The Scholarly Teacher
Applying Evidence-Based Strategies to Enrich Student Learning



# Promoting Engagement in the (Sometimes Very) Large “Lecture” Classroom

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In the reality of higher education today, student to faculty ratios seem to have increased considerably with many universities experiencing significant growth in student populations in the last 10 years (“Digest of education statistics, 2012,” 2013). In the face of this growing student population, permanent faculty hiring has increased only five percent nationally between 2005 and 2011, and by less than one percent at the top 25 state schools (Erwin and Wood, 2014). We have seen the result of these changes in our high enrollment science lectures at the only public research institution designated by the state of Oregon and federal agencies as not only a “land-grant” institution but also a “sea-, sun- and space- grant university” dedicated to making “education possible for the common person…and service to its citizenry” (Office of Human Resources, 2015). We may teach at times upwards of 600 students in one classroom – certainly providing a service to our citizenry. However, one challenge we face as instructors in these courses is finding a way to reach *all* students so that they can learn, helping them to not feel like another number in our gradebooks. When we look out to the sea of hundreds of faces, we wonder: How do we make their education possible?

Our answer: Engage them.



Many years of research generally supports the idea that the more time spent in the classroom, the more successful the student (Credé, Roch, & Kieszczynka, 2010). Once in the room however, students who engage in active learning are generally more successful than those that sit and passively listen to a lecture (Freeman et al., 2014). Additionally, when students engage in the university community through participation in clubs or peer mentoring groups, they are also more likely to succeed academically and socially, closing achievement gaps and showing higher rates of persistence and retention between traditionally at risk groups and highly represented groups (Eddy & Hogan, 2014; Tough, 2014). As instructors we have endeavored to merge these themes into our very large classrooms that promote not only student participation, but also interaction, to encourage the greatest possible learning and student success (Chi & Wylie, 2014).

## Phase I: Clicking – From Basic Knowledge to Just-In-Time Teaching

We first began to foster engagement and interaction through the use of audience response devices (clickers). Clickers can be used in a variety of ways in the classroom: to take attendance, to ask basic questions as a check of understanding, or as a mechanism to encourage student discussion and interaction with peers. For us, clickers are relatively stress-free to employ in the high enrollment classroom, our students seem to like them, and managing large volumes of clicker data is relatively simple. As we both started our implementation of clickers in our individual classes, it was easy to ask basic knowledge comprehension questions that required little thought beyond recall of facts. This was a good way to get students to attend lecture, break up the lectures into smaller components, and ensure that students were "checked in" to the lecture.  Then, influenced by the work of people such as Eric Mazur (Mazur, 1997), we began asking more critical thought questions and questions that drove at common misconceptions in the hopes of promoting conceptual change (Tanner & Allen, 2005) and the most in depth engagement and learning. Moving to this model of using more conceptual clicker questions requires that we determine students' current, baseline

understanding in a non-clicker manner. Today, we both use our online tools (publisher provided course sites or our own LMS tools) to quiz our students on the more rote content, which allows us to develop clicker questions for class that flesh out the harder to shake knowledge structures, ask ill-structured problems about which opinions can vary, or to assess rapidly accessed knowledge.


Perhaps the most useful way in which clickers have helped us engage our students is in concert with in-class group work. Using the clickers as students engage in group work allows us to check for understanding as the learning progresses and help make corrections as needed, a-la "Just-In-Time Teaching" (Marrs & Novak, 2004), easily give participation credit to large groups of students for in-class work and provide students with formative feedback on how their group activities are progressing.

Although clickers allowed us to work with and engage our students in mass active learning, we both began to feel that we wanted our students to have more individualized engagement to help them develop science process, argumentation, data analysis, and critical thinking skills required of today's modern scientists. Worksheet based activities (see below for more information) in which students could engage with one another at their own pace and in their own "language" seemed attractive, but to fully implement this desired active learning in our large classes we needed help in the classroom to also provide individualized attention.

## Phase II: Near-Peer Learning Assistants

To accomplish this, we adapted a model of a Learning Assistant (LA) program first developed at UC-Boulder (see Otero, Pollock, & Finkelstein, 2010, http://laa.colorado.edu), in which trained undergraduates (LAs) facilitate peer discussions and in-class activities. LAs are near–peers, providing just in time support in a more socially close way. Additionally, they are able to engage learners not only with the content but also with each other. Through this model we could also engage our students in even more active learning in our classroom. In developing an LA program, there are several important elements: 1) developing an adult learning and facilitation pedagogy course for the LAs, 2) recruiting LAs, and 3) logistical planning of how to use LAs in the

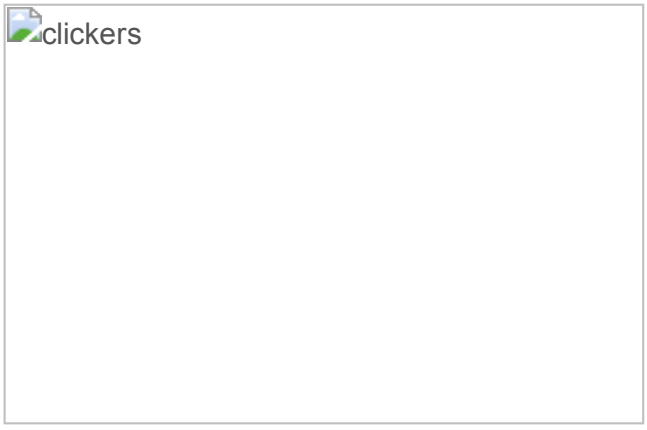
classrooms. We were able to adapt the curriculum built by CU-Boulder to begin our LA pedagogy course.

*Amy C. Edmondson*

For recruitment, we emailed a selection of our former students (the top 10% or those that we believed would be successful in the program) and asked if they would like to work on this project. In return for their training and weekly classroom work with us, we offered little: the opportunity to deepen their own content knowledge, to lead by doing (experiential learning) while earning credit, and possibly, dinner or a glowing letter of recommendation. The response of the students was overwhelming and we easily recruited 40+ LAs over the last year. The logistics were somewhat challenging: finding acceptable meetings times for LAs and faculty, organizing the classroom so that students and facilitators could all interact, and finding/creating group worthy activities for in class learning. By mandating a weekly meeting time, the lead instructor and the LAs would meet to debrief the previous facilitation, review content, and prepare for the new activity. In the classroom, we were able to block off seats allowing LAs to move between seats, assign LAs territories, and ensure LA access to all students.

As for finding/creating group worthy activities, we each took a different approach. In the Anatomy and Physiology classroom, 200-600 students participated in a more traditional lecture twice weekly and then, once weekly, cooperated to complete directed worksheets designed in the POGIL format (https://pogil.org/). These worksheets were very appealing not only for their inquiry style, open and closed ended nature, and the forced collaboration of peers, but also because they allowed groups to self-pace in the classrooms (i.e., groups of students could move through the material at different rates).

Additionally, students answered clicker questions as they proceeded, informing the instructor of their progress. Successful implantation of POGIL required providing students with individualized feedback – either affirmation of correct responses or student/group specific redirection when they steered awry (thus the need for LAs).




In contrast, in every lecture period of Principles of Biology (three days a week), roughly 400 students participated in active learning interspersed with short lectures, activity review, and clicker questions. Biology students utilized hands-on activities (strip-sequences, see Handelsman, Miller, & Pfund, 2007), worksheets, data analysis activities and short writing activities. The LAs answered questions and provided feedback to the students on activities and clicker question discussions, facilitated the distribution and collection of materials, and helped students form groups.

## Student Impact and Helpful Tips

The response of our students to the active learning and LAs has been extremely positive. This model has helped us to be successful in engaging ALL our students in these very large enrollment classrooms.

1. Attendance has not declined on activity days compared to non-activity days in the anatomy classroom.
2. Participation in clickers increased over previous years.
3. Student performance on questions over the same content increased with active learning (for some content).
4. According to student surveys – they liked it!

There are many methods to increasing engagement in your student

populations, and while it may seem daunting in the "sometimes very" large lecture, it if far from impossible. Some tips we have for implementation of these types of practices in your classrooms are:

1. Start small (we started with clickers before moving to an LA army).
2. Don't be afraid of failure (your students are more forgiving than you think if they believe that you care about their learning).
3. Be brave – ask for their feedback and what they need to be successful as you try new things (for excellent suggestions, see Seidel & Tanner, 2013).
4. Explain to them why you are teaching in this method (show them the data!)
5. Be open to course correction if things seem to be going astray.

Happy teaching!

## Resources for Active Learning Activities

General Resources

- Merlot (http://www.merlot.org/merlot/index.htm)
- National Center for Case Study Teaching in Science (http://sciencecases.lib.buffalo.edu/cs/)
- POGIL (https://pogil.org/)
- Learning Assistant Resource Site (https://sites.google.com/a/colorado.edu/la-resources/)

Biology Specific

- Pulse Community (http://www.pulsecommunity.org/page/active-learning)
- TIEE (Teaching Issues and Experiments in Ecology; www.esa.org/tiee/)
- EcoEd Digitial Library (http://ecoed.esa.org/index.php?P=Home)
- http://iclimate.org/ccc/index.asp
- Summer Institute Teachable Tidbits (http://cst.yale.edu/teachable-tidbit-general-categories)
- Thinking like a biologist (http://www.biodqc.org/dqcs)

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This blog is based in part on a presentation made at the 2015 Lilly Conference in Newport Beach,CA.

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