FACULTY LEARNING COMMUNITY

COLLEGE OF NATURAL SCIENCES & MATHEMATICS

FINAL REPORT: SPRING 2015 COHORT

SPRING 2015 FLC COHORT MEMBERS

MEMBERS WHO COMPLETED THE PROGRAM

Kuan-wen Chuang

Eric Marinez

Gary Shin

Eric Sorin

MEMBER WHO COMPLETED THE DISCUSSIONS BUT DID NOT PROVIDE REPORT:

Rebecca Bishop

MEMBER WHO DROPPED OUT OF THE PROGRAM:

Nancy Gardner

Galen Pickett

FLC Leader: Shahab Derakhshan

Co-leader: Nate Onderdonk

Assessment Advice : Susan Gomez-Zweip

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Summary of Individual Reports

1) Kuan-Wen Chuang: He examined the idea of Active Learning approach in form of "Team-Work Study" and applied them in teaching PHYS 320 (Thermodynamics) at Active Learning classroom Fall 2015. He assembled groups of students with assigned leaders for "Team-Work Homework", "Team-Work Exercise", and "Team-Work Quiz". He did not achieve his goals in "Team-Work Homework" due to the lack of proper communication between group leader and team members and also him. In future he plans to provide more clear and complete descriptions about the responsibility of the group leaders. However, in the other areas of teamwork such as quizzes his goals were met and the overall class performance was acceptable for him.

2) Eric Marinez: His plan was to use iClicker questions instead of in-class quizzes in his second semester Organic Chemistry course. The goal was to encourage students to read the material before coming to the class and immediately after any lecture. While he had met the goal of students' active engagement in class discussions he encountered limitations in term of his required time for the lectures and for that reason he had stopped the practice. Accordingly he is planning to redo many of his lecture notes to truncate them so that time is available to permit an open discussion.

3) Gary Shin: His goal was to examine the impact of iClicker in improving Students' Engagement and Attention in his large BIOL 200 lecture. He hypothesized that actively participating students in the clicker questions would have a higher retention of course material. By comparing his students' performance in clicker questions and the exams, he noticed that there are indications that clickers improve course performance among students and there was a general positive trend between clicker and exam performance.

4) Eric Sorin: For his CHEM 377B (Physical Chemistry Lecture), he decided to give students points for assigned homework/problem sets. To offset the additional points available to students, he removed "Exam Zero" (E0) from the course curriculum, which previously tested students' preparation for the course (pre- requisite math, calculus, general chemistry, and general physics concepts and problem solving) following a 1 week review of these concepts and skills. He concluded that the proposed change did not improve the students' performance. In future he will NOT award points for the completion of homework/assigned problems. Rather, he will administer non-"pop" in-class quizzes, while also exploring alternative assessment techniques such as course projects, the implementation of "social homework," and/or the implementation of a "game-based" curriculum/point system, as reported by Daubenfeld and Zenkar [J. Chem. Educ., 2015, 92 (2), pp 269–277].

Personal Summary & Suggestions on the FLC

Working as a co-leader and a leader in two consecutive semesters was a great opportunity for me to learn from the valuable discussions and ideas, which were exchanged among the participants. I viewed my role as a facilitator of the process and tried to make the on-line discussions more engaging for all of us. However, I should emphasize that the level of interest among the participants is not near to what I experienced when I participated in the first cohort of FLC members at CNSM. Specially, close to the end of the process some people quit and I had very hard time to ask participants to post their thoughts about the modules. Some times I had to reach the participants personally and extend the deadlines for them. My personal opinion is that most of the faculty members who view the effort as a great value on their personal developments have already completed FLC and the interest among the others is not the same level as what it used to be not very long time ago. Therefore, immediately after completion of my first semester as the leader, I requested a meeting with all the FLC leaders and Dean Kingsford to share my experience with them. Accordingly, Dr. Onderdonk (FLC leader for the following semester) decided to choose a different approach by breaking the modules to smaller pieces and having weekly discussions to maintain the momentum in form of continuous process. My other suggestion is that perhaps having one FLC cohort per year (instead of two) may result in more effective effort. The cohorts may be assembled among the newly hired faculty members, some lecturers and those who have strong beliefe and commitment to FLC. The Faculty Learning Community can continue to run the Munch and Learn events each semester and can potentially devote some effort towards organizing teaching related workshops for interested CNSM instructors.

Participation Data on the FLC

The *Piazza* forum was used to enable online discussions on the modules. Some data is presented below, which I suggest to use as the basis to recommend the level of the stipend (full or partial).

Name	**Days Online**	**Threads Viewed**	**Contributions**
Kuan-wen Chuang	10	11	6
Eric Marinez	12	10	12
Gary Shin	15	14	8
Eric Sorin	29	12	19
Rebecca Bishop	10	11	17
Shahab Derakhshan	53	20	35
Nate Onderdonk	21	15	18

Kuan-Wen Chuang
Lecturer
Department of Physics and Astronomy

After the participation of Faculty Learning Community (FLC) selected by the Dean Dr. L. Kingsford and Department Chair Professor C. Kwon, some of the changes of my teaching strategy are from "I expect you" to "I wish you" and also from "I test you" to "I help you", in addition to the most important and fundamental principles of my teachings "love, respect, and responsibility".

The difference between "I expect you" and "I wish you" is that I wish students learn physics based upon their background in physics not from my point of view. And the difference between "I test you" and "I help you" is that I help students study physics to obtain the "Clear and Reachable Target". "Clear" is defined as that the materials in physics for students to learn and test are clearly described in the beginning of the classes. "Reachable" is defined as that the materials in physics for students to learn are based upon their background in physics. Finally, "Target" is defined as the grades which the students want to get not only "pass", but also "A" or "100".

Then "Team-Work Study", "Clear and Reachable Study", "No Cheating" were formed in my teaching methods. Particularly I applied them in the teaching PHYS 320 (Thermodynamics) at Active Learning classroom Fall 2015.

The idea of "Team-Work Study" including "Team-Work Quizzes", "Team-Work Exercises", and "Team-Work Homework" is that the team members shared the idea of diversity of individuals skill sets and provide the potential for better ideas for solving the same problem.

As for "Clear and Reachable Study", I clearly told the students that the problems of the midterms and final exam would be totally from homework problems in the beginning of the semester. I also posted the "Hand-Writing Lecture Notes of assigned chapters" and "Homework problems of whole assigned chapters" in the beginning of the semester. The idea above was that I wished them from "Team-Work Study" to receive good results from individual test.

"No Cheating" would be the most important policy to prevent the students from cheating to obtain good grades and also guiding the students to learn physics in the correct "attitude".

The applications described above to PHYS 320 are described as following:

There were 36 students with 6 large rectangular tables and electronic facilities in the classroom AS-235. Before the class began, I sent the survey form to the students in the Beach Board to understand the students' background in Thermal Physics.

In the beginning of the class, I set up six groups (one leader for each group) with "Team-Work Homework", "Team-Work Exercise", and "Team-Work Quiz" for the processes of "Team-Work Study".

About "Team-Work Homework", the assigned homework for each chapter was on a regular basis and posted in the beginning of the semester on Beach Board. The students may work together on the assigned homework from group leader for each team member. Indeed, I encourage them to work together to understand the problems. However, they must each separately write up solutions in their own words (and equations) and may not turn in something they do not understand. (That is, they may not simply paraphrase someone else's solution as their own.) Paraphrasing without understanding, or outright copying, will be considered plagiarism. But the effect of "Team-Work Homework" was not reached what I hoped. The main problems were from the communications between group leader and team members and also from me. Only 3 out of 5 group leaders could do good communication among team members. I did not give a very clear and complete descriptions about the responsibility of the group leader, I need to continue thinking a suitable job for group leaders.

The group leader is a very important role in each group. Assigning and collecting homework from each team member were very tuff but important job for the group leader. Also organizing the team member to work on the exercises and quizzes in class was very difficult. One of the group leaders was complained by his team members, and I then broke that group up and sent the team members to the other groups.

About the tests (Midterms 1, 2 and final exam) I assigned one table for all the group leaders to sit together during the examinations (three different versions for each test). Rest of them can sit anywhere without same version of the test sheets around. No smart phones, no graphical calculators (I also prepared number of scientific calculators for some of them), no scratch papers were allowed. Formula sheet was provided. No cheating was very important for every student.

In the beginning, a few of them in the same group tried to use smart phone or laptop to find the solutions during the Team-Work Quiz or Team-Work Exercise, although some of them claimed that they needed to read the ebook from the smart phone or laptop. I allowed them only to open text book and lecture notes for "Team-Work Exercise" and "Team-Work Quiz", but no smart phone or laptop. After first midterm, those students who did not received good grades realized that the way they studied was incorrect.

The average of the whole class for each test is as following: $A \geq 85$, $85 > B \geq 70$.

Midterm 1: 76.0/100, highest: 100, lowest: 31

Midterm 2: 79.7/100, highest: 100, lowest: 39

Final Exam: 86.5/100. highest: 100, lowest: 64

The students made a progress in study of thermodynamics shown from the tests, although a survey given before the class began showed that some of them did not learn thermal physics or some of them took physics 151 long time ago. Particularly, one of them received the second lowest grade (41/100) on the first midterm in class, but he received 100/100 on the second and 88/100 on the final exam. Fortunately, all PHYS 320 students passed the class, 17 received "A", 17 received "B" and 2 received "C".

The most important ideas learned from the Fall classes teaching are that the teaching materials and the test problems should be suitable for students' background in physics. The high completion rates in each class and the increase efficiency of my class teaching were reached.

Faculty Learning Community: Eric Marinez

Hypothesis:

To gage the effectiveness of iClicker for second semester organic chemistry. My interest in adopting iClicker was intended to replace 1 minute quizzes which was initially used in my courses to encourage students to read the notes and textbook prior to my lecture. The 1 minute quizzes also served the purpose of encouraging students to attend class and to get them to class on time since they were given unannounced at the beginning of lecture.

Results:

Although iClicker was used sparingly during the Fall 2015 semester, it did serve the purpose of getting students engaged in class and providing instant feedback to course concepts. However, due to lecture constraints on time, I had to stop using the iClicker as the semester progressed. My inability to continue with iClicker was strictly based on ineffective time management. The lack of time for every lecture was compounded by requiring 6 exams during the semester and this included a review exam, 4 midterm exams, and a final. In addition, university scheduling also gave students a full week for Thanksgiving break, which led to one less class meeting for the fall semester.

Discussion:

I am open to continue using iClicker as it did showcase its value by having students discuss problems amongst themselves. The students discussed each problem out loud and were encouraged to come to a general consensus to arrive at the correct answer. To encourage the engagement, it was necessary to permit at least three minutes for each question. I posed two to three questions per a 75 minute lecture. It was the first time I witnessed student engagement to the extent and level I observed. Students talked out loud and discussed why certain answers were incorrect until they arrived to the final answer. Some of the students even shared why the answer had to be the one chosen based on the concepts that were just taught. Interestingly, many of the students scrambled to look at their notes to decipher the concept being asked and to use their notes to answer the question correctly.

I did observe many of the benefits of using iClicker. I did see students engaged and an increase in student attendance. I did observe that the majority of the students participated in the discussions and answered the questions. Most importantly, the students and I received immediate feedback to assess the student learning taking place in the lecture. For me, this reinforced my assumption that many of my students understand the concepts being taught as I lectured on each topic. For students, this led to their awareness that they do understand many of the concepts as it is being taught in lecture. This permitted the opportunity to discuss with my students how critical it is to review and study their notes immediately following every lecture and not to procrastinate on processing some of the more difficult concepts in organic chemistry.

One of the drawbacks of using iClicker was I lost valuable time normally used to elaborate on concepts by using experimental data to support how mechanisms are either supported or refuted. I will need to redo many of my lecture notes to truncate them so that time is available to permit an open discussion. I aim to start this next semester and I also hope to inform my division the importance of permitting more time for student engagement. This will include reaching an agreement on which topics we do not need to teach which is currently a very dense and ambitious course. Another issue I found was that some of my undocumented, transfer students were not going to purchase an iClicker due to its cost. I will either need to acquire additional iClickers to lend out to these students or adopt Top Hat.

My initial interest in using iClicker was to replace 1 minute quizzes, which was used by Dr. Donald Paulson of Cal State Los Angeles as an effective active-learning strategy to get students prepared for lecture and on time. Several years ago I implemented 1 minute quizzes and gave them randomly throughout the semester so that students were required to attend lecture and keep up with the reading. The quizzes were worth 10 pts. If they missed both questions but attended lecture, I gave them 2 pts for showing up to lecture on time. If they did not attend lecture or were tardy, this was documented as receiving a 0 on the 1 minute quiz. In order to be most effective in implementing 1 minutes quizzes, I gave up to 12 of them each semester with the policy that I would drop 2 quizzes with the lowest scores. The quizzes required a dedicated GA to assist with the grading and also to assist with grading 3 midterms. When I decided to implement 4 midterms and a review exam, I stopped issuing quizzes since they often took at least 5 minutes of class time to pass out their bluebook by name and to get them collected. My argument was that 12 quizzes at 5 minutes each amounted to a loss of 1 lecture, therefore going from 3 midterms to 4 midterms would require that I drop the 1 minute quizzes.

I will implement student engagement from now on and now understand the importance of time management to permit this experience. I will try a combination of my one-minute quizzes with iClicker questions to develop more student engagement in the class. In order for me to conduct a class using a combination of active learning strategies, I must cut back the volume of lecture notes I am currently using so as to permit at least 5 minutes every period for this new student engagement strategy

FLC SUMMARY

Gary Shin
Department of Biological Sciences

HYPOTHESIS:

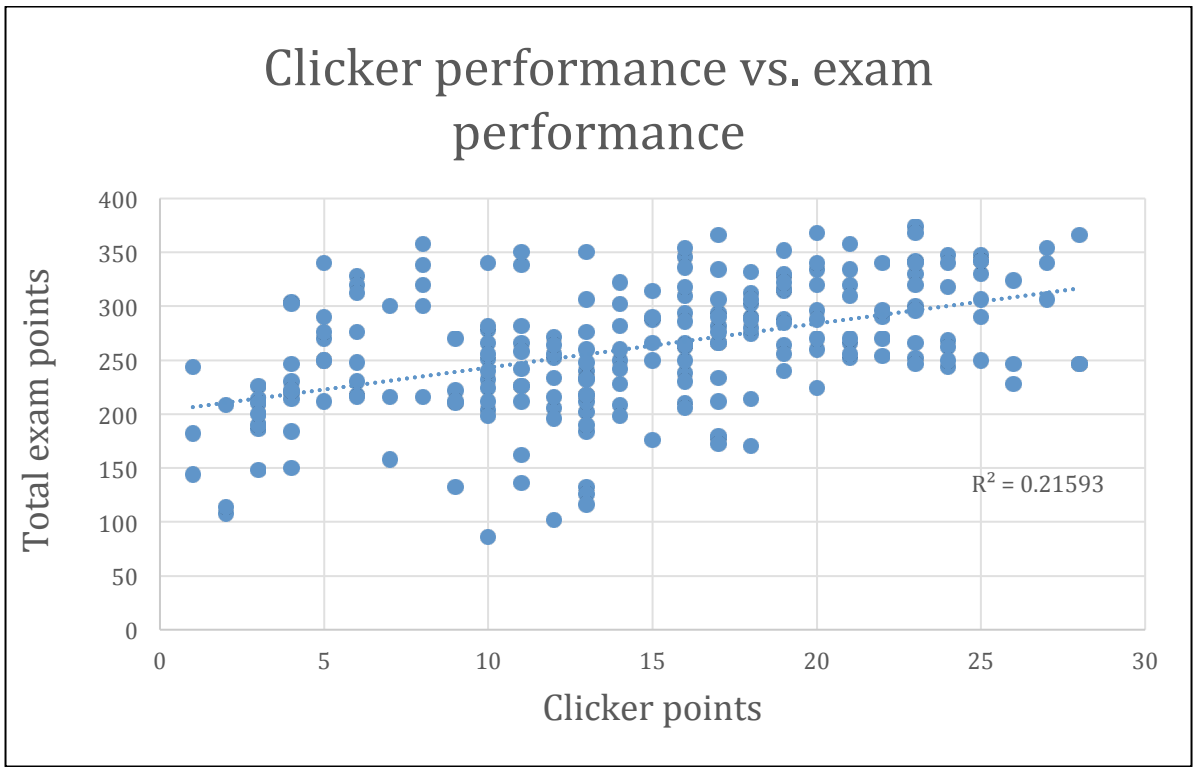
Large lecture classes such as BIOL 200 generally suffer from a lack of student engagement and attention. To increase student involvement, I punctuated by lectures with clicker questions. The questions were distributed throughout the lecture in order to break the period into shorter, more manageable chunks. Questions were of three basic varieties: (1) a reading quiz type question usually delivered at the beginning of lecture; (2) concept checks to verify whether students grasped the topic being taught; and (3) application questions, in which students were asked to apply their knowledge to a given situation. I hypothesized that those students who participated in the clicker questions would have a higher retention of course material, which would be reflected in higher exam performance.

RESULTS:

Participation in the clicker questions was not mandatory, but over 70% of the class did record data for at least one of the clicker questions (225/306). Those that did register clickers had highly variable involvement, with some students answering 100% of the questions, while others answered only a few. The average clicker score for all participants was 14.6 out of a possible 30 points.

Overall, students who participated with clickers demonstrated a 5% improvement in exam performance (261.7/400 for clicker users versus 239.6/400 for non-clicker users, $p = 0.003$). This might suggest that clickers are highly effective at increasing student performance, but may also be an artifact of self-selection (i.e., highly motivated students are the ones participating in the clickers).

To effectively assess the impact of clickers on exam performance, I examined student clicker scores versus overall exam scores.



While a positive correlation was seen between clicker performance and exam performance, the relationship was not as compelling as I had hoped it might be (r^2 = 0.2159). High performance on the clicker questions did not necessarily guarantee high performance on the exams, nor did low performance on the clickers necessarily indicate low exam performance.

DISCUSSION:

Although the data is not perfectly clear, there are indications that clickers did, in fact, improve course performance among students. Students who did participate in answering clicker questions did markedly better than their counterparts who did not participate, and there was a general positive trend between clicker and exam performance. But even without clear evidence that they improve exam scores, there are several reasons why clickers might be helpful tools. (1) Clickers help to increase student engagement in class. Rather than simply sitting and listening, students can discuss with their peers the answers to the questions, which can increase cooperative peer-to-peer learning. (2) Clickers are also helpful to assess whether students are grasping concepts as the instructor goes over

them. Concepts such as photosynthesis are difficult to teach, and using clickers, an instructor can assess whether a class has a sufficient grasp of the material before moving on. And (3) clickers can be used to start discussions. In discussing stem cell research, I assessed whether students supported it or not, then discussed the arguments for and against the work, then reassessed whether their opinions had changed.

Overall, I would deploy clickers again in my class. However, I think the implementation needs to be more integrative. For this semester, I simply had clickers as a stand-alone, optional element of the class and gave extra credit points for those students that participated. I think clickers would be better used as an integral part of the students' grade.

Eric J. Sorin, Ph.D., Assoc. Prof. of Chemistry & Biochemistry Course: CHEM 377B, Fall 2015 Semester

Hypothesis

CHEM 377B Fundamentals of Physical Chemistry II is the second half of a two-semester sequence in physical chemistry for BS Biochemistry and BA Chemistry majors that focuses on quantum chemistry and spectroscopy.

The primary change made to this course was based on feedback from students in previous semesters, who strongly urged me to give students points in the course for assigned homework/problem sets. Although I had done this in the past, upper division analytical courses often do not award students points for completing problem sets and I discontinued this points- for-homework system several years ago upon loss of a grading assistant for 377 courses. Students in previous semesters felt that giving points for assigned problems sets would motivate future students to complete assigned problems within a given time after completing lecture modules and would help students prepare earlier for CHEM 377 exams. This serves as my primary hypothesis, about which I was not strongly enthusiastic.

A secondary change made to this course, to offset the additional points available to students, was the removal of "Exam Zero" (E0) from the course curriculum. In previous semesters, E0 was worth 50 points (out of a possible 600) and tested students' preparation for the course (pre- requisite math, calculus, general chemistry, and general physics concepts and problem solving) following a 1 week review of these concepts and skills. It was determined in 2014-15 that scores on E0 were in no way correlated with success on future CHEM 377 exams, and it was thus my plan to remove this item from the point system in this course. In lieu of E0, students were given review materials to reinvigorate their knowledge and use of pre-requisite materials.

Results

While my expectation was that awarding points for assigned problem sets would improve student performance slightly in CHEM 377B (i.e. within one standard deviation of that

observed in previous classes), class average scores on exams remained unchanged or declined slightly from 2014-15 values, with the same exams being used in the fall 2015 semester as in the fall 2014 and spring 2015 semesters (with minimal changes made to either [a] clarify the questions being asked or [b] replace specific molecules about which those questions were being asked (some students were retaking the course, others may have heard about specific molecular structures included on previous exams). For example, the class-average RAW score on Exam #1 was 42.0 ± 20.5 % in fall 2015 compared to 42.7 ± 23.6 % in spring 2015, and the class-average RAW score on Exam #2 was 53.5 ± 19.1 % in fall 2015 compared to 61.7 ± 23.9 % in spring 2015. In the end, the class-average score on the ACS-style final exam[1] was 43.5 ± 9.4 % in fall 2015 compared to 51.0 ± 14.2 % in spring 2015, representing a significant decrease in semester-long student retention.

Discussion

Based on my single-semester assessment of awarding points for completing assigned problem sets (for the first time in several years), it is clear that no significant improvement in student performance resulted from this change, as I expected. Indeed, physical chemistry students who heed their instructor's hints and suggestions understand that applying lecture concepts via problem solving is essential to exam and overall performance in physical chemistry courses. In addition, if secondary modes of earning non-exam based points in the class are available to students (such as quizzes, see below), students earning less-than-acceptable exam scores may "earn" a passing course grade (C-) while clearly not reaching an acceptable level of understanding of course materials.

Rather than continuing this practice, I will instead continue to administer in-class (pre-announced) quizzes on lecture material throughout the semester, thereby providing students with non-exam based points in the course and allowing continual assessment of students' motivation to keep up with presentation of course materials, which has proven a strong indicator of which students are studying course material as it is presented and which are "cramming" over the 1 – 2 days prior to exams. This mode of assessment has proven effective in a myriad of chemistry courses (organic, inorganic, physical,

biochemical, and analytical) and has consistently received positive feedback from students as a motivating factor in their weekly study habits.

Follow-up Actions

In future offerings of CHEM 377 (both A and B) I will NOT award points for the completion of homework/assigned problems. Rather, I will continue to administer non-"pop" in-class quizzes (as noted above), while also exploring alternative assessment techniques. This may include course projects, as done in previous offerings of 377A/B; the implementation of "social homework," as preferred by our colleagues in Physics & Astronomy; and/or the implementation of a "game-based" curriculum/point system, as reported by Daubenfeld and Zenkar [J. Chem. Educ., 2015, 92 (2), pp 269–277], the latter of which was shown to increase average student study time (outside the classroom) by "more than 3-fold" to an average of 4.6 hours per week.

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[1] The ACS does not produce exams for Fundamentals courses, such as the CHEM 377 sequence. Like ACS exams in other courses, this exam is a cumulative examination consisting of 40 multiple-choice questions taken from an ACS database or designed by me to result in an average class score of approx. 50% correct answers, with a given time of approx. two minutes per question.

Modules and Discussions on Piazza

Module 1: Our Students Today

There are two main areas to jump start our discussion: both deal with the device-phillic millennial generation.

When planning your courses, do you take into consideration who you are teaching? Did you know how many hours a student works outside of class, how many units they take as STEM majors, how long it takes them to graduate, how their career goals change from entering freshman to graduating seniors, how important technology/multitasking is in their lives?
Will any of your teaching practices (i.e. amount of homework or other tasks assigned, the way that you try to connect with students, etc) change because of viewing these content topics? Why or why not?

The students today love their gadgets (and so do we!). Smart phones, laptops, twittering in the classroom.... What are your policies of allowing technology “toys” (i.e. cell phones, ipads, internet, twittering, etc) in your classroom. Are they always a distraction? Should we embrace them and try to use them for the power of good? Can multi-tasking really happen?

1.1. Eric Sorin

Hi all,

I found this video quite interesting and will happily spend today's free time (??) posting a comment for you to consider. I'm not sure how lengthy our comments should be here, so I'll keep this first post relatively concise and linear ...

I find the statement "18% of my teachers know my name" very interesting, but I'm not sure to what degree this has changed in the last 200 years of academia. Personally, I make it a goal to know each and every one of my students' names in the first two weeks of class, and they really respond to that. First, it shows them from day-1 that I'm paying attention to them individually and, hopefully, that I care about their success in my course(s). Second, it allows me to "drag" students into our classroom discussions (not "lectures") at any point in time, which motivates them to stay attentive during classroom discussions (who wants to be singled out for FaceBook'ing in the middle of a lecture/discussion?). The fact that they're paying attention, and that I'm periodically reaching out to them by name, not only keeps them on track, but also helps them determine when they've "lost track" of our discussion, which leads students to ask questions when they feel lost or think the material is contradictory in some way, and which almost always leads to further questions, related or otherwise, by other students.

[Side note: During my pre-tenure peer teaching evaluations, I was asked by multiple colleagues "How do you know all of their names so early in the semester?" and this was commented on in nearly all of my RTP evaluations ...]

1.1.a G.P.
A lot of what these readings claim for millenias as their unique properties look awfully familiar to me. These are exactly the people I was an undergraduate with.

There is a tendency for us to forget what our peers were like, because our peer group has been systematically selected from graduate school on into the professoriate to be ... well, who we have turned out to be. Studious, patient, independent, tenacious.

Dirac would have been a World of Warcraft player, had such a thing been available. As it was, he was facsinated by the Sonny and Cher show.

Didn't Socrates complain that students in Plato's generation were not studious, serious, etc? And, Plato complained about Aristotle's generation of student, and so on right up to today.

My experience is that students ...in all of their energy and diversity ... have been a constant ensemble for a long, long time.

1.1.c S.D.
This is a great observation Eric. I also find it very useful to know the names of my students. This way we send a message that they receive a personal attention and of course facilitates the in class discussions . This approach will ofcourse work only with small/mid size classes.

1.1.d E.M.
Eric, my own comment on the statement "18% of my teachers know my name" is that just like you, I have also made every effort to get to know my students. I have to share a story that happened to me about 8 years ago on this campus. I had a student who took my course and had problems passing both semesters of organic chemistry. I would say she probably repeated the course more than 8 times if not 10. Because of this every organic chemistry faculty member knew her by name. Well it turns out she did not do well in my class receiving a D. Several years later she came to see me to ask for a letter of recommendation for medical school. I replied "it would not be easy for me to write you a letter since you received a bad grade." I requested that she talk to other faculty members in the college who she may have received a better grade. She emphatically said, "Dr. Marinez, you are the only one who knows me and has spent time talking to me." This has continue to resonate with me even today and has driven me to get to know

my students beyond their name.

I was fortunate that I spent my undergraduate education at CSULA where class sizes were relatively small permitting interactions with faculty members. Upon graduating with my undergraduate degree, I recollect that every faculty member knew who I was. I will be honest and say that I was not a very good student early on because of my own personal distractions. However, many saw my potential and many continued to pressure me to recognize this for myself.

In comparison, students from the UC system believe that they are just a number. In contrast, I have had the opportunity to engage with many faculty and students at the community colleges. They all have expressed how more engaging their sciences classes have been in comparison to CSULB. The students taking chemistry at the community college take both the lecture and lab with the same faculty member. At some schools, the lecture precedes the lab and the students walk with the instructor to the lab.

As the video suggests, this lack of communication is strongly correlated with very high student to faculty ratios. Students at the community college receive the smallest and the UCs the largest. From my experience with transfer students, it takes them a semester or two to acclimate to the differences experienced at the institution. I have often told those closest to me that they were highly patronized at their community college.
1.1.e R.B.

Note that the video showed students in a large lecture class that likely seated a couple hundred souls... knowing 18% of those people is relatively equivalent to knowing 100% of a regular sized class (which Eric clearly noted above is a notable accomplishment). Anyone here ever memorized all 100% of their large lecture course roster? I'd like to meet them.

Just as a note: I've actually had some students specifically say that they enjoy the anonymity that the large lecture provides them. I wonder what percent of student agree. I'm not condoning it - just pointing it out.

I wonder what the stats are for faculty knowing their student in standard-sized classes (say, under 40 students/class)... Certainly a faculty member only knowing 18% of that population is a crying shame. Does that really happen?

That leaves me thinking about large lectures versus 40-person classes. does out campus have enough classrooms and hours in the day to accommodate breaking up the large lectures into smaller classes? Based on my recent experiences around campus, our facility is pretty packed. We are beyond capacity and large lecture are a way to relieve some of that issue. So for now, they are a necessity unless we reduce our enrollment (not a popular idea).

It is difficult to compare the community college, CSU, and UC environments to each other, since their purposes are clearly different. Community colleges are intended to

coddle their students... it is an institution that is supposed to be accessible to everyone - whether they finished high school or not or intend to pursue a degree or not. (Recall the hot topic is that community colleges are to become free again to everyone, just as they had been a couple generations ago). In contrast, the CSU is the working man's university - a filtered population of folks who intend to get a degree (clearly with a purpose towards getting a job in the general workforce). The UC is a seen more as a research institution: more theoretical, and less directly applied.

Community college has become High-School part 2 for most folks. Just as the article said, this generation is delayed in their maturity... so they are not really mentally out if high school until grade 21 (instead of grade 18). Can we at the CSU level expect them to think at that higher level with their brains are not ready for it? I certainly can't as my 1st grader to do 4th grade stuff... I know my comparisons are a little hyperbolic, but I hope you see my thought. Is it OUR responsibility to get the student up to the speed WE expect, or is it OUR responsibility to dumb-down our lecture to accommodate this generation's average learning level? Or is it the STUDENT's responsibility? Or the parents who made the initiative to bring them into this world, but generally don't take the full responsibility of raising their child, part of which is preparing their child for the outside world? hmmmmm.....

1.1.f G.P.
My understanding is that community colleges far from coddle students. Students that make it through that system have done it (particularly in STEM) without a lot of support. We only see the ones that manage to tough it out for themselves.

1.1.g R.B.

Galen, I hear that. Man, I REALLY want to survey my colleagues who work at multiple community colleges along with CSULB. On an equal class offered at both institution types, are the expectations the same, or not? How about the texts? How about success rates as students move up the ladder? Got me thinkin'! (isn't that the point?)

1.1.h G.P.

The standards of success are remarkably different, and strangely the same. CC measures student success by the number of AAs they award ... so 2 years of GE, and transfer to CSU. That is a disaster for us in physics ... probably everyone else too, because you still have 8 semester prerequisite chains to run through.

The classes are the same (even more rigorous in some cases, because faculty in the CC are *very* sensitive to appearances that they are too sift, just as we are sensitive to comparisons to UC courses). It is the advising that is remarkably weak in the CC, particularly for people who want to be physics majors.

1.1.i G.S.

I teach at a community college in addition to my work here at CSULB. I've also worked in the UC system. What I have found is that at all levels, the top students are pretty much all the same -- their levels of motivation and preparedness would make them successful at any level of education. The difference can be found in the rest of the class -- the middle and lower performing students. Comparing CSU students to UC students, I find that the range of performance is broader; with an even broader range for CC students. I do not reduce my expectations for my CC students; but much more class time is devoted to bringing these students up to speed. A topic that I can cover in a 75 minute lecture here takes 2 hours at the CC level.

As for Rebecca's assertion that CC is High School Part II for many students, I'm not sure that I would altogether agree. There is a keen sense that it *is* a different experience from high school, but for many of these students, their high schools have not properly equipped them to deal with the responsibilities and rigor of college level courses. They are simply bringing underdeveloped skill sets -- the proverbial knife to the gunfight. It's not that their brains aren't ready... It's their background.

This definitely goes back to the original theme of "knowing one's students." It's important that we recognize the limitations of our students' backgrounds.

1.1.j E.M.

Rebecca,

What I have found from my experiences with community colleges, is that course standards are quite variable. Galen, is also correct in that we do see students who have persevered and are more resilient. Through HSI-STEM, I run a research program for transfer students who will conduct research prior to starting their degree program in the fall at CSULB. I also taught and co-developed NSCI 390 for transfer students. I require the students to write a personal statement which I ask them to turn it in 3 times for editing and critiquing. Trust me too many stories to share. But I will say that I had an AB 540 student who took 10 years to finish his AA at ELAC largely because of financial circumstances. The kids is very bright but he is sometimes unable to reach his full potential because he is constantly concerned how he will feed himself and pay for school tomorrow.

I unfortunately have to share that attending a community college is becoming the norm. Many students do not get accepted into their first choice institution. Often they must need to relocate to attend the university that have accepted them. Because of limited financial resources, many decline to attend these universities and instead attend a community college that enables them to commute. Just to give you an idea of what we are dealing with, 97% of all community colleges in California are HSIs, 75% of CSUs are HSIs, and 44% of UCs are HSIs (excluded UCSF since they have no undergraduate degree programs). Data as of 2004, for first-time Latino students, 75% will attend a community

college, 8% a UC, and 17% a CSU. Of the 75 who attended a community college, only 7 will transfer, 1 to the UC and 6 to the CSU.

1.1.k G.P.

Given these statistics, it is very important that we in the CSU give CC transfers the best possible odds of success.

1.1.l N.O.

Sorin- what are the class sizes you memorize? I could not do it with a 200 person class. But most of my other classes are only 25 max, which is no problem.

1.1.m E.S.

Yes, 200 would be difficult ... last semester I had 104 students in two PChem courses and had them all down by the end of week 4, but I knew some of them already. I think up to 100 is doable, but definitely work ;o).

1.1.n N.G.

In addition to my work at CSULB, I am also teaching at Irvine Valley College. I enjoy the challenge of teaching large classes at CSULB, but I also have an appreciation for teaching at the junior college level. At CSULB, in the large class I miss the student - professor interaction.

I find the standards at IVC to be equally as rigorous in both general and organic chemistry, if not more than ours at CSULB. The difference in my classes is the time I have to spend with the students. Teaching both the lab and lecture that follows, I have 8-9 hours a week of class time. During this time I have the opportunity to interact with the students, help them with homework problems and follow up after the lecture and exams on difficult concepts. I think if we had smaller classes at CSULB in our chemistry classes, we could improve our pass-rate to 70% of our students.

1.2 Kuan-Wen Chuang

(A) When planning your courses

1. Do you take into consideration whom you are teaching? Based upon the classes I am teaching, I will know that the students who are taking physics 100A or 100B are non-science major students (for instances, biomed, law, music,..., and biochemistry major.) If the students who are taking physics 151, 152 (lower division classes) or taking physics 320,..., (upper division classes) are science major students. I will know that some are from physics major and some from engineer major.

2. Did you know how many hours a student works outside of class? When the students came to talk to me, I would ask them in the beginning, say, how many hours per week they did for the part job (generally are about 20 hours per week) or full-time job. Particular I used to have a mother student who need to take care of kids and family most time.

3. How many units they take as STEM majors? Most of the students took 12 units, but a few of them took 16 units.

4. How long it takes them to graduate? I did not ask them how long they will take to graduate, but I asked them mostly when they would graduate.

5. How their career goals change from entering freshman to graduating seniors? I did not ask them how their career goals change from entering freshman to graduating seniors, instead, I asked them mostly what they would do after they graduate, either go to graduate school or find a job.

6. How important technology/multitasking is in their lives? Generally speaking, technology is very important in their lives. It is relatively easier to find jobs if they have some technologies which they learn from school. Multitasking is also important, because the job marketing is not so good for the students to earn enough money from one job.

7. Will any of your teaching practices (i.e. amount of homework or other tasks assigned, the way that you try to connect with students, etc.) change? because of viewing these content topics? Why or why not? We have a consistent weekly on-line homework and quiz for all the sections of physics 100A or 100B (wileyplus) with one coordinator and also weekly on-line homework for all the sections of physics 151 or 152 (webassign) with one coordinator. Before end of semester, I will give some more problems to the students to exercise during the weekends before the final exams, in addition the review section in the final week of the semester. I tell the students that if there will be given 4 problem-solving questions for the final exam, three will be from homework and lecture and one will be a challenging question which is also within the lecture materials. The students like to have more exercises, in addition to the weekly assigned homework, because of some possible reasons: (1) They could obtain more confidence about the application of the physics theories they learned. (2) They might expect that those additional exercises could be the problems for the final exam.

(B) The students today love their gadgets (and so do we!). Smart phones, laptops, twittering in the classroom....

1. What are your policies of allowing technology "toys" (i.e. cell phones, ipads, internet, twittering, etc.) in your classroom?

(a) Not allowed: For the tests, answering questions for iclicker. Silent for cell phones or smart phones.

(b) Allowed: For ebook reading, for writing lecture notes or take the pictures from the whiteboard during the classes.

2. Are they always a distraction? Some of them use them to log on websites for something else or doing something else, except for ebook reading and for writing lecture notes.

3. Should we embrace them and try to use them for the power of good? We may use them for the power of studying and learning not for the cheating in the tests.

4. Can multi-tasking really happen? Personally I would say that it is difficult to have multi-tasking happened, because I use the power point to show the teaching materials to the students and also use iclicker for the students to answer questions about what they are learning. I then do not have enough time to show more information which is related to the class teaching through internet (for instance, to show the video from youtube about how the superfluid created for physics class 320 (thermodynamics)). Of course, I would like to have multi-tasking happen if I have enough time during my lecture time. The students can also learn more related information through those toys at home (The physics department has provided some kinds of physics video for students to learn physics through internet).

Module 2: Classroom/Course Assessment

OK, we are off to a strong start with describing our classes, students and approaches we use. Now, I'd like us to turn our attention to the next module on assessment, which is now available on beachboard. The idea of "backward design" may be new to some of us, so it is included in the first article on beachboard (with some relevant links). To start us off this week, I would love if we could all share our approach to assessments in our different classes. For example, if you teach a large lecture class do you use scantron? If so, do you use the Parscore in the ALS which allows you to do item analysis? For upper division courses, what kinds of assessments are you using? How do you work to close the feedback loop quickly so that you know what students are learning. Another key unknown is how to make assessments measure the engagement of students with the material (and not just exam performance). Let's discuss..!

2.1. Gary Shin

I have a large class -- 400-450 students spread over two lecture sections. Assessment has three components: (1) I use the publisher's online homework system, called Smartwork, as a formative assessment. These assignments are due weekly as we cover the corresponding chapters in the book. These assignments are open-book and account for 22% of their total grade. (2) Lab quizzes cover the material in the labs. These are administered through Beachboard. Each lab exercise has a question pool of approximately 50-70 questions and student quizzes are made up of five randomly drawn questions. These, too, are open book, and make up approximately 18% of the final course grade. (3) Summative assessment comes in the form of four in-class multiple choice exams. These are scored with Parscore in the ALS.

2.1.a R.B.

Parscore is a tool that I have never used, but hope to. How, exactly do you use the data you get from Parscore? Perhaps to throw out a question or to know to reword it next semester? If so, what thresholds do you use to determine when to throw out a question?

2.1.b S.D.

Hi Gary, thanks for sharing. Could you please elaborate some more on the outcome of your Parscore in the ALS? For instance, what type of infrmation do you obtain from your analysis and how do you use them?

2.1.c G.S.

Parscore is very useful because you have access to all sorts of data. Performing an item analysis, for example, shows you how many students answered each question correctly, as well as which answer choices were most selected. It even breaks it down by overall performance (e.g., the top 25% of students got this question correct xx% of the time). This allows you to see whether students are struggling with a particular concept or whether the question itself is poorly constructed. Unfortunately, this became very burdensome for me, since I have four different exam versions (and therefore had to

perform four separate item analyses for each exam and then manually compile the results). Its utility ended up not justifying the effort (1) because my exams are summative assessments and (2) they didn't help me to write better exams since I write new exams for each semester. Currently, the data I gather includes class performance data, including histograms and percentile distributions. However, for formative assessments or for those instructors who reuse questions for later semesters, the item analysis functions would be extremely useful.

2.1.d S.D.

Thanks a lot for the new post Gary. Just to add to your wonderful note, I personally use itemized analysis to detrmine what were the topics that my students **DID'NT LEARN WELL.** This gives me an opportunity to revise my approach accordingly and address the problem later in the semester (for midterms) and/or in following semesters (based on the final exam).

2.2. Kuan-wen Chuang

n-Classroom Assessment Techniques
iClicker-ConcepTests, On-Board Exercises and Feedback Exercises
I noticed that some of the students brought laptops sitting far back in the classroom, some of them brought physics lab reports to work on, some of them never showed up……., etc. during the physics lecture. Of course, most of them were sitting in the front of the classroom and ready to learn physics. I wished them can learn understanding the physics concepts and knowing how to apply those theories, formulas, concepts to solve the problems during this one hour and 15 minutes period of lecture.
Why use the iClicker-ConcepTests, On-Board Exercises and Feedback Exercises?
The instructor obtains how well the students understand the key concepts and how well the students learn how to apply the concepts to solve the problems in a STEM field prior to, during, and after instruction.
The students have an opportunity to enhance teamwork and communication skills.
The instructors obtain the class attendance and attitude toward the course.
What are the iClicker-ConcepTests, On-Board Exercises and Feedback Exercises?
With the help of iClicker, test questions in a multiple-choice or short-answer format are given on the board while students have common misconceptions in mind.
The instructor guides students with the theory to apply to the Problem-Solving question on the board. Then ask if anyone of the students is willing to continue to work out the detailed to solve the problem. (Most of them obtained extra credits to work on the board)
The instructor assigns similar or related exercises (for extra credits too) from the textbook for them to work at home without copying the solutions from books and turn in next lecture.
What is involved?

8. **Instructor Preparation Time:**
   Very little time is needed as long as well-prepared in class.
2. **Preparing Your Students:**
   No training is required. iClicker is required.
3. **Class Time:**

Varies with length. ex., 5 seconds to 1 minute for each of iClicker questions.

4. **Disciplines:**
Appropriate for all.

5. **Class Size:**
Appropriate for all.

6. **Special Classroom/Technical Requirements:**
Audio and video equipment are required.

7. Individual or Group Involvement:
Normally individual, but could also be adapted for use with small groups.

8. Analyzing Results:
Data analysis is performed by the iClicker program. Instructors receive summary data, including attendance.

9. Other Things to Consider:
Encouragement with extra credits is included in the CAT. It is hard to predict how much material will be covered
in a lecture. It may take a sustained effort for an instructor and class to become comfortable and work effectively
with the iClicker-ConcepTests, On-Board Exercises and Feedback Exercises.

2.3. Shahab Derakhshan

Dear all,

Just reminding you that this is the final week of our discussion on assessment, which is our second module out of four. I would appreciate it very much if you send your posts by the end of today so we can have follow up discussions as we had in our schedule.

2.4. Galen Pickett

Assessment is not an easy topic. Essentially, we are being asked to measure learning ... but that is a very sophisticated project in psychometrics. I do my best, and what seems sufficient to me ... but even an item analysis has to have pretty sophisticated statistics associated with it to extract meaning. We do sometimes mistake quantitative for significant.

My big assessment in PHYS 151 as a course is how it acts as a recruiting tool for the physics program. The number of physics majors has increased by a factor of 4 over the last 10 years, the classes have reasonable grade distributions (about 80% pass rates, and there are no achievement gaps is important). The strength of the curriculum at the 100 level is strong enough to support upper division coursework in physics. None of this will be acceptable to Brotman Hall as a proxy for assessment, though. Or, the CNSM dean's level, for that matter.

2.4.a S.D

Thanks Galen for the post. For the large classes that are taught by multiple instructors (even in different semesters), do you have a common set of student learning outcomes? I would personally like to know about the mechanism that you guys apply for this matter.

2.4.b G.P

...each course has a SCO, and each course has the same honework due at the same time for the same credit each week. Other than that, we expect the faculty to bring their own expertise and style to their instructuon. Kuan-Wen can let you know how that "coordination" feels ... we teach different sections of the same course, use I CLICKERS about the same way.

...and one of our common student learning outcomes is that students will *like* physics. We know they do...because we ask them. Despite not liking the book, and agreeing that they are working *very* hard at something that is *not* *easy*, they finish their experience in PHYS 151/152 liking the field.

We sample student affect scores pre and post instruction.

If we ever get serious about retention in STEM, thus is going to be a part of the solution.

2.4.c S.D

This is very interesting and I cannot be more agree that the 100 level classes play a major role in making them interested. Does the "like" factor apply for the entire population or mostly the physics majors/minors? One aspect of this observation might be related to the fact that those who choose physics really like the subject and they want to become physicists and therefore are more motivated and more committed. However, many students who choose other fields of science (Chem, Bio, etc.) want to become MDs, Pharmacists, etc and when they learn that this is not for them, loose their motivation. I wonder if this also plays a role.

2.4.d N.O.

My question for Gary and Galen is how do you guys do assessment for upper division classes? I can see that analysis of scantron questions can at least give you a rough idea of what questions or concepts they didn't grasp, but in upper division classes where (I assume) you have more written, multi-part answers to problems, I feel like it is sometimes harder to know whether the concept was tough for students, or if my question was ill-phrased...

2.4.e G.P.

I teach all of my upper-division courses in AS244, so I get all sorts of opportunities to give students tasks to do on the walls ... it is pretty obvious to me if my point got across or not. They work like the devil on those whiteboard walls, even though they don't get graded on what they do there.

...so the formative assessment is built in to the way the room is laid out. My summation assessment is a portion of a physics GRE exam covering the mechanics and quantum material the students have taken. There is some spread, but students answer questions

correctly at about the same rate as the national sample from that year. That is just a final check, though.

grade upper-division problem sets myself, again with a strongly formative bent. I give 1 point for a correct aolution, 0 if there was a problem. I mark where they went wrong on the problem ... and then ask them to start again. At the end of the course, some people are reworking the same problem for the 6th or 7th time ... but eventually everyone learns how to do the problems. Some do that with a lot less work than others, but *revising* your thinking is an important part of learning, and I want to reward sticking to a problem and eventually powering through, so it would be counter productive to take points irrevocably for making mistakes.

Go and miscalculate no more.

2.4.e N.O.

Hi Galen,

I like this idea of re-working key problems until they get it. being a physics major myself in college, I can see how it would work in that topic (i think in some quantum physics classes, all we did was solve shrodinger's equation over and over again). But for geology (and I imagine some parts of Bio too), i feel like the problem-solving is not as clear-cut. But I will think about how I can merge towards your approach.

it's very interesting to me how the different sciences often have very different approaches and methods of assessment!

just to add- i also agree that in the upper division classes, where you may only have 12 to 18 students, assessment is less formal- you get to know the students' skills and issues pretty quick and can sometimes see what they are getting and what they are not getting. i tend to rely heavily on labs and projects, to see how they can apply the techniques and concepts they have learned, rather than exams. my exams are usually only 10 to 20% of the total grades in my upper division and grad classes.

2.4.f G.P.

...my upper division classes have averaged 50 students per course per semester over the last 3 years ... so I do have to find an efficient way to interact with everyone. The "groups working on the walls" approach lets me focus on what 10 groups are doing, instead of what 50 students are doing.

2.5. Rebecca Bishop

In large lecture MATH 113 (Pre-Calculus) I utilize i-clickers as one method to drive my instruction. The i-clicker receiver device has an indicator screen that shows how many folks are clicking which multiple choice answer 9with an accompanying bar graph showing percentage of students making each selection). One of my favourite situations is when there is a 50/50 split between two answer choices: I display the bar chart to the students and which is an instant catalyst for heated debate. I find these short bursts of debate to be some of the most valuable learning experiences for the students. Students will get so into it, that they stand up out of their chair, lean in and point at the screen, etc... There is no greater sound to an instructor than the cacophony of 175 voices talking over one another using vocabulary such as "vertex," "maximum," "increasing," "extraneous," for example. It has gotten to the point of students putting down money on one-another's answer (between them, of course).

Other types of assessment I regularly use use in that same large lecture class are on-line homework sets, off-line homework sets, exams, and exam self-assessments. On-line homework (publisher provided WebAssign) is worth 12% of the students' overall course grade and is due one or twice a week on Tuesdays and/or Fridays. I find that using the same due dates week after week adds to the consistency and predictability of the class - fewer student forget about due dates that way. We encourage collaboration offer 30 tries for every problem. I find that two of the greatest benefits of this system is that students receive immediate feedback on their effort and can try similar problems by simply clicking a button.

Off-line homework usually consists of a worksheet that the students print from Beachboard, with questions very similar to upcoming exam problems. It is due weekly on Wednesdays and is worth a nominal (3%) of their course grade. We try to incorporate "read this passage from the text then fill in the blank based on what you saw" types of questions on there to remind the students that the text is always there as a resource and that it is assessable to them. There is also some major-concept problem (usually a word problem or real-life based problem). We suggest collaboration on these assessment as well. One of the greatest benefits of this type of assessment is that is it hand-graded by the same graders and in the same methods as will be used in the upcoming exam, as to inform students of what is expected on the high stakes exams. This feedback becomes the major reason for students to choose to do these assignments, and far offsets the very low points-weight assigned to each off-line homework.

After exams (particularly after the first exam), students are given the task to look ober their exam in detail and categorize the mistakes made by type:

9. *Unprepared: You did not know how to do the problem due to not doing your homework or inadequately reviewing for that part of the test, or taking other steps which would have prepared you.*
10. *Concept error: You really didn't understand the concept behind the problem (you did not know how to approach the problem).*

11. *Careless error: You knew how to do the problem, but made a simple mistake that should have been avoided (such as copying expressions incorrectly, forgetting negatives, missing units, forgetting to distribute, etc…)*

Students then fill in a spreadsheet that shows which errors were made on each problem, accounting for all points missed on the exam. Not only does this force the students to review their exam, but it also forces them to look at how they can improve for future exams. How may times do we instructors hear, "I just made a lot of silly mistakes?" This task forces the students to see if that is really an accurate statement, and also to quantify what they mean by "a lot." In many cases, students are surprised at what they see.

Despite the size of the course, I still give short answer and open-ended show-your-work type exams. There may be a very few circle or fill-in-the-blank type of questions sprinkled throughout, but the majority is not. It is very important that the students' work matches their final answer. I find that the logic behind doing the problem is just as (if not more) important than the final answer. Also, I am a big advocate of having the students use units on their answers (as appropriate). A student who does not put appropriate units on an answer really has little clue what (s)he just calculated. To be sure, it takes a team effort to grade these and turn them around within one week. To maintain consistency, the same person grades the same problem for the entire exam. While grading the rubric stays consistent and students who make similar mistakes are given the same credit, and student who get through certain "gates" of the problem are also given similar credit. Problems are based on off-line homework (see above), WebAssign (see above), and are extensions of lecture notes. We purposefully put an array of level of problems on the exam including identify, show, etc., but by far my favourite type is *create and invent*. For example: "Invent a function whose domain includes all real numbers except -3 and 7." There are multiple correct answers, each at a very high level of thought. This type of question was never directly presented to the student prior to the exam, but is certainly related to the lower-level though question "here is a function, tell me its domain." These synthesis type questions usually differentiate the A's from the B's in my class.

2.5.a G.P.

I teach a similarly sized lower division course, and I *never* give m/c exams. I take home 170 blue books on a Friday, and return them graded on the following Monday ... I do have some tricks to efficiently grade these open-ended problems.

The first thing to do is to triage the papers ... "almost right" "almost totally wrong" and " the middle". Only the "middle" is really hard to grade.

2.5.b N.O.

Rebecca-

I really like your idea of having the students look back over their exams and evaluate why they missed the problems! I need to try that.

When you do that, how do you use the spreadsheets? Do you ever adjust problems that they seem to mis-understand? or is it mainly for the students to see what problems they need to work on?
I have done something similar in a scientific writing class- I make them look at my edits and make a list for themselves of common problems and things they have to work on, but I have never thought to do it with stuff other than writing.

2.5.c R.B.

Yes, we have a pre-prepared spreadsheet for the students to fill-in. Then there are follow-up questions which ask the students to analyze their data. I found this technique while observing student/master teachers at Millikan High School in LBUSD. I'm more than happy to share! It is a great quantitative tool.
Trying to find a place to post it on Beachboard and/or Piazza and cannot seem to find one. Send me your e-mail and I'll share.

2.5.d S.D.

This is great idea Rebecca, "**learning from mistakes**" is an essential part of the learning that many students tend to ignore. For a very long time I had problem to have students go over their tests with me in CHEM 111A. Recently I have stopped returning their tests and only give them their scantrons back. The TAs and of course instructors have a copy of the tests and our office hours are now more popular than what they used to be.

2.6 Eric Marinez

I teach one of the more notorious courses at the university, organic chemistry. Our challenge as a division has been to teach the course as consistently as possible. We have developed SCOs to facilitate this but I will add were initially constructed as a rigid and strict approach to ensuring consistency and "precision." We have everything in the SCO from order of topics, to grade distributions, and to allocation of points allotted to exams, final exam, quizzes and problem sets. For exams, there is even an allotment of points for multiple choice questions. Personally, I felt that the SCO did not give me the flexibility I needed to address student learning outcomes for my course and to try new approaches to teaching.

To be a team player, I shared with all that I wanted to try giving 4 midterms instead of 3 and because I would lose a lecture I was not going to give quizzes. As I shared before, my objective with FLC is to learn to incorporate more assessment by using i-Clickers in the fall.

I am very receptive to student assessment and evaluation. My problem has been that I have not been trained to know how to do this. The institution should create workshops for faculty to learn about this and at least require all junior faculty at the university as a requirement for tenure. We are all so busy and conducting this as a formal workshop that

is not on-line will ensure participation. I dislike online courses. I have resented taking drivers training online as well as harassment and responsible conduct in research on-line.

Currently, the only assessment that we do in organic chemistry is give the American Chemical Society exam as our final for the second semester organic chemistry course. It is a comprehensive, multiple choice exam and combines questions for the two semester sequence. The exam is for 2 hrs and has 70 questions. We are fortunate that it is a test that other institutions use and has an assessment on how students score nationally so that we can compare how our students do in relationship to other institutions. With a larger data set of students who have taken the exam, there is data that showcases the frequency of questions answered correctly for every question. To be candid, I don't think we use all this assessment information to its full potential. The ACS even offers us the opportunity to submit our scantrons to them so that they can provide the service of assessment for individual questions. I know of only one colleague in the division who has used this resource. Unfortunately he has had awful passing rates and uses the ACS exams as a reason to justify the need to be more difficult. The rest of us tend to report on the exam on where we compare with the national average. To share we are average.

In contrast, my midterm exams are all written. My exams for organic chemistry requires students to demonstrate that they can draw chemical structures. This includes representing structures in 3-dimensions using a variety of models for projection. It also includes conceptual questions on how structure dictates chemical reactivity. There are often questions on how a reaction proceeds by delineating its reaction mechanism that takes into account the energetics of the reaction. Two other very high level learning objectives in the course is asking students to construct the most efficient synthesis for a molecule and to elucidate the structure of an organic compound using IR and NMR spectroscopy and mass spectrometry.

Writing a midterm exam often takes me a long time. Mostly because I lose sleep realizing if I wrote an exam where students are able to do.

I have yet to look at questions individually to see how students answer them.

By the way, I am very impressed with this module. There is a lot of excellent information in it that I would like to use and learn more. My problem is during the semester I am swamped like most other faculty. I do believe we are challenged by balancing teaching, research, and service.

2.6.a N.O.

Eric-
I'm surprised to hear how organized the organic chemistry class is. Especially the part about they taking a ACS exam. Does this limit you at all? do you feel like you are a K-12 teacher teaching for an exam? or do you like it? I feel like I can see both an advantage to this level of organization and a disadvantage....

2.6.b E.M.

Nationally, this has been what many would call a high-failure rate course or gate keeper. Several years ago when i was a junior faculty member, a meeting was held with the deans in the college and the division to address the severity of our problem of not passing an appreciable amount of students. I made the recommendation then to institute the ACS exam as our final so that we could demonstrate student performance in our classrooms. I am proud to say that I have had 4 students earn a 100 percentile with one of them getting a perfect score. Interestingly, the student that scored a perfect I knew he was going to do this even before he took the exam. It was not because I taught students the test, it was because of his performance on all my written exams and the questions he asked me during class. None of us teach for the exam and instead we all teach the material from our textbooks. Most of us teach conceptually and challenge the way students think and approach questions. It is an excellent course to teach problem-solving and critical-thinking skills but with the breadth of information contained in textbooks, I simply do not know how to flip a course.

I did find myself needing to change some of my lecture material for the exam. But in my view, it is a very minor limitation. For example, I use to teach at the end of the second semester as special topics chapters on carbohydrates, amino acids and proteins, and lipids. I have had to limit the amount of material I cover in the last two chapters because I needed to include coverage of polymer chemistry. One of my colleagues believes this exam has several questions on polymer chemistry since it has been a financial engine for the ACS.

I have never felt like a K-12 teacher. The concepts in the chapters of most standardized textbooks of organic chemistry are very developed. There are many topics I teach that I will never put on an exam but are critical to the overall understanding in the course.

I am on the fence in regards to the use of the ACS exam. We have used it for at least 7 years and I am not sure what I have learned from it. A big part of this is that a large division of 7 does not convene to discuss assessment in our courses at least semester by semester.

Thank you for your questions.

2.6.c R.B.

One thing we (several of us) MATH 113 large lecture instructors do to maintain consistency in grading is to write and grade out exams together. A single person grades the same problem for the entire exam.

Another thing we do it to keep data on student performance on each problem of each exam. Each student exam has a cover sheet that is for data collection only. It is a line-item of parts of the exam problems, that are coded in a way that is meaningless to the students but meaningful to the graders. We then connect the problems on the exam to the

student learning outcomes. Lucky for us, we are the department of mathematics and STATISTICS and have some of the stats faculty working on out project to track/connect the data collected from the exams (as well as on-line homework scores, ALEKS completion, and off-line homework scores) to student learning outcomes and determine which exam problems, homework sets, etc... make the best predictors of student success in our classes. Last year were surprised to find that students who finished homework assignment w, and who met the weekly objective time requirement were more likely (with statistical significance) to succeed in the course than students who did not. I was quite surprised that the exams were not among the greatest indicators of student success in passing the course.
To be sure, collecting this data adds a couple hours to he grading process, but we find that the insight it affords us is quite worth it.

We can also track student growth and progress toward the learning outcomes as the semester goes on. (the same SLO's are present throughout the semester and tested exam to exam).

I second Eric's post about this module being a welcome abundance of information and resources. I noticed that Beachboard indicates the module ends Mar 15, 2015 11:59 PM. does that mean we will lose access to the links and resources after the weekend? If, so can it be extended? Or am I misinterpreting the date?

2.6.d G.P.

Eric, Shahab, and Eric ... what is it about organic chemistry that makes it so hard? I would expect physical chemistry to be the "make or break" course for chemists. Why is organic the "gateway"?

2.6.e E.M.

Students take general chemistry before organic chemistry. The first semester of gen chem is where students learn structure and bonding which is key in organic chemistry. The second semester of gen chem focuses on quantitative problem solving exercises and my understanding is there are multiple chapters that focus on equilibrium. In fact it is very easy to develop a pattern for problem solving in gen. chem. compared to organic chemistry.

Organic chemistry in contrast is almost entirely qualitative problem solving exercises. Students in my classes will never use a calculator on any of my lecture exams. The qualitative problems rely heavily on applying key concepts to explain differences in reactivity and stability. Questions I ask include; "Predict the order of reactivity for the following substrates and explain **why**? **Why** does substrate 1 react by the following mechanism whereas substrate 2 does not? Rank the following acids in increasing strength in acidity. I have reduced the number of questions where I ask why because students 1) could not explain what led to their answer and 2) they could not do

so succinctly. Both synthesis and structure elucidation using spectroscopy are challenging problem solving exercises. I strongly believe that proposing a synthesis for a particular compound is the most difficult problem to learn. Students need to look at a structure and predict appropriate places in the structure where they should dissect to break the molecule into two or more pieces that can somehow be later reacted together. Also the ability to do synthesis relies on the students knowledge of a breadth of organic reactions. Just like a carpenter would have a hard time building a house with just a hammer and nail, students need an arsenal of reactions (the tools) to construct their structure. For example, I often have observed ludicrous syntheses proposed by students because they may know comfortably 5 reactions instead of the 10. If they do not know the reaction I am test them on, they get extremely creative to the point that it does not make sense chemically.

Physical chemistry is also notorious and is probably worse than organic chemistry. Although I have not seen one in a while, when I was a student there was a bumper sticker that stated I past P-chem. I have never seen one for organic chemistry. A major difference between the 2 courses is that only students who are chemistry, biochemistry, and chemical engineers will take P-chem. In contrast, organic chemistry is a requirement for health professions and is taken by a larger number students including biology. It is a gatekeeper for majors outside of chemistry so the organic division gets a lot of pressure.

2.6.f G.P.

Are the questions on the ACS exam similarly qualitative?

The inventory of reactions that a student should know ... are these logically linked in some way ... and does a student have to discover these linkages for themselves? Those are the sort of "backward design" questions I would be interested in. There are questions on the ACS exam that are qualitative. Rank the order of least reactive to most reactive, less stable to more stable, etc. Much of it is based on simple facts. Which reagents will best fulfill the following transformation? What is the IUPAC name for the following structure?

2.6.g E.M.

Your second question is interesting. Most textbooks teach organic chemistry the way many faculty have learned. Most commonly used textbooks are organized by a particular functional group. For example, alkanes, followed by alkyl halides, alkenes, alcohols, etc. Unfortunately this approach does not link the chemical reactivity. A different way, the way I learned, is to organize a textbook by reaction type or reaction mechanism. There is consequently less reaction types than organic functional groups so I believe this approach is easier for the student to learn. Unfortunately, the very uncommon textbook that uses a mechanistic approach does not last on the market for very long because most faculty are unwilling to try something new and uncommon to them. Other than that, I don't know why this approach has not grown in popularity although it has been around since the 60's.

2.6.h S.D.

Galen, ACS tests are standardized and as Eric mentioned we have a large amount of data about the students performance from various institutions. I was the first instructor who used it for Chem 111A, which used to be a problematic course as well. As I mentioned in one of the previous posts, I focused on what my students **DIDN"T LEARN**. I identified topics such as thermochemistry, bonding and structure as candidates for improvement. Accordingly, I spent more time (we had additional lecture and additional problem sets) for those area. A comparison between the students performance before and after the modifications (for all the lecture sessions and independent on who was teaching the class) showed that the process works. We use different versions of the ACS tests and the results are always very similar. I believe a key factor for success in such projects is **consistence and uniformity**. We are giving common midterms to all sessions. Our ~27 labs run parallel and they are not attached to any particular lecture session. We have a single gradebook for all sessions in beach board and only one online course for homework.

Rebecca, I'll keep the access open for our future readings.

2.6.i E.S.

Hi Nate: I was very skeptical about moving to ACS standardized exams several years ago, particularly given that I teach PChem for Biochem majors, or "Baby PChem", with less mathematical rigor (they do use calculus) and more focus on applications in the biosciences: these students are not prepared for the ACS exams that BS Chemistry majors face. I found that by using some ACS questions verbatim, along with some modified ACS questions (poor wording corrected, etc), as well as my own ACS-style questions (add in that critical thinking component!), I was able to assemble what I felt was a solid multiple-choice final exam. Over several semesters, you can get a sense of which MC questions the students are missing, and thereby try to assess the cause, and as I have not "taught the exam" the distribution of scores has been consistent (i.e. 35/40 is a truly excellent score and 6/40 is both abysmal and statistically quite hard to accomplish ;o).

2.7 Eric Marinez

I lead the large HSI-STEM grant, and am co-PI to H2OLA and PPOHA. These are all very large institution grants that require my presence at meetings with administrators and with different colleges. Recently, this now includes conversations with administrators from the chancellor's office. I have taken 2 trips to HSI conferences this semester and will need to attend next month a forum from the chancellor on CSU HSI-STEM programs. On Monday, I presented a talk at the Alliance for HSI Educators (AHSIE) in San Antonio as an effort to showcase the HSI-STEM research programs as best practices. The title of my talk was "Increasing interest and persistence in STEM fields through research." The presentation was allocated for an hour and 15 minutes. To talk for this length, I had to present much of our evaluation plan and our preliminary results. My point

is compared to our colleagues in psychology and health, this college has been steps behind on assessment and evaluation of our training grant programs. I would imagine this may also be true for teaching.

There is growing pressure from the U.S. Department of Eduction for assessment and to identify by evaluation best practices for student development, retention, and graduation. To share their challenge with congress, HSI-STEM is a 1 billion dollar investment over the course of 10 yrs. This bill will end in 2018.

Our HSI-STEM grant ends next year in 2016. I am in the process of thinking of new ideas for a competitive renewal to HSI-STEM so I solicit any ideas with regards to faculty development and resources for teaching. The current grant does provide some of the resources for FLC and I thank Terre Allan for writing this piece in the grant. However, just to share, the objectives associated with FLC by the end of the grant is to showcase a change of 3% more students passing high failure rate courses as well as a change of 3% more Latinos passing the same course. Another words, if the average passing rate for organic chemistry is 60%, the grant wants me to demonstrate the passing rate is now 63%.

2.8 Rebecca Bishop

I teach a rather unique class (MTED 495) that is geared towards student passing the CSET exam in single-subject math, which is a timed multiple-choice and open-ended exam that is meant to prove subject matter competence and take the place of having a bachelors degree in the subject. All pre-service teachers with a degree other than math must take the CSET exam to prove subject matter competence prior to receiving their single-subject teaching credential in math. I give weekly open-ended, show-your-work style quizzes that are in alignment with the topics on the CSET, and purposefully make the quizzes progressively more difficult as the semester progresses. In addition, I embed multiple choice clicker-style questions on content matter within my lessons to assess both content knowledge and exercise multiple-choice test taking strategies. The final exam is a mock CSET with a similar ratio of multiple-choice and open-ended questions that could be expected from the actual CSET, however it is graded as follows:
Partial credit for the correct multiple choice selection (knee-jerk reaction) and the rest of the credit for explaining how they arrived at the answer they selected.
I find that writing a multiple choice exam with interesting incorrect choices harder to write than the traditional "solve the problem and show your steps" type of test. I also have a hard time justifying full credit for multiple choice exams when the outcome could be (in many cases) due to guessing(test taking strategies) and not necessarily content knowledge. I feel that my grading system gives me the best of both worlds: giving the students experience with a format similar to the CSET, but actually more demanding in requiring justification for their choices. I have also worked hard to write questions that do not allow the student to test the choices in the problem, but instead force the student to solve the problem then do something with the solutions. For example: "What is the sum of all of the roots of x^2-x^3-x^2-x-2," is a much better multiple choice question than

"Which of the following is/is not a root x^2-x^3-x^2-x-2?" since the latter lends itself to guess and check while the former requires specific content knowledge and procedure.

In addition to these more formative assessments, the majority of the class meeting time is activity (performance) based. The students work collaboratively on hands-on activities that reinforce the lesson and learning objectives. For instance, "show that 4 great circles cover the sphere" by actually cutting out great circles from paper or fabric and covering a sphere with them, then use that experience to derive the formula for the surface area of a sphere. I have found that these types of authentic exercises make the formulas much more memorable than just introducing them for the umpteenth time. I allow the students to finish portions of the activities at home, and test the concepts the following week on the weekly quiz. In addition, the student are to submit an activity portfolio (I provide a coversheet that includes the ordering of the activities and a self-assessment of completion page) that is due on the day of the final exam. I scan through the portfolios while the students take the final exam, checking for completeness as well as scanning for accuracy. The vast majority of the student in the class receive full credit for these and note that assembling the portfolio the week prior to the final made for good review for the final exam topics. It i also the case that these future teachers are entering an education system that is common-core driven - learning geared toward discovery rather than being told it is so, because "I said so." While this methods class is not a methods class, I feel that giving the student in the class first-hand experience with this style of instruction very valuable (remember, these student were still part of the old take-notes and-mimic-me generation, and have limited experience with the currently popular common core values.) After getting their credential and being hired by a school district, many students have also used the portfolio activities in their own high school classrooms.

2.8.a G.P.

I am a part of the "lost generation" ... my education was entirely lecture, and yet I have had to learn ... discover, really, how to create an active classroom. Nothing in my experience as a student helps me figure out what to do ... maybe a good thing, but there was a *lot* of time and intellectual effort that went into that discovery process, and that definitely took time away from my physics research activity ... and I have paid a price for that in my career. My students will have an easier time of it... particularly the ones that go into 2ndary teaching.

2.8.b E.M.

Galen, I concur. I was also taught traditionally and still have a hard time implementing some of the modern tools in pedagogy. I also spend a lot of time considering how to best teach my students since there is so much more repercussions if I do not have a respectable passing rate. I also find myself needing to give extra credit or regrades for exams which takes additional time. When I was a student, my instructors never graded homework problems or problems sets. Today, students expect to receive these softer points as I call them.

2.9 Nancy Gardner

Module 2: Classroom/Course Assessment
OK, we are off to a strong start with describing our classes, students and approaches we use. Now, I'd like us to turn our attention to the next module on assessment, which is now available on Beachboard. The idea of "backward design" may be new to some of us, so it is included in the first article on Beachboard (with some relevant links).

To start us off this week, I would love if we could all share our approach to assessments in our different classes. For example, if you teach a large lecture class do you use scantron? If so, do you use the Parscore in the ALS which allows you to do item analysis?

Yes, CHEM 90 is a large lecture course, we use five different assessments.

12. Two **mid-term exams** are given, they are both scantron based and timed. Post exam analysis is done by questions and category of question to determine which questions are missed most often.
13. Students have chapter **activity worksheets** specific to CHEM 90, to help them with problem solving skills and to give them an indicator of progress in the course. (TA's are instructed not to teach in activity sections, but rather answer questions and help them solve problems on an as needed basis only).
14. Each online **video has a quiz** associated with it. Students are asked about the video, and asked to use the basic concepts taught in a multiple choice problem. (This is designed to be completed before the lecture on that topic and before reading their Smartbook.)
15. Our Smartbook is an **adaptive learning text**, that is completed before lecture. Students are expected to read the book and do their quizzes via online assessment incorporated within the text.

ALEKS is our online adaptive learning tool. It is responsible for dramatically increasing the student success rate in this course.

2.10 Eric Sorin

I know this is rather late in coming, but has anyone used ParScore in place of ScanTron? If so, I'd love to hear what you felt the benefits and/or drawbacks were and whether you stuck with it!

Module 3 - Engaging Our Students

I'm sure we've all sat through talks and seminars in our field which were absolutely boring - and talks that have nothing to do with our disciplines that we found utterly fascinating. Familiarity breeds contempt, some would say. Let's turn to thinking about our students, and the distractions they have. For that 1 hour and 15 minutes in your class (times 20 something lectures in the semester), how do you encourage students to become engaged and remain excited to learn? What excites you these days to learn new things?

Are you building in class time to practice? Do you use stories from your academic and personal life to stimulate discussions? Do you use demonstrations/videos etc? Do you connect topics with everyday life and "breaking news" items, explaining how science and math can help make informed choices in life? Many things to start discussing under the topic of student engagement...

After reading the articles in module 3, let us know how you make your classes engaging for students, and how you go beyond pedantry. Are there any improvements you want to make in regard to course design/structure that specifically address student engagement in your STEM course?

3.1 Galen Pickett

I will share with you all the most important thing I have learned doing this job over the last 15 years. I call it the "0th Law of Teaching Physics."

Students will only engage in behaviors that are graded.

I know this is a controversial statement in the field of SCED, but it is some thing upon which I have learned to rely.

In this context it means ... if we want students to be engaged, they have to be rewarded directly and immediately in a grade book entry for displaying that engagement.

And ... the engagement I am most interested in is OUT of the classroom. I am plenty capable of holding the attention of a class of 150 students with my glittering personality... but that is just the beginning of what I want to happen. I want students to get "hooked" on working these problems ... and it is too late to reward them only when they have the right answer. There should be something they earn *while* *they* *are* *working* *and* *failing*. In this case I mean failing to find a solution.

So ... what I am looking for is a way to instantly reward a student for attempts and discussions of the material in real time, that I can then turn into 10% of the course grade.

That's why I am so interested in "grit".

3.1.a S.D.

This is wonderful observation Galen, POINTS DO WORK. Could you please tell us some more about your in-class approaches?

3.1.b R.B.

I agree that grades (i.e. academic payout) the the major influence in student participation, just as cash is what drives most people get up in the morning and go to work. However, there are some people (instructors) who are just hands-down more motivating than others. It is a personality characteristic that cannot be mimicked by another without looking insincere. And, trust me, our students can smell insincerity just as wild animals smell fear.

I recall having a sociology class (one I dreaded taking and put off as long as possible), that surprisingly turned out to be among the very best class I had ever taken in my life. Attendance in that class was nearly 100% every meeting. Why? The instructor had the gift for storytelling, and a knack for getting each and every student to buy-in on the topic of the day. There are just some people who have it. I find that I have to look at it like a CEO would look at selling products to the mass market: how can I get my market (students) hooked on my product (math knowledge) ? What makes my product (math knowledge) better than my competitors (other instructors or institutions)? How do I keep my employees (students) happy while the perform tasks that I as of them?

Lately, I've been thinking about how motivational techniques used in the general workforce might translate to a classroom environment. For instance, how companies like Google or Facebook, are able to achieve their high levels of job satisfaction and low turn-over rates, and how I could use that to increase student buy-in/engagement and decreased W rates. Is it the freedom that these companies provide their employees that is a-typical of other companies? If so, then should our students be given more freedom to explore on their own? Unfortunately, that is counter to all the structure on our classes (and our students are likely not to be mature enough to do this anyway). Have you happened to have noticed that the academic freedom of the instructors (at CSULB and beyond) has been diminishing over the past decade or so? More restrictions on pacing, common assessments, etc... While at the same time, ironically, the huge push in K-12 education is a more exploratory, hands-on, real-life buy-in approach.

One of my main mantras is "what will my students get from coming to my class that they will not get from just reading the textbook or watching the movie?" What would I want if I were a student? I wish I had the answer. All I can say is that I seriously think about it each day and hope I can one day get the same results of that former CSULB sociology instructor.

3.1.c G.P.

The danger I face is that I am so engaging in the classroom that some students use me as a proxy for the text. That is ... if they engage with me enough, they don't have to engage with the material. I wish I could do something so that a student would look to *the* *text* as if it was a superstar lecturer. I don't want this to depend on me too much.

3.1.d R.B.

Well, what if we put the engaging/sparking personality on video and have the students watch it at home, then have them engage their peers and the content in class for activity. Flipping the classroom, no? Has anyone tried that? I know a few math instructors have tried partial flips in the past and I know of one who is doing a full flip in Bio Calc this semester. I'm following along to see how it goes with her, and I plan on trying it our myself next semester. Any of you have experience in this area? Advice/commentary? I've gotten advice on video length, follow-along worksheets that are due during the class meeting, etc... searching for MORE!

3.1.e E.S.

Hi Rebecca: Would you be concerned that the same students who fail to do the assigned reading and problem solving (in a classical lecture+homework course) would simply fail to show up for many/most regular class sessions? I suppose making participation worth points addresses this, but I could certainly see many of the less-motivated students showing up without having bothered to watch the assigned video lecture ;o)

I guess my posts are tending to harp on these less-motivated students and how to address their lack of interest and effort. This is a real concern for me ... I'd welcome any thoughts on this topic.

3.1.f N.O.

My opinion regarding Rebecca's comment on putting the engaging lecture online (flipped) is that in my experience, the online lectures are way less engaging. I think I do well in keeping interest in the big lecture classes, but a lot of it must come from reading the class, putting in little side jokes, the occasional personal experience, maybe my excitement about the topics. When I record flipped lectures, I tend to be way more mechanical.

My students have liked the flipped format, and I agree with Galen's problem that if you are very interesting in lecture, the students think they don't need to read the book. I struggle with motivating them to read the book as well, and the only way to get most of them to do that "behavior" is to assign points (in the form of outlines or weekly question assignments) as Galen says.

3.2 Eric Sorin

[Sorry Galen, but this is an In-the-Class response, although I look forward to seeing what others suggest regarding Out-of-Class engagement!]

This is something I've mentioned previously, and it really is only suitable for N students (where N is the number of names you can remember after a few weeks).

1. As I teach upper division courses in the range of 40 – 70 students, I memorize my students' names each semester and call on them by name weekly (at least a dozen students randomly selected per lecture). I call on students most often to address questions in my slides, which we then discuss verbally (and not on the slides), making attendance more than just the reading of information from my lecture notes.

2. I also try to incite lively discussion and debate in my Pchem classes … for instance, "does the photon have mass?" is a fantastic way to get students thinking about something beyond the textbook "rules" and applications. I can then play Devil's Advocate to get multiple students involved, and this kind of discussion often gets the attention of anyone not already paying attention.

3. Engaging is very important, but IMO it's also very important to let students know that it's OK to be wrong … from time to time I call on students who look shy and/or reluctant to participate. My first response is always something like "It's OK to be wrong … we'll only laugh at you for a moment or two!", and such levity ALWAYS breaks the tension ;o)

3.2.a G.P.

The danger for me is that engagement with ME in the classroom does not translate to engagement with the material OUT of class. I try to make classroom engagement lead to engagement with the material... but you need a way to reward a student for making mistakes (and correcting them) out of my presence.

3.2.b E.S.

Hi Galen: I agree completely with your statement here, and this is surely one thing I've struggled with, so I'll look forward to hearing more ideas about out-of-classroom engagement and how it can be inspired. I think this is the real issue is *inspiration*, and that's something I believe we are all constantly trying to depart to our students, but it's clear that some students simply don't want to be inspired and have little-to-no appreciation for intellectual pursuits simply to be stimulated and challenged by course material. How do we overcome the "I just want to pass this course and get my degree without any real appreciation for what I'll be prepared to do after I graduate" mentality?

3.2.b E.S.

I really like Eric's ideas. And I think that when the students engage with you in class, they do actually engage with the topic more, even if it is not always detectable. If they are interested in you, the are getting interested in the topic and that is the jumping off point for learning in my experience.
I agree with both of you that engaging outside of class is hard.... not sure how to do that well.

3.3 Eric Sorin

Speaking of engaging students: I wonder if anyone has tried this new system called Reef Polling (http://reef-education.com/, makers of iClicker) than can be used via mobile device rather then requiring clicker devices? I'm likely going to schedule a demo with them (for sometime after spring break) ... please let me know if you're interested in attending.

3.3.a G.P.

I love clickers ... but I am not touching this sysyem with a 3 meter pole. The very last thing I want to do is to give a student a reason to have their smartphone out. The clicker is a boring device that does nothing except vote (I don't even like the alpha numeric ones, just give me A-E and I can find out anything I need for formative assessment).

3.3.b E.S.

I see your point but I have to admit that I find the added functionality and the device-independent nature of this system attractive. Being able to conduct live in-lecture polls consisting of more than simple multiple choice questions sounds like a great step beyond clickers, and the system boasts several other interesting features ... I'm certainly not sold, but I'll be participating in a demo next week to get more info and examine the limitations.

3.4 Galen Pickett

Ok ... how about I go about this another way...

What is the evidence any of you have that students are engaged with your course? This is different from a laundry list of strategies to get engagement to occur ... can anyone say that (for instance) in week 8 of a course 50% of the student's are engaged?

This ties back into our assessment module ... do I have a way to gauge a particular student's engagement and reward them if it is high, and help them if it is low?

...if our group could generate such a measure, that would be an important step forward for the entire college.

3.4.a S.D.

Galen,

This is a very interesting point and at the same time (probably) a very hard question to answer as each of us may define "engagement" differently. As we discussed earlier, the first step in any effective assessment is to have measurable standard learning outcomes, based on the curricular material. "Engagement" on the other hand (to me) is a rather philosophical concept, for which I personally cannot imagine a formula that works the same for all of us. However, relatively speaking, we can say that in some of our own classes students are more engaged than our other classes. The level of students' participation during the in-class discussions is my main qualitative measure.

3.4.b G.P.

Quantitative measures of engagement might include total delta T for a problem set ... A disengaged student might wait for the last minute. Attending class is probably the 0th order measure, particularly if attendance is only indirectly measured, say, by Iclickers.

I hate to be a walking advertisement for Social Himework, but that systems pinpoints students who are "unplugged". The Social Homework grade is a quantitative measure of participation outside class... A measure of engagement I use in lower division AND upper division.

If engagement can not be measured... or even quantitatively defined ... then it really is just some philosophical idea ... that can't possibly affect anyone.

3.4.c E.S.

This, to me, is one of the most important topics/discussions we could address this semester. Particularly as the critical thinking component is, to me, intimately connected to student engagement.

I like the notion of developing quantitative metrics of student engagement, but I fear the results could be extremely misleading and easily misinterpreted. For instance, some students may tackle a given problem set the day before it is due and spend only 2 hours working the assigned problems, but their attendance and participation during in-class discussions could lead them to be much more successful that students who failed to attend lecture but spent 10 hours reading the text and working the same problems with much less engagement or success.

Moreover, how would such data be collected? Student polling could be acceptable, particularly if done anonymously, but we would still be depending on student honesty

regarding their own study habits and this would really hinge on their own self-assessment of engagement ...

Galen: I'd really like to learn more about your social homework experiences, especially for upper division quantitative coursework!

3.4.d G.P.

I can't seem to post pictures here, so here is a Google+ post:
https://plus.google.com/115624021374660826601/posts/AStWV5Ecikf

I have blurred the image to protect student's identity, but I can clearly identify students who are not participating in homework discussions out of class, and I can act on that by putting people in different groups.

These bubble plots are a part of the analytics package for the tool.

...and all student work is time-coded ... so statistics on the time-on-task are available.

3.4.e E.S.

Your figure caption states: "The students near the origin need help to get engaged ... so I group them with students in upper right. Tracking how a students moves on this graph is a direct measure of engagement... they are working homework problems out of class with each other."

This is a very interesting idea, Galen: it sounds like you're (a) forcing students into "group study" situations and (b) making sure that there are "teacher-students" and "learner-students" in each group. I try to accomplish this verbally, but with no points to motivate it many students do not participate in group study or do not group up well to maximize their teaching-learning complementarity. A couple of questions about Koondis:

1. The Koondis website is not terribly informative and my time now is short: do you supply the problems and let Koondis do the student tracking and group assignments? If so, it seems this system could be used for any course at any level ... true?
2. How much of your time does this require each week and how is that time distributed?
3. Is there any cost to the instructor or students for this system?
4. Are there other benefits that may not be explicitly evident I should consider?
5. How much of the total course grade do you allot for Koondis/social homework?

Thanks, Galen!

3.4.f G.P.

Yes, we are working on the Koondis site to make it clear what's going on.

The problems are not in koondis, I just assign Team 1 does Problem 1, etc. and they take it from there. So, I don't have to create new content each week.

It takes me about 10 minutes each week to make assignments and get grading information. There is no cost for an instructor, and the nominal cost to a student is $35, although there was an IP agreement with CSULB that says CSULB students can't be charged. That does severely limit the number of licenses we make available. If you are interested in piloting something for Fall ... contact Zvonko Hlousek, he is in charge of the "Course Redesign" project for the CO, and they have ~ $4K stipends for instructors.

The best thing for us is to get new people experimenting with the system, so the answer to your last question is I don't know ... yet, and won't know until you experiment with the system yourself.

...and I make koondis count for 10% .. enough so that no one will ignore it, but it won't take a C student to an A.

3.4.g S.D.

My point was about engaging students during the lecture time and not homeworks and that is why I think we can define it differently. As you pointed out many online systems will give you all the details about when they started, how much time they spent on the activity. For assessment purpose there are some systems, which can also compare the performance of our specific classes with national average. I have personally examined ALEKS with MASTERING and I have noticed that each one is better than other for certain purpose.

3.4.h E.S.

Thanks for the info, Galen ... I didn't realize that Koondis was being developed/maintained by the CSULB Phys & Astro Dept. I like the "no charge to CSULB students" policy, even if it is limiting ...

My main concerns here are twofold:
(1) First, I'm somewhat against grouping students, as this nearly always leads to the more motivated, more prepared students "carrying" the less motivated, less prepared students ... isn't this a concern for social homework in general, as it is with group projects? Are there aspects of Koondis that address this imbalance?
(2) It sounds like the primary assignment of points is based on time spent on a problem rather than accuracy (please correct me if I misunderstood this though!). While I can agree with placing value on effort, it sounds like students who had not read the text/studied the notes beforehand could be rewarded equally with those who prepared to

tackle the social homework, maybe even earning more points as they spend more time getting inaccurate answers ... am I interpreting this system correctly? If so, this might concern me, though I'd have to weigh the pros and cons ...
Lastly, would the Koondis system allow me to weight certain aspects myself, such as placing specified values on time and on accuracy?

3.4.i R.B.

I wish that Social Homework had worked better in the try that the math department gave it for Business Calculus. A couple semesters ago, I ran several break-out activity sections of Business Calculus that used Social Homework to get students to work cooperatively outside of the classroom on capstone-type homework problems. We just ran into too many glitches that frustrated that students, who eventually started blowing the whole project off. Has the system been improved in the past few semester? If so, I might be interested in trying it again.

3.4.j G.P.

I think we learned a lot about how to use the system effectively from the business calculus course. One thing is that if the system is only used for sporadic, large assignments, students see the assignments as additional work, and wind up being hostile to the whOle system. Smaller weekly assignments used as homework support seem to hit the sweet spot of promoting continual interaction, not adding too much work, and getting students on board with doing a bit more work (in return for a LOT more help).

3.4.k E.S.

Thanks for the feedback, Galen ... is there a way I can "audit" your current Koondis course website (maybe as a guest with no posting priv's) to see how the students are using it, what the interface is like, etc.? I'd really like to consider something like this for my fall PChem "course experiment", but I'd really like to understand the system better before I reach out to Zvonko .

3.5 Kuan-wen Chuang

Module 3 - Engaging Our Students (Due 4/5/15)

Think about a specific STEM course that you teach and its design.

1. How do you encourage students to become engaged and to learn the material for your class?

1. Interacting (Bi-Directional Communication) with students with physics questions for them to speak up in the class and also help them to understand the concept.

2. Design some questions for students to practice in the class with extra credits.

3. Remember students' names and encourage them orally.

1. Is your class designed to facilitate learning?
   1.

2. Do you lecture about content and then moving on to more content to test on content later? No written test is designed in the lecture, except the test of iclicker questions which I can make up anytime.

3. Are you building in class time to practice? About 10-20 minutes out of 1hr 15minutes to practice.

4. Do students show up because you expect them to, or does your class population swell only on test days? Most of them show up regularly, maybe because they need to get the credits from iClicker questions. Certain number of them really want to learn physics. Only a few of them show up on test days.

5. Do you assign points for attendance/daily quizzes/participation? The function of iClicker will assign points for attendance/daily quizzes/participation.

6. Do you taking away points for late assignments/missing class? No late assignments will be accepted (no make-up either). iClicker will take care of missing class.

After reading the articles in Topic 1,

1. Are there any areas that you want to improve in regard to course design/structure in your STEM course? Thermal physics is the one that I would suggest to have 100 series introductory course offered for the students who will take 300 series thermodynamics (Physics 320) class later.

2. Tell us specifically what you want to improve in terms of student engagement, and Design a few "simple and suitable demonstrations" (not repeated from the physics labs) for the class use. Also give more practices at home with extra credits.

3. Using tips and ideas from the topic readings, how you might do just that in your class. Before I discuss the detailed of each topic, I will organize a few of photos and diagrams to help students to understand the whole idea of the topic.

Mid-semester evaluation: FLC - your thoughts!

We appreciate your time and input in participating in the FLC. If you would like to share your thoughts and opinions on the FLC so far, please go ahead. Has it been valuable so far? Are you learning new things and getting more from it than you put in? There will be a a longer evaluation and summary sheet to fill out at the end of the year, but this is more to reflect on what you've gained by joining the FLC, gather your thoughts on teaching development, and to resolve to "up" your contributions if you've been tied up with other things.

1. Eric Sorin:
I haven't posted very much due to an unexpectedly heavy service load this semester, but I've enjoyed the discussions and resources of this FLC.

One complaint: the quantity of reading and resources provided seems rather high, particularly as I was catching up with Module 2 (quite late) ... there's simply no way I can make time to read and evaluate this large amount of information on assessment, but I am happy to simply focus on the items that grab my interest.
n fact, I'm going to test out a new classroom assessment technique during today's lecture for which I was inspired by something I just read ;o)

1.a S.D.
Hi Eric, please share with us the outcome of your recent effort.

1.b E.D.
Hi Shahab.
Yes, as a part of the Assessment section I saw an interesting twist on giving quizzes, which is to give a quiz at the end of class on the material covered in the previous hour. As I was already giving 5 minute short answer quizzes, I decided to try this in Pop Quiz format ... I made it an extra credit thing this first time around, worth just a few points, to avoid an immediate insurrection ;o)

Results/Observations/Afterthoughts:
1. absent students get no points, so this could encourage attendance by those who frequently are absent (or, alternatively, be seen as punitive toward those students!)
2. the mean and SD were comparable to my pre-announced quizzes; if students were warned ahead of time that there would be weekly pop quizzes, would this improve engagement and/or improve attentiveness?

I plan on announcing a similar quiz at the beginning of lecture when we return from spring break to compare the pop and non-pop versions of this type of "what did you just learn?" quiz to (a) try to evaluate the effectiveness of both and (b) to get the students' opinion on which is better and why ...

2. Kuan-wen Chuang:

(1)Has it been valuable so far?

Yes, I read many comments from our group and learn some new ideas from them.

(2)Are you learning new things and getting more from it than you put in?

Yes and hope I can apply those new ideas to my teaching.

Panel Discussion

What would be an exciting theme for our panel? We hope to pull in as many of our CNSM colleagues as we can, so something distilled from conversations about teaching across the college would be great! Some examples of topics from previous FLC cohorts are: SCALE-UP pedagogy, group work in math and science (not online though), flipped classrooms, etc. Please let us know about your preffered topic by the end of this week (March 20th) so we look for experts in the field.

Cheers,

Shahab and Nate

1. Galen Pickett

I would like a panel about "grit" and "fixed vs. growth" mindsets particularly in STEM. How can we teach "toughness" and persistence, rather than just *fultering* for them. I think this is the key diversity and student success issue facing our disciplines.

2. Nate Orderdonk

Hi Everyone,

I really like Galen's idea. But I also have a couple suggestions for the Panel discussion session this semester:

1.Project-Based Learning- what are some examples of classes/professors that have used project work to promote learning topics and/or techniques in a class. I 'm thinking about more that just the typical "class project". Maybe some people in the college have done this with well-thought out goals and learning objectives? I know of one member of the geology department that would be willing to speak about this.

2. Incorporating phones, ipads, laptops and social media DURING lecture. There has been previous presentations about the Social Homework, but I would be interested in hearing how, if any, people have incorporated these things into the lecture to enhance student involvement in big classes.

3. Kuan-wen Chuang:

I like Galen’s idea too and also am interested in the suggestions from Nate. I never had the experiences about the project work and incorporating electronic devices (except iClicker) in my lecture.

Do I need to worry about using the video from youtube (or somewhere else?) in my lecture? against the law?

3.a S.D.

Using youtube videos are not against the law, although you need to make sure that they have subtitles.

4. Eric Sorin

I too like Galen's "grit" and "fixed vs. growth" idea. Another idea: group learning activities/student-on-student teaching/learning. I'd like to avoid tech/gadget-based topics for numerous issues, such as device flexibility and compatibility.

5. Nate Orderdonk

Anybody else have any opinions on what the Panel Discussion should cover? I think we need to get going on this so I have time to organize it.

Galen-

if we went with your idea, do you have someone in mind that could present what they have done related to teaching determination in a course? And I don't know if I totally understand what you mean by "fixed vs growth"- do you mean the difference between teaching specific concepts and techniques vs teaching how to learn??

-Nate

5.a G.P.

I think Susan or Lisa in SC ED would be good people to present. The "fixed vs. growth" deal is ... does a student feel their ability for a particular discipline is "fixed" (i.e. I am not good at this ... and I am just not good at math) or the "growth" deal, meaning "I am not good at this, but if I work at it I can grow my ability". It is very closely related to grit. People with a fixed point of view don't have gritty behavior ... because why bother. If the orientation is growth, then they do not give up.

6. Shahab Derakhshan

Based on the feedbacks I suggest having two presentations. I think both Galen's and Nate's suggestions are great choices. So I think we should look for speakers and confirm the event.

7. Nate Orderdonk

FLC participants:

You probably saw the email from Margaret Karteron regarding the Munch and Learn this semester on April 30th. We chose the topic and date based on the speakers that were available. There were several ideas put forth for the topic of this event on Piazza and we were trying to pursue the topic of incorporating teaching students "grit" and helping them see that their comprehension of difficult topics and abilities is cultivated, rather than fixed (suggested by Galen). However, we were not able to find any speakers for this topic. I guess it is being discussed in another FLC, but not many people have systematically implemented this enough to give the rest of the faculty some insight. There was also some concern of overlap with the other FLC that is associated with BUILD. So we decided to go with the group-learning topic for which we had two speakers ready to go. But because both of these speakers are often leading field trips Fridays to Sundays, we had to schedule it for a Thursday. I hope this clarifies the choices and I apologize if this does not fit your schedule- we didn't have many options.
-Nate

Module 4. Active Learning

Hello! I appreciate all the discussions so far, let's finish strong with module 4 on active learning. As usual the materials should be available on beachboard, and you can link to this page through the "Task-Active Learning" link. As a prompt to the discussion, I'd be interested to know your thoughts about the following:

Making the safe assumption that the most learning happens when we have to teach the subject to someone else, do you have opportunities in your class for students to teach each other? How do you facilitate this..share your thoughts.

4.1 Rebecca Bishop

This semester I have been experimenting with including more activities in MATH 119A (BioCalc). My students started ASKING early on in the semester (during exam #1 review during the 4th week of class) to review "games." In response, I have developed a few interactive review activities for that course that seemed to go well, at least for the first go-around. Well, at least well enough that I plan on using them again in my next section of MATH 119A in the upcoming Fall.

Telephone game: one person is given a function, for which they have to find the derivative. They pass that derivative (a function) to the person behind them, who then evaluates the function at a particular coordinate (initial condition problem). Player #2 then passes some information to person #3, then so on. The 4th person turns in the final result at the end, with team players names on the answer slip. Teams are then allowed to consult with one another and change their answer if they wish. A correct answer "naturally/without consult" is worth 2 extra credit points. A correct answer that was arrived at via consult is still worth 1 extra credit point. I played this sale game with indefinite integrals, constants of integration, and definite integrals.

Matching game (find my neighbors): The purpose of this task is to find/identify/discover the relationship between a function, its derivative, and its antiderivatives (aka "the holy mathematical trinity". One of each is placed on an index card; 3 cards make a set. A variety of sets (from families of polynomial, exponential/logarithmic, trigonometric, radical, etc... - 2 from each family) are created by the instructor. The deck is shuffled then dealt to the students, one card to each student. The idea is for the students to walk around the room searching for their two missing counterparts to make the set. Students then explain their reasoning to the instructor. Once accepted, the set is placed along the chalkrail around the perimeter of the room, then students are given 10 minutes to perform a gallery walk and write down the sets.

Students seemed to have appreciated the time away from standard lecture. We'll see what they say on the student evaluation forms about it.

4.1.a N.O.

both of these sound pretty cool! why were the students asking for games? this was totally out of the blue? or they knew you sometimes do this type of stuff?

4.1.b R.B.

totally out of the blue. Most of my students in this particular class a quite young (true freshmen) - perhaps they had gaming experience in high-school?
I'm wondering how these activities would translate to other disciplines. Perhaps to Chem (reaction equations) or Geology (matching rock types), or physics (all kinds of applied math problems there).

4.1.c S.D.

Great practice Rebecca, I am sure that the matching game can work for chemists too. One could consider nomenclature and chemical formula for instance.

4.1.d S.D.

yea, I will definitely think about this next time I am teaching a lower-division class. Should be pretty easy to create some game-like problems for geology. Thanks Rebecca!

4.1.e E.M.

Hi everyone, I like these strategies for engagement in organic chemistry for synthesis which relies heavily on utilizing a number of reaction steps to synthesize a product. The matching game is awesome in this capacity. I can give different groups a given synthetic reaction and ask them to have a member hold up the individual step on a white board in class. The group becomes the expert for that particular reaction. I can then ask each group to develop a product that is different for each group. Each group must first work together to develop a synthetic strategy. The only resources they can use are the groups that have been identified by a different group that are experts (or consultants) for that particular reaction. Before any group proposes their final synthesis, they must first engage with every group that has the specific proposed for their synthesis.

Rebecca, thank you for sharing. I have to think about how I could use the telephone game. Shahab, how do you think one could utilize these strategies for nomenclature? Thank you.

4.1.f G.S.

Love the matching game. It's like Tinder meets mathematics! How big a class could this work for, do you think?

4.2 Rebecca Bishop

s well as teaching MATH courses, I occasionally teach MTED (Math Ed) courses. It is my goals for MTED courses to have AT LEAST 50% activity based classroom time. I have guided worksheets, practice problems, activities involving manipulatives, etc... that take a lot more planning than standard lecture, however, believe that the overall payoff is much more valuable in activity based learning. My role is basically a facilitator of the activities, and the students know/expect to struggle with the content in order to make a discovery.
I do not grade the activities right away; instead, I collect them as a portfolio (putting together the portfolio according to my rubric makes good review task for the students) on the day of the final. I scan/grade them while the students are taking the final, then return to them as they walk out the door on the same day. This works for classrooms of 30 students or less - anymore would not be feasible to grade in two hours. The portfolio is worth somewhere in the neighborhood of 15% of their overall course grade - most students get the full amount.
I've had these students come back after they land their own teaching jobs and indicate that they had adopted some of the activities for their own K-12 classrooms.

4.2.a S.D.

Thanks for sharing this Rebeca. I am always surprised how active learning pays off. For my 400 level and also my graduate courseI dedicate the last couple of lecture sessions for student presentations. I assign the topics(either related to descriptive chemistry, or technological applications of the material they have learnt) and they are expected to teach those concepts . This counts for 15% of their total grades. The rule is that I remain invisible at the last row of the class and they run the event. They grade each other (for 10%) and there is an assigned chair person for each presentation who takes care of the time and leads the Q & A. My role is to give them rubrics and a paper where they justify their given grades, and I only grade their grading and their active participation during the discussions (for 5%). I have found this much more engaging and effective than me being in full charge.

4.2.b E.S.

Yes, I agree this is a great approach, Shahab ... I only use this for my 400/500 split level grad class, but I have the 500 level students present a complete 45 minute lecture on an advanced topic that they have to assemble themselves (with my guidance, of course), while the 400 level students present ~2 related research articles related to their own interests (roughly 20 mins per undergrad talk). This is roughly the last 1/3 of the semester, but all of this material the students cover is also covered on the final exam, making it important for all students enrolled. The student-student interactions, in the form of Q&A during and after such lectures and talks, are generally very stimulating and I too try to only join in when there is inaccurate or incomplete information being disussed ... I also have the class grade each others' lectures and talks, which are almost always quite consistent with the scores I myself would have assigned ;o)

4.2.c E.M.

Rebecca, I like your strategy for potential implementation for my activity section (CHEM 224) that is taken concurrently with organic 1. I have found many of the students rely strictly on what I propose for discussion for the given period. Although I have tried repeatedly to change this, I have found it difficult for students to ask questions on concepts or questions they find challenging at the beginning of the period.

What I am thinking of trying is to ask students to anonymously ask questions before class by writing them down on a piece of paper and submitting them to an envelope placed outside my office. At the beginning of class, I will first randomly place students in 6 different groups which changes week to week and label them group 1-6. I will then pull a different question from the envelop sequentially for each group to work on for the first 15 minutes. Each group would then have someone present their answer on the board for the remaining 30 minutes. Having a portfolio would serve as a journal to all the students they work with throughout the semester. Great idea and thank you for sharing.

But how to do this with a 50+ student, 300 level PChem class when we struggle to get through so much material each semester ... it's just not feasible in my experience.

4.3 Gary Shin

My class, general biology, is a large-lecture format class, usually held either in the University Theater or some other large lecture hall. As such, I have found it expedient to stick with the lecture format, and have relied mostly on funny or interesting stories to keep students involved, or short 5-minute tete-a-tetes with students to hash out the implications of various issues such as cloning. I've experimented with a few other little activities to liven up the students' experience (for example, a "biology on the ballot" lecture devoted to discussion of biological issues being voted upon). However, I've found that unstructured discussion tends to be dominated by a few students. With the size of my class, I've also found that breaking students up into small groups isn't particularly useful, because not every group is willing to discuss ideas with each other or with the class. I also run into the issue of time: not every group gets to say what their group has worked on. One new technology that I think will help a lot with student involvement is clickers. A colleague of mine at UCLA is a huge advocate of them, saying that they increase attendance, involvement, and overall class performance. I'm willing to give this a shot. I've contacted the iClicker rep and have a unit in hand; but haven't really thought through how to implement it quite yet. Any suggestions?

4.3.a N.O.

Hi Gary-
When I teach big (200+) classes, the clickers are really handy for keeping students involved. I give a quick 3-question quiz every week to let them earn points for coming, but the main thing they are good for is injecting little questions or activities into each lecture. I put in little puzzles or questions that they answer with the clickers and it keeps

them engaged, but they also like it because it lets them test their understanding as we go (and gain participation points).
Clickers are real easy way to boost engagement and participation in those big classes. and helps you see immediately what the class is getting and what they are missing so you can adjust the lecture as you go, or re-explain topics they didn't grasp.

4.3.b G.S.

I'm worried that the data will be confounding, and I won't be able to suss apart what the students are getting and what they're not. When I look at the Par Score data from exams, for example, I have students who are struggling in almost every single learning objective, but they're not all the same students. For example, a group of students might struggle with genetics, while a different set might struggle with mitosis. Is there some "set limit" that triggers you to revisit a topic? Say, if 30% of your class doesn't get a topic?

4.3.c N.O.

I don't have any set limit, but usually if less than about 75% of the class can answer the question, I will go over the topic again. Or ask any other students in the class to volunteer to explain it.
The good thing about the clickers is that you get instant feedback- as they are putting in their answers, you can watch on your laptop how many are getting it right vs wrong. The software will give you a histogram of the answers. or a pie chart if you want. So you can instantly revisit it if needed (you don't need to look at the data later like with a scantron test).

I think you will be surprised at how easy it is and how well the students respond just by throwing in occasional questions mid-lecture and giving them participation points for answering.

Course change hypothesis

Dear Colleagues,

Please share your course change hypothesis. What change(s) are you planning to make to your current class(es)? How do you expect that the proposed changea(s) will affect your students' learning process?

1. Eric Sorin

CHEM 377A/B Couse Change Hypothesis: The most obvious and consistent cause for students' poor performance in physical chemistry courses is their lack of adequate time spent on problem solving; this has been quantified many times in J. Chem. Ed. articles and is consistently reported to be less than 50% of the suggested weekly problem solving time. Having given thought to several potential methods of motivating students to work the assigned and suggested problems, feedback from my previous class at the end of the S'15 semester motivated me to go back to the basics rather than aspiring to be novel. As our CHEM 377 courses have grown in size, now frequently 60 – 80 students (which is far too many), grading regularly scheduled assignments and/or quizzes is rare in these courses. My students, however, strongly urged me to go back to collecting and grading problem sets, even if grading only 1 – 3 of the assigned problems. They also urged me continue the new quiz format I had just introduced (5 conceptual questions in T/F, MC, or FitB format in 5 minutes). Per their suggestions, I'll be collecting and grading problem sets this semester for the first time in several years. On (or soon after) days that problem sets are due, I'll also be giving 5-minute quizzes, as described above, as a method of checking students' conceptual understanding and ability to apply what they learn while completing the associated problem set. I believe these two assessment tools, in concert, will motivate students not only to complete the assigned problems, but to also better understand the process of solving the assigned problems and the meaning/interpretation of the final answers at which they arrive. I expect this will lead to my students being, in general, more prepared for exams in my course, and thus yielding higher exam scores and an improved passing rate.

2. Gary Shin

BIOL 200 Course Change Hypothesis: Our class, as a large lecture class suffers from a lack of student engagement. In order to bring more student participation into the classroom in an expedient manner, I am reconfiguring my lectures to introduce clickers. The benefits I anticipate are three-fold. (1) While I do not intend to "flip" the classroom per se, I plan on presenting students with "reading quiz" type questions via the clicker system so that they will do some work prior to coming to class. (2) The clickers will add a classroom participation component to the course. And (3) the clickers will allow me to gauge the students understanding of difficult concepts as they are being presented. In this first semester, I plan on making these clicker assignments optional (for a small amount of

extra credit). It is my hope that this will permit me to compare the test scores of students who actively engage in lecture versus those that do not.