

Comment on “Beyond Clickers, Next Generation Student Response Systems for Organic Chemistry”

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ABSTRACT: This Letter is in response to a 2016 Technology Report regarding the use of web-enabled devices (e.g., cell phones) as student response systems. The letter argues that sometimes old-fashioned “technologies” (like whiteboards) can accomplish effective instructor–student communication as well, if not better than, some modern devices.

KEYWORDS: First-Year Undergraduate/General, Organic Chemistry, Collaborative/Cooperative Learning

In his recent article, “Beyond Clickers, Next Generation Student Response Systems for Organic Chemistry”,¹ Shea describes how new apps, such as uRespond, TopHat, or Learning Catalytics, combined with Web-enabled devices, allow organic chemistry students to interact and communicate with instructors in new ways. Students can select specific atoms on drawings that are electronically provided, but also can electronically submit their *own hand drawn* sketches. The benefit of have students *draw things out for themselves* was underscored in a recent article² in which authors found that organic chemistry students who drew out their work first before entering their answers in an online homework system outperformed those who simply entered their answers electronically.

My own recent attempts to utilize an app (The Answer Pad³) like the ones Shea describes have led me to reconsider the benefits of a more old-fashioned student response system. For the past three years, I have been using small, 8.5 in. × 11 in. whiteboards⁴ in my organic chemistry classroom. For those instances in which I want students to practice drawing, I distribute the whiteboards (with markers) to small groups of students (2 or 3 students/group). I then assign students problems to work on and I walk around the room checking and looking over student work. (My course enrolls 80–100 students.)

While attempting this past spring to use the Answer Pad app (the wireless signal in my classroom was not up to the job), I came to realize that there were a number of somewhat subtle benefits to the more old-fashioned whiteboard “technology”.

1. The sharing of whiteboards forces students to work together, to draw and discuss together. The size of the whiteboards is large enough (unlike the typical size of a cellphone screen) that group members can see each other's work.
2. The size of the whiteboard also prevents student lurking and hiding. I can easily tell who is lost or not trying.
3. I learn which students are getting it and which students are struggling or lost.
4. I can provide customized feedback to each group. Some need support and encouragement. Some need hints, and others need explicit guidance.

5. By walking around the room (rather than viewing student work from a computer podium), I am able to provide hints and encouragement privately without exposing student errors to the class.
6. Walking around the room allows students to interact with me one-on-one. This helps break down barriers and makes the course less intimidating.
7. I learn from student mistakes. Often students make mistakes that would never occur to me. But when I see their mistakes, I learn a lot about how students are thinking, what misconceptions they have, and/or what specific details I was not clear about. I am able to immediately clarify misconceptions or points of ambiguity.
8. Because I am able to provide customized feedback to students, they can immediately learn from their mistakes.

It is true that many of the benefits of whiteboards can readily be accomplished with larger electronic devices such as tablets, but at public universities similar to mine where most students do not have tablets, I have found whiteboards to be a very useful “technology”.

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Notes

The author declares no competing financial interest.

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- (2) Smithrud, D. B.; Pinhas, A. R. Pencil–Paper Learning Should Be Combined with Online Homework Software. *J. Chem. Educ.* **2015**, 92 (12), 1965–1970.
- (3) Answerpad Homepage. <http://www.theanswerpad.com/> (accessed Sep 2016).
- (4) Purchased for about \$1 each on Amazon.com. (Item purchased was NEOPlex Student Laptop Dry Erase Marker Board, set of 30.)

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