



GUEST COMMENTARY

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How a Classroom Failure Improved My Teaching

Like all teachers, I am interested in experimenting with almost anything that will effectively connect my students to the material. So, prior to my first semester teaching introductory biology as a new assistant professor, I committed myself to using active-learning practices. After all, I study biology education, so I was well versed in evidence-based methods and equitable teaching strategies. Plus, I spent the summer carefully constructing activities and quiz questions to be used with our personal-response clicker system. Walking across campus on my first day of class, I felt excited and empowered. I thought, “The levers of successful teaching are at my fingertips, and I vow to serve these undergraduates as a dedicated instructor and mentor. Yes, I *am* prepared for this enormous responsibility.”

This is the way the story starts – but, of course, it’s not how it ends. As you will see, it is a story of failure and redemption, mischief and learning. This is a story of teaching, a stumble, and the impact of constructive stupidity in the classroom.

Even though I had all the ingredients for active learning in place, I worried what would happen if something unpredictable occurred. I carefully constructed the syllabus and set up the online interface for students several weeks before the first class day. I visited the lecture hall, tested the document camera, and pondered the best overhead lighting mode. When the students arrived, the first class went off without a hitch. Once I started presenting the course material, I was astounded by how much the students already knew about the topics I covered.

My strategy was to have students working in small groups to answer low-stakes but complex multiple-choice items through their clickers. The first question I asked was admittedly easy – could they distinguish the difference between five phylogenetic trees? And 99% of the students answered correctly! “Wow, they’re paying attention!” I thought. Then I gave them a more difficult question and braced for murmured protests. But, remarkably, nearly all the students answered that question correctly, too. Over the following class periods I asked increasingly more difficult questions to measure their baseline knowledge. However, no matter how difficult the question, nearly all the students replied with the correct response. I considered many explanations, one more marvelous than the next. Perhaps I had tapped into a teaching style that would become a model for university instruction. I could imagine our athletic teams parading me around before each game to offer thanks and herald my achievement.

This apparent success went on for almost three weeks.

One day, mid-class, I stepped down from the podium to wade among the hundreds of students in attendance. I noticed something odd on the screens of laptops, cell phones, and iPads. It sure looked like the students could see the subsequent PowerPoint slide, which contained the answers to all my clicker questions. Indeed, I learned later, that next slide was visible through the clicker system. I had been duped by my very own students and no one said a thing. This was a collective act of such great theater that

I could barely refrain from admiring their collective discipline in not spilling the beans.

To compound this apparent catastrophe, the students did poorly on the first exam. This made perfect sense, as they had no need to learn the material if the teacher was unwittingly giving them the answers. Embarrassed and disappointed, I quietly closed the loophole to students for the rest of the semester (much to their dismay and fright, I’m sure). Neither I nor they ever said a word.

I was in serious need of inspiration. As the next semester approached, one night I was jolted awake by a research question: Is exposure to these clicker questions inherently valuable, or must the questions be accompanied by meaningful student engagement? The previous semester had served as a perfect control in an unintentional experiment in which students went through all the motions of frequent, low-stakes assessments but without thinking deeply about the material or participating in peer discussion to arrive at their answers.

So, I set up an experiment in my own classroom. In the subsequent semester, I included complex questions in every class period. Of course, this time, the students did not start with the correct answer. In most cases, I encouraged students to first think independently about the question, and then engage in group dialogue. Then I explained why *distractor* responses were incorrect when a portion of students selected them. After the first exam, I eagerly checked how the students had performed overall, and specifically on the *tracker* questions that were modified from the first exam in the previous semester. Overall, they performed 15% better in the experimental setting, with 5–20% *more* students answering individual tracker questions correctly.

While I knew that meaningful engagement with regular, low-stakes assessments has been shown to reinforce student learning, it was through the growing pains inherent to learning a new instructional technology that I could visualize its effects on my own students. I will get better at experimental teaching. After all, you only get better by doing it. This semester, I shared this story on the first day of class with hundreds of students to demonstrate the importance of engaging with formative assessments and participating in group discussions. My intention was to make them laugh, and then to think.

Mistakes do not diminish one’s contributions – in teaching or any other endeavor; rather, turning these experiences into teachable moments ultimately makes us better at our craft.

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