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# Reflections on Teaching Evidence with an Audience Response System

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# Reflections on Teaching Evidence with an Audience Response System

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I am flattered to have been invited to contribute to this festschrift in honor of Margaret Berger. I have great respect for her contributions to scholarship in evidence and civil procedure. Her work has often helped me with my own. She has written about law and science at the highest level, while finding time to serve as a consultant and reporter on highly significant projects that affect the law in action.[1] She is also the co-author of a leading treatise on evidence and a leading casebook. Among her works is an article on forensic evidence, which I teach in my basic Evidence course using the response system that I will describe in this article.[2]

I started using an audience response system in my spring 2009 Evidence course. I project a question on a screen, and students signal their answers using "clickers."[3] When enough students have answered a question, their answers are automatically displayed with an accompanying graph. The screen display shows aggregate answers without revealing which student gave which answer. For an example, see Figure 1.

[1] Among her other activities, Professor Berger has served as Reporter to the Advisory Committee on the Federal Rules of Evidence, as a consultant to the Carnegie Commission on Science, Technology and Government, and as a reporter for a working group of the National Commission on the Future of DNA Evidence.

[2] The article is Margaret A. Berger, *Laboratory Error Seen Through the Lens of Science and Policy*, 30 U.C. DAVIS L. REV. 1081 (1997), *as reprinted in* JON R. WALTZ, ROGER C. PARK & RICHARD D. FRIEDMAN, EVIDENCE: CASES AND MATERIALS 917-27 (11th ed. 2009).

[3] The "clickers" were handheld radio transmitters that sent a signal to a radio receiver that was plugged into the USB drive of my computer. The "clicker" hardware may become obsolete as web-based systems that receive signals from students laptops and cell phones become available. *See infra* notes 20-21 and accompanying text.
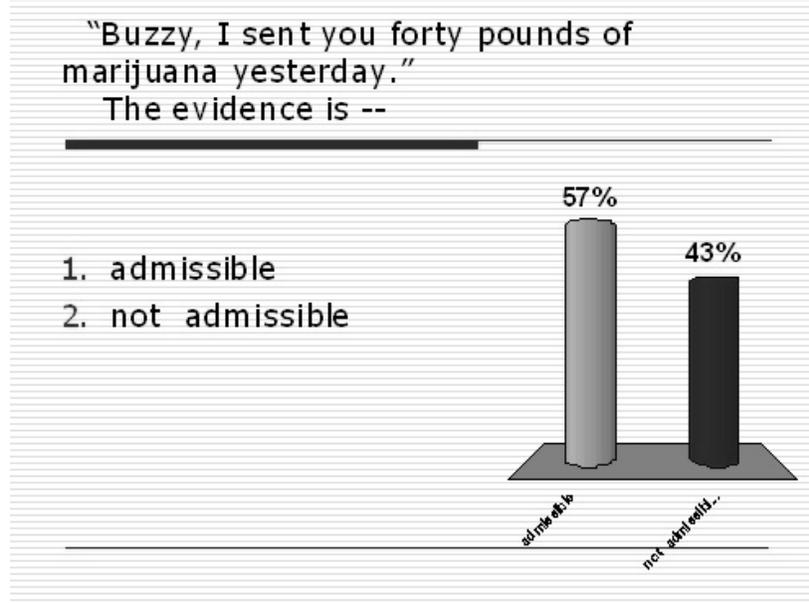
FIGURE 1

After projecting the answers to the initial question, I follow up in class by asking other questions, either using screen projection or asking the follow-up questions orally, and calling on individual students to respond.[4] Sometimes I ask students to discuss answers with their neighbors and re-answer a question.

The PowerPoint platform was the foundation for the application that I used to poll audience responses.[5] PowerPoint teaching was a new experience to me. In earlier years, I avoided it because I thought it would tie me down too much. Also, Edward Tufte's essay on the *Cognitive Style of*

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[4] After the question presented in Figure 1, I projected the following question and asked students to signal their answers:

The statement is not hearsay if it is offered to prove—

1. She sent the marijuana

2. The package contained marijuana

3. Buzzy believed the package contained marijuana

4. More than one of the above

When the answers to my initial questions are debatable, I usually call on a student to defend one of the answers instead of projecting follow-up questions.

[5] The add-on application was TurningPoint. *See* description, *infra* note 14 and accompanying text.

*PowerPoint*[6] made me worry that there might be something inherently corrupting about the way the system encouraged presenters to organize their thoughts, and that a system developed for pitching "power points" in the business world might not be right for academia.[7] The addition of an audience response system to PowerPoint turned the tide for me. I have always believed in active learning; it worked for me as a law student, and early-career research on teaching and learning reinforced my belief in it.[8] Another reason I tried the system was that laptops had become ubiquitous, causing some students to be virtually not present during class. I was reluctant to ban laptops, but I welcomed anything that would compete with them.[9] Finally, the system provided extra feedback to students.[10] I was not disappointed. So far as I could tell, students paid close attention to the questions and worked actively on solving them. The use of laptops for passive note-taking (or worse) seemed to decrease. During the answer pauses, students looked at the projector screen instead of their laptop screens. When I asked them to talk to each other about the question, they did so vigorously.

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[6]  EDWARD R. TUFTE, THE COGNITIVE STYLE OF POWERPOINT: PITCHING OUT CORRUPTS WITHIN (2d ed. 2006). Tufte's essay verges on blaming the space shuttle Columbia disaster on the use of PowerPoint slides by NASA engineers. For a short version, see Edward R. Tufte, *PowerPoint is Evil*, WIRED, Sept. 2003, *available at* http://www.wired.com/wired/archive/11.09/ppt2.html. *Cf.* Douglas L. Leslie, *How Not to Teach Contracts, and Any Other Course: PowerPoint, Laptops, and the CaseFile Method*, 44 ST. LOUIS U. L.J. 1289 (2000) (asserting that PowerPoint promotes passivity).

[7]  In Tufte's words,

   The standard PowerPoint presentation elevates format over content, betraying an attitude of commercialism that turns everything into a sales pitch. . . . PowerPoint's pushing style seeks to set up a speaker's dominance over the audience. The speaker, after all, is making power points with bullets to followers. Could any metaphor be worse? Voicemail menu systems? Billboards? Television? Stalin?

Tufte, *PowerPoint is Evil*, *supra* note 6.

[8]  I did research on teaching and learning while preparing an article with a learning psychologist about using computer lessons for self-study. *See* Roger Park & Russell Burris, *Computer-Aided Instruction in Law: Theories, Techniques, and Trepidations*, 3 AM. BAR FOUND. RES. J. 1 (1978); *see also* RUSSELL BURRIS ET AL., TEACHING LAW WITH COMPUTERS: A COLLECTION OF ESSAYS (Westview Press 1979). For citations to the active learning literature in the particular context of using an audience response system in law school, see Paul L. Caron & Rafael Gely, *Taking Back the Law School Classroom: Using Technology to Foster Active Student Learning*, 54 J. LEGAL EDUC. 551 (2004).

[9]  For further discussion, see Caron & Gely, *supra* note 8, at 554-58.

[10]  *Id.* at 564-65.

The students also liked the audience response system. In an anonymous poll administered in my class, 97% of the respondents agreed with the proposition that "[c]lickers have been beneficial to my learning."[11]

**Attitude survey – April 6, 2009**
Park's Evidence class
58 respondents
Response rate 85%

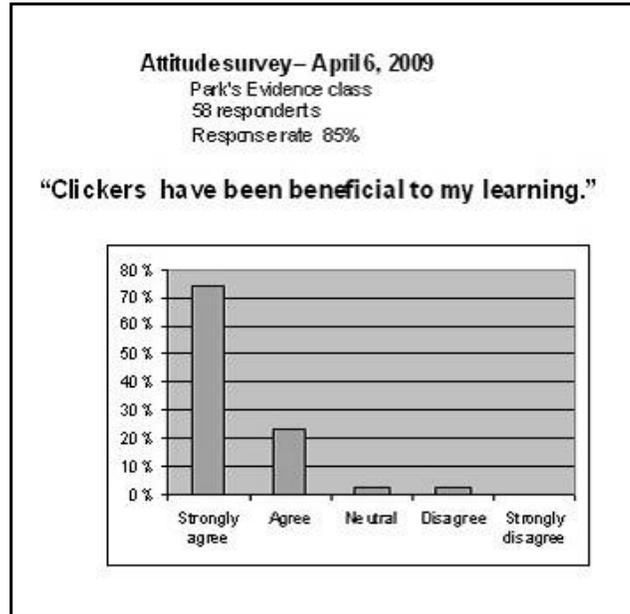**"Clickers have been beneficial to my learning."**

FIGURE 2

The audience response system changed the timing of class interaction. When I asked a question, I paused for students to respond. As students answered the question, the screen display revealed how many had answered, though it did not reveal the breakdown of answers into categories until getting a further signal from me. I usually waited until 50 or 60 students answered the question. (Waiting for 60 answers meant about a 90% response from students armed with

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[11] *See* Figure 2. The answers were anonymous, but of course they might have been influenced by the fact that I administered the survey. Sixty-eight students were in the class the day I did the survey and I got 58 responses. Four of them couldn't respond because they didn't bring their "clickers," and six of them had "clickers" but didn't answer in time. After submitting this essay, I used the "clicker" system again the following semester and asked the same question to my evidence class on November 4, 2009. Seventy-six students attended that class. Seventy-two brought their "clickers." Sixty-eight responded to the assertion "[c]lickers have been beneficial to my learning." The answers were as follows: 66% strongly agreed, 31% agreed, 3% were neutral and 0% disagreed or strongly disagreed.

"clickers.")[12] My teaching assistant timed the length of the answer pauses in five of my early classes. The results are in Figure 3. In those classes, I asked 56 questions using the system, or just over 11 questions per teaching hour. The average pause-for-response time was about one minute per question. The curve was skewed right; sometimes I gave the students two or three minutes to answer. These long pauses occurred when I asked students to discuss answers with their neighbors.

**Answer pauses**

(This chart shows answer response times in five 60-minute classes in which a total of 56 ARS questions were asked)

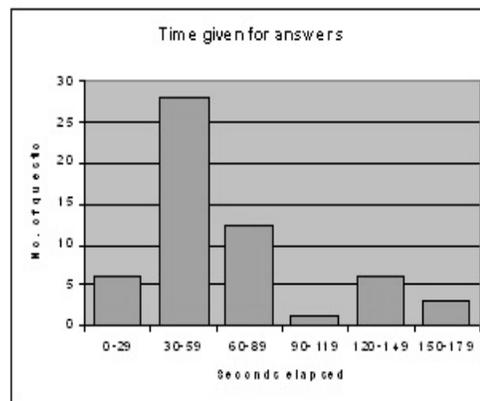| Median | 55 seconds |
| Mean | 65 seconds |
| Range | 15-165 seconds |

Time given for answers

FIGURE 3

I relished the extra thinking time the answer pauses gave me. During the pauses, I had time to arrange my notes or look at the seating chart. I could think about whether to use volunteers to provide explanations for the answer, and decide who should be called upon for follow-up questions. I could look at the students to try to figure out what they were doing. I could walk up to them to eavesdrop on their discussions, or ask whether they were prepared to answer oral questions after the pause was over.

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[12] Occasionally I polled the students about whether they had brought their "clickers" to class. I also asked my teaching assistant to count the number of students in the class. Typically there were four or five more bodies than "clickers."

Admittedly, the answer pauses have the potential disadvantage of lengthening the class and cutting down on coverage. However, some of the time loss is recouped because, when students are asked to explain their answers, they are less likely to ask that the question be repeated or to request a pass because they don't have anything to say. Also, some steps in an ordinary question-and-answer class can be skipped or minimized. When I prepare notes for a Socratic class, I often include "helpers" or follow-up questions that are designed to bring out relevant points when the student is baffled by the question. These questions are sometimes useful, but they take time. At any rate, it is a refreshing change to have students give more thought to the question before answering it. (A similar result can be obtained by assigning problems and questions ahead of time and pre-appointing the students who will give answers, but I do not often use that method. It promotes passivity among the other students, and sometimes only the "expert" students and the teacher understand the dialogue.)

In the end, I concluded that whatever drawbacks the answer pauses had, they were more than offset by the likelihood that the audience response method promoted widespread active involvement of students. The opportunity for me to have a few minutes to think and plan at midpoints in the class was a nice side effect.

The audience response system also facilitated a "talk to your neighbor" approach to teaching. Of course, it is always possible, under any system, to ask students to solve problems together, either before or during class. But the audience response system adds something because it tells the teacher where students are having problems with a concept. When the display reveals an unexpected pattern of answers—for example, when many students choose an answer that the teacher believes is clearly erroneous—the teacher can ask students to talk the question over with their neighbors and then re-poll them.

I tried this technique because a colleague had sent me an article from *Science* reporting on the use of audience response teaching in a genetics course.[13] The authors used an

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[13]    M. K. Smith et al., *Why Peer Discussion Improves Student Performance on In-Class Concept Questions*, 323 SCIENCE 122 (2009). The abstract of the article reads as follows:

audience response system and asked students to talk answers over with their peers. The authors reported that this technique resulted in superior performance, compared with the standard teaching method, not only on the talked-over questions, but also on other similar questions. I did not collect data of this nature, but I did try the method and noticed that students generally made good progress in reaching the correct answer, a result that could not always be attributed to copying the majority answer (sometimes the original majority answer was wrong).

I have mentioned the "correct" answer, a concept that will not sit well with some law teachers. I might as well confess that I believe that there are analytically challenging questions about law that have one clearly superior answer. I am not afraid that by asking such questions I will be conveying the message that all legal questions have a definite answer. That battle was won long ago, and today's students are appropriately skeptical about the certainty of the law.

In ordinary question-and-answer classes, questions that have definite right answers sometimes fall flat. It is harder to salvage student answers to one-answer questions than to questions that have many correct or arguable answers. In theory, the Socratic master should, by asking the right questions, be able to lead students to discover the right answer themselves, without just telling them what it is. But things do not always work that way. Sometimes the teacher ends up saying the equivalent of, "Well, your answer was 'yes,' now what's the other answer?" The falling-flat problem can lead the teacher to avoid asking questions that have clear right and wrong answers, at least when the questions are difficult ones. If so, then common misconceptions are not examined with an active learning method; difficult concepts are explained by lecture and absorbed by passive note-takers.

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When students answer an in-class conceptual question individually using clickers, discuss it with their neighbors, and then revote on the same question, the percentage of correct answers typically increases. This outcome could result from gains in understanding during discussion, or simply from peer influence of knowledgeable students on their neighbors. To distinguish between these alternatives in an undergraduate genetics course, we followed the above exercise with a second, similar (isomorphic) question on the same concept that students answered individually. Our results indicate that peer discussion enhances understanding, even when none of the students in a discussion group originally knows the correct answer.

The audience response system facilitates asking difficult analytical questions that have a clearly preferable answer. If the teacher sees that many students have gone astray, she can ask students to discuss the question with a neighbor and then re-poll. Having done her duty to facilitate active learning, after re-polling she can choose just to explain the answer, rather than trying to derive it from further questions.

That does not mean that the teacher should stick only to questions that have clear, correct answers. The audience response system is not a graded test (or at least it need not be one). The teacher is free to ask questions that do not have a clear, correct answer. These conversation starters can facilitate later class discussion or lead to sub-questions, exploring justifications for competing answers.

Of course, the fact that the question-asker has to offer the students a set of predetermined answers can be a disadvantage. Some questions do not fit that approach. Standards like "What's the holding of the case?" and "How are those two cases distinguishable?" work less well with predetermined answers. But the system works well with hypotheticals that ask the student to apply a case or statute to a new situation. Also, questions about values and objectives can easily be asked; they will lead to a free-form discussion that the teacher can continue off-screen. The fact that the teacher uses an audience response system does not mean that it must be used for every question. Anytime he wishes, the teacher can darken the screen and continue with another method of instruction.

Because there is always an answer pause of at least a few seconds, the teacher might want to avoid asking extremely simple questions to which he expects a quick answer. If the teacher wants to use a short drill of simple questions, he should consider rolling all those questions into one by listing them in a format that makes it possible for the final option to be "all of the above" or "none of the above."

Sometimes a question with a list of alternative answers can be used as a substitute for a lecture. Suppose that the teacher wants to make sure that the students are familiar with the standard justifications for a rule, because she later plans to compare it to another rule and ask if the two are consistent. The quickest approach would be to simply list the justifications that have been advanced for the rule in a lecture. But the answer may stick better with the students if they are presented with a list of objectives and asked which ones support the rule.

That way the students evaluate each objective and are more likely to remember them.

I hope that my questions will improve from year to year, because I certainly learned more about my own questions and hypotheticals by using the audience response system than I would normally learn using a verbal question-and-answer method of teaching. The reason is that the audience response system can reveal that an unexpected answer is widely shared. I expect that many readers have had this experience when reviewing data about student answers to exam multiple-choice questions. With the audience response system, the teacher has the real-time option of probing to see why students chose an unexpected answer. This can reveal that the question was ambiguous, or that there is an unforeseen good argument in favor of one of the response alternatives. Sometimes it reveals a misconception whose roots need to be explored.

The audience response system also made me more aware of ways in which answers might turn on facts not stated in my hypotheticals. Perhaps this was an outgrowth of the fact that my questions sometimes expressly offered an "it depends" answer, or the fact that I would ask students to explain when I got unexpected responses from a significant number of students. As the year went on, I found myself trying to define what sorts of factual variations were fair game in answering the questions. For example, I deemed an "it depends" answer to be fair only when the answer depended on facts that were reasonably probable under the circumstances. For example, a student should not answer a hearsay question "it depends" on the grounds that the statement might have been made while the declarant was aware of the imminence of death, unless the other facts in the hypothetical suggested that it was reasonably likely.

I have only used one audience response system, TurningPoint,[14] so I cannot compare it to other systems. That being said, it seemed to me that TurningPoint was relatively "unbuggy" and easy to use. I enjoyed making my slides.

TurningPoint does have a few regrettable features, but these can easily be cured by changing default settings or by making template slides. The attached footnote describes two of

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[14] For the manufacturer's description, see Student Response Solutions, Turning Technologies, http://www.turningtechnologies.com/studentresponsesystems/studentresponsesolutions/ (last visited Feb. 27, 2010). I have no relationship with the makers of TurningPoint or PowerPoint other than as a customer for their software.

the features I changed.[15] I cannot resist commenting in text about one feature that particularly annoyed me. The feature exists for all types of questions and all ways of displaying the answers, but I will illustrate with an example involving a question that has the answer choices "yes" and "no," and whose answers are displayed using a bar graph. If 67% of the students give the "Yes" answer and 33% give the "No" answer, then the bar representing the "Yes" answer will be twice as high as the one representing the "No" answer. That's fine. But suppose the vote is closer, so that the number of students giving the "Yes" answer is only slightly larger than the number giving the "No" answer—for example, 52 to 48. In the bar graph display, the bar representing the "Yes" answer will still be about twice as high as the one representing the "No" answer! This led to laughter when it occurred in my class, because law students, whatever their quantitative shortcomings, know that 52 is not twice as much as 48. I assumed that this feature was a flaw in the application, and was surprised to find that it was deliberate. TurningPoint's explanation was that if the difference was not exaggerated, the audience might not realize that one answer got more votes than the other.[16] Fortunately, this ghastly feature can be turned off,[17] and when it is off, the answer graphs will display actual proportions. In other words, the default display intentionally makes small differences look the same as big differences. If this way of displaying data pervades the business world, it may explain our current financial crisis.

The TurningPoint system is capable of gathering individual and group data about student answers. Each "clicker" has a different radio signature, and by keeping track

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[15]    (1) The space allotted for questions is center-aligned, so that the questions are formatted like a title page. Left alignment (such as that used in the text of this essay) can be achieved by changing the default settings. (2) The slides allot too little space for questions and too much space for answers. This can be changed by making a template slide and copying it instead of making new question slides by clicking on "new slide" on the toolbar.

[16]    To be precise, the explanation given for showing charts that are not proportionate to answer choices is that the method "will clearly identify the answer choice that received the majority of responses." (The quote comes from a pop-up window that appears if a user hovers the cursor over the "Auto Scale Charts" option under "Chart Settings" in TurningPoint version 4.0.0.8224.)

[17]    To do so, (1) Choose "Tools" (in the TurningPoint menu), (2) Choose "Settings," (3) Make sure "Presentation" is highlighted, (4) Change the setting for "Auto Scale Charts" to FALSE, and Choose "Done." I am indebted to Hastings' IT Director, Eric Noble, for this guidance.

of who had which "clicker"[18] a teacher could collect data about individual student answers. Demographic data could also be collected; for example, you can compare answers of male and female students, or compare the answers of students who did well on other questions with those who did poorly. The system can also be an attendance checker.

I decided not to use these features. I knew that data collection would cause student concerns, and I was not sure what I would do with the information anyway. So I set the data collection feature on "anonymous." (Teachers who want to take an extra step to reassure students can also ask them to swap "clickers" with their neighbors when answering sensitive questions, or by not collecting information about which "clicker" went to which student in the first place.) To give students an extra feeling of safety, I decided not to give credit for class participation, and I announced that decision on the first day of class. I am happy to report that the participation of typical class members has been better than in years in which I did give grade credit for participation.

I posted my slides on my class website after using them. I hope that this encouraged students to focus on thinking about the questions instead of trying to write them down verbatim, since they could always cut and paste the questions from the website later. To help the students find particular slides for cut-and-paste, I numbered the pages on the slides I displayed in class.

I found it helpful to have a teaching assistant, though I am sure many teachers could do without one. I hired a member of the class to set up the computer and projection equipment each day, summon help in emergencies, format the slides for posting on the web, and collect data such as that displayed in Figure 2. I made the slides myself in my office, often tinkering with them until just before class as I rehearsed. With the projector in place and working as a regular element of the class, it of course was easier to do other things that required it, such as showing video clips.

Using TurningPoint meant that I was also using PowerPoint. I learned to like PowerPoint more than I had expected, though I never figured out how best to handle large chunks of text. One option is to explain the display, but not to

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[18]  The Director of IT at Hastings handed out the "clickers" in my class, noting which student had which "clicker." Students signed an agreement promising to pay the school $35 if they failed to return the "clicker."

read it, which divides the students' attention because they are simultaneously trying to read the display.[19] Another is to read the slide, which is deadly and which research suggests is also distracting, because students will monitor the reading.[20] The third is to step aside and be a stagehand, which does not seem better than simply telling the students to turn to a page in the book and read it to themselves. So I gradually learned to avoid large text displays. Thus, when lecturing, I would display short "bullet points" that raised topics, then I would explain the topics orally. I spent more time in question-and-answer mode than I did lecturing.

When I was conducting a dialogue about the case, I would sometimes just display the case name, court, date and page number, hoping that information would be a useful reference for confused or drifting students. At other times I would add a line or two about the facts of the case. This text might describe the gist of a statement whose hearsay status was in issue, or names and postures of parties and witnesses. For one case, I used a simple drawing of an auto mishap to summarize its facts. I also used PowerPoint to display diagrams, graphics, charts and photos.

On the question slides, I would sometimes try to keep the text display short by stating part of the hypothetical orally, only putting a reminder of its gist on the slide. More often, I made an exception to my rule that text displays should be short, and displayed the entire hypothetical so that students could refer precisely to what was being asked in formulating their answers. When I did set out the facts of a hypothetical at length on the slide, I would either remain silent while students read it, or read it aloud myself word for word. I generally avoided other commentary that could have distracted students while they were trying to read the facts of the hypothetical. When I was using a hypothetical printed in the casebook, I did not display its facts on the slide. The slide displayed only the page number of the hypothetical and its bottom-line question (e.g., how should the judge rule?). I did things this way because when I intend to use a hypothetical printed in the casebook as a question in class, I always assign the question in the syllabus and implore the students to answer it before class; I wanted the students to look at these hypotheticals in their casebooks

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[19]    *See* Deborah J. Merritt, *Legal Education in the Age of Cognitive Science and Advanced Classroom Technology*, 14 B.U. J. SCI. & TECH. L. 39, 47 (2008).

[20]    *Id.* at 47-48.

instead of on slides, because I was hoping that they had annotated their casebooks with answers, or at least that the question would seem more familiar to them if they looked at it again in the book. On pure-text slides that contained no questions, sometimes I thought it made sense to put up a fairly long excerpt from a statute, for the purpose of using PowerPoint features to highlight and discuss specific words or phrases in the statute. But generally, as the year went on, my pure-text slides got shorter and shorter.

For the TurningPoint system that I used, students signaled their answers with handheld "clickers" that sent a radio signal to a receiver plugged into the USB drive of my computer. Alternatives to handheld "clickers" are becoming available in the form of web-based systems that take answers from students' laptops or cellphones.[21] Perhaps some web-based systems will be free, or included as an element in the school's subscription to some other service, such as Westlaw or CALI. At the time of this writing, Westlaw's TWEN system offers a "customized polling" option that has some of the features of the audience response system that I used, though the current TWEN system seems more suited for pre-class polling than for live in-class use.[22] Although the use of handheld "clicker" hardware is not essential to an audience response system, having dedicated hardware for signaling may have advantages. There is no delay for student log-ins, and "clickers" can be used by professors who have banned laptops.

I was pleased with my experience with an audience response system. It provided active learning and feedback without much time or trouble. Judging from the results of the attitude surveys that I have described, students also liked this method of teaching.

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[21] TurningPoint recently announced that it would be offering a web-based system. *See* Andrea Lawn, Press Release, Turning Technologies Unveils ResponseWare™ Web—a Web-based Polling System, SCYONLINE (March 31, 2009), *available at* http://blog.svconline.com/briefingroom/2009/03/31/turning-technologies-un veils-responseware%E2%84%A2-web%E2%80%94a-web-based-polling-system//.

[22] Faculty members at Westlaw-subscriber schools can try out the polling feature by going to http://lawschool.westlaw.com/twen (last visited April 23, 2009.). Click on "create new course" and follow the instructions for creating a course. After setting up the course, click on "customized polling" and "create a poll."