store their class notes on their laptops, this practice serves the purpose of providing a second opportunity for students to engage in the process of encoding. By reviewing their longhand notes before typing them, the student once again has translated what the professor said into words, charts, and diagrams that are individually tailored to their cognitive learning patterns. Returning once again to the problem-solving example discussed above, if the students handwrite their answers to the problem in class, this after-class review provides them with the opportunity to review their handwritten answers in light of the class discussion before typing a revised answer onto their laptops.

115. In my opinion, the most serious drawback to hardcopy paper handouts is an environmental one—the number of trees that are sacrificed for the sake of the lesson. I often ask myself before deciding to make 100 copies of a handout whether the handout is worth that sacrifice.

116. After class, the professor can post the problem online so that students can access the problem on their laptops in the event that they wish to refer back to it at a later time.

117. This exercise might be especially useful in a legal writing course where not only is the content of the answer important but also the quality of the writing itself.

118. This idea was brought to my attention by my colleague, Professor Herb Ramy, the Director of our school’s Academic Support Program. See Herbert N. Ramy, Succeeding in Law School 80 (Carolina Academic Press, 2d ed. 2010).
By doing so, reviewing and then typing their notes also serves to improve the students’ abilities to judge their own comprehension of the class materials, thereby enhancing their metacomprehension awareness. If the student experiences difficulty translating her class notes into a language which more closely matches her cognitive learning processes, then this process should alert her that she likely does not fully understand the materials. With such an awareness, the student hopefully will take further steps to improve her understanding. Such steps might include consulting other sources, speaking with her classmates, and seeking clarification from the professor. While there is no assurance that the student will seek any further assistance, it is certain that without that awareness, the student will not likely seek further assistance since she will not know that she does not understand the material.

Finally, having gone through the encoding and metacomprehension processes, the student produces a revised set of notes which will likely prove to be more comprehensive and comprehensible to her, and more helpful when she later studies for exams. Thus, this process enhances the external storage value of the notes.

V. RECOMMENDATIONS

In light of the points raised in this Article, how should we, as educators, view the use of laptops in class? To answer that question, I suggest that we must first recognize and accept the following premises:

1. That many, if not most, students are using their laptops during class to access the Internet for purposes unrelated to class discussions and that the negative consequences of such uses should compel us to try to curtail such practices.

2. That the measures which have attempted to limit these practices, such as teacher monitoring and grade demerits, either do not work or have adverse educational consequences.

3. That aside from the distracting effects of using laptops for non-class-related related purposes, according to the Mueller/Oppenheimer study, there is a substantial risk that many students who type their notes on laptops may very well be hindering their ability to adequately comprehend and retain course materials, thus adversely affecting their performance on subsequent tests and other forms of assessments.

4. That the use of laptops in class for specific exercises may serve a useful purpose, but that such use must be restricted to only those specific classroom exercises.

119. See Dunlosky et al., supra note 27.

120. See supra note 24 and accompanying text.
If we accept these premises, then we need to start questioning the rationale for continuing to permit our students to use laptops during class sessions. To further such self-examination, I recommend that law school deans and faculty encourage their colleagues to experiment with teaching a course that either bans laptops completely or strictly limits their use to very specific educational purposes. Such official encouragement could be especially helpful for junior faculty, providing them with the assurance that experimenting with banning or limiting laptop use would not adversely affect their chances for tenure. My experience is that most new faculty members assume that they are expected to permit unlimited student access to laptops with, perhaps, the proviso that they should try to ensure that their students are only using the laptops for class-related purposes. Communicating to new faculty that such is not the case, and that banning or restricting laptop use is also an acceptable (if not preferable) practice, would disabuse them of that false assumption. It might also improve their teaching and their students’ learning processes.

Furthermore, I would not limit this encouragement to junior faculty, but would expand it to all professors, whether tenured or not, and especially to those who have never taught a class without allowing their students to have unlimited laptop use.\(^{121}\) This latter category of faculty members would probably include a large percentage of the current faculty of most schools since in-class laptop use by law school students has been an acknowledged practice since the mid-1990s.\(^{122}\)

Thus, it is highly unlikely that any professor who has started teaching within the past twenty years has ever taught a class without the students having unfettered laptop access, unless the professor has expressly banned or limited the use of laptops in their classes. The implication of this is that these professors are not in a position to assess the differences in student performance levels based on whether their students were permitted to use their laptops or not.

Not only are those professors incapable of comparing exam performance levels (external storage) between classes with and without laptop access, they also cannot judge the encoding (learning in class) differences between the two types of note takers. Through questions and

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121. I feel compelled at this point to concede that I am skeptical about how many professors, having taught for decades allowing their students complete access to laptops, will be interested in experimenting with a new approach. In this vein, I am reminded of a comment an old friend (a law professor and former associate dean) once told me. He asked me why you cannot teach an old dog new tricks. His response was “because the old dog doesn't want to learn them.” I am not sure whether he based this remark upon his experience as an associate dean, but, in any event, I fear the lesson drawn from his comment would apply to many of the professors who fall into this group. Having taught for so many years allowing students unlimited laptop access, many might feel it is just not worth the hassle to change their policy.

122. See Murray, supra note 1 and accompanying text.
responses, professors often can gauge how well their students understand the materials discussed in class. Teaching a class without laptops, or permitting their use only for very specific class exercises, would allow these professors to compare the level of student in-class comprehension with the level they experienced in classes where they taught the same materials to students who had unfettered access to their laptops.

Also, professors without pre-laptop teaching experiences cannot compare what I would characterize as the change in classroom atmospherics which includes but may not be limited to: the level of student eye contact with the professor, how much attention the student pays to comments by their classmates, even to what degree students are engaged and appreciate the humor which from time to time arises in class. As I have noted earlier, I recognized those differences when I instituted my policy. It allowed me to regain my joy of teaching. In effect, it helped humanize my class by enhancing the interpersonal relationships between my students and me and amongst the students themselves.

Of course, this is not to say that every professor will share, or perhaps even value, such experiences. But, without ever instituting some form of a no-laptop policy, it is certain that they will never have the opportunity to judge for themselves how that change can enhance the educational quality they are providing their students, as well as how such a policy can enhance their own enjoyment of teaching.

My last recommendation applies regardless of whether professors set a laptop ban or impose strict limitations on their use. Given the strong correlation between notes which contain high verbatim content and the adverse effect such notes have on encoding and external storage, I recommend that some form of instruction be provided on how students should take notes. This instruction would benefit both students who

123. The use of "clickers" is another way a professor can assess whether her students understand what is being taught in class. After discussing a particular issue in class, the professor poses a multiple-choice question on those materials, usually by projecting the question on the screen in the front of the room. Students are provided with a clicker, a small remote device, which allows them to press a letter on the unit that corresponds to which of the multiple-choice answers the students believe is correct. The classroom responses are recorded, indicating how many students chose each question. From this data, the professor can determine how many students in the class correctly answered the question and, thus presumably, understood the materials. Additionally, by viewing the number of students who clicked each of the incorrect answers, the professor can discern where specific areas of confusion may lie. Clickers may well prove to be an effective way to gauge, during the class, the level of student comprehension of specific materials. However, while their use requires that the professor have computer access, it does not require such access by the students. See NBC NEWS, Interactive Clickers Changing Classrooms, NBC NEWS (May 17, 2005, 1:07 AM), http://www.nbcnews.com/id/7844477/ns/us_news-education.

124. See supra note 56 and accompanying text.
handwrite and those who choose to type their notes because, while the Mueller/Oppenheimer study found verbatim note taking to be more significant among laptop note takers, even those students who handwrote their notes tended to use verbatim quotes.\textsuperscript{125}

This form of instruction should be offered at the beginning of the students’ law school experience, either during the orientation period or during the first few weeks of classes. It could be taught in class by faculty or perhaps through on-line instruction. Whatever the modality, however, the instruction would have to include faculty actually taking time to review the students’ notes and providing each of them with individualized feedback. While this would entail a commitment of faculty and other resources, if taken seriously, such instruction would likely improve student academic performance.

**CONCLUSION**

Over the past two decades, I have observed how first-year law students in doctrinal courses use and often misuse laptops in class. I have also noted the extent to which many professors seek to justify the use of laptops and minimize their distracting effects while experimenting with different methods to curtail their non-class related uses. With the Mueller/Oppenheimer Study, we now have at least one recognized study that raises another serious drawback to student in-class laptop use. Indeed, even when students use their laptops only for note taking purposes, they often are at a disadvantage compared to those students who handwrite their notes.

At some point, the continued rationalizations for allowing, if not encouraging, laptop use starts to look very much like the tail wagging the dog. Proponents assert that we have this technology and it is essential that it be used to enhance learning. However, the negative effects of in-class laptop use are, by now, well documented. We know that many students use their laptops for purposes unrelated to class discussions. We now also have a strong reason to suspect it causes even the diligent laptop note taker to perform less successfully than his handwriting counterparts. It is time to start seriously questioning under what circumstances it is an educationally sound practice to allow students to use their laptops in class.

In legal terms, in light of these findings, the burden of proof should now shift to those who favor in-class laptop use to demonstrate just how laptops enhance students’ learning processes. As I have discussed in this Article, I believe that in some cases laptops do serve a legitimate educational purpose. But, where their use is not proven to be beneficial, I believe we need to discourage, if not ultimately ban, student access to laptops during our classes.

\textsuperscript{125} See Mueller & Oppenheimer, supra note 14, at 3.