STEM Faculty Learning Community
College of Natural Sciences and Mathematics
S12 Cohort Final Report

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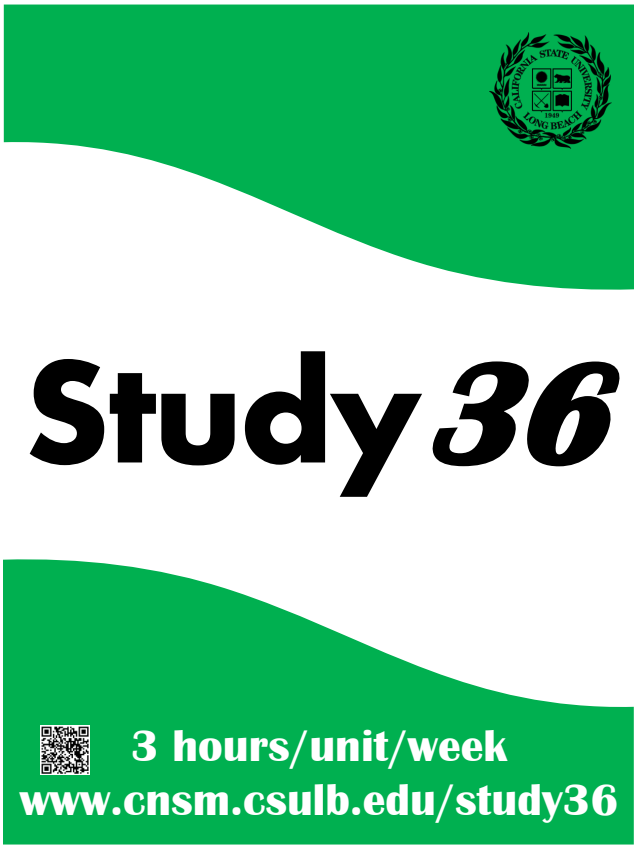
Faculty Learning Community S12 Cohort Second Semester Report: Effecting Change

The second semester of the College of Natural Science and Mathematics Faculty Learning Community brought with it new faces, discussions, issues and solutions. Faculty members participated in a similar online component as was developed in the previous F11 semester. Modifications based on F11 results were made, with a new module on "life work balance" created to deal with some of the issues raised by faculty in F11. The overall goal of the FLC remained the same: to encourage faculty to make sustainable changes in their teaching, and to foster a culture of teaching excellence throughout the college.

This cohort was particularly good at crossing departmental lines. When the issue of student preparedness and motivation came up, the entire FLC was galvanized. Everyone had something to say, and discussions were rich. Importantly, this was not a CNSM-sponsored complaint session; the focus continually centered around potential solutions. In one of the discussions, I introduced the concept of a "study campaign"- similar to Cal Poly San Luis Obispo's successful *Study 25-35 Hours a Week* campaign, created by their COSAM Dean Phil Bailey. The FLC discussion boards lit up with ideas, suggestions, and modifications based on our student population. To follow this idea through, I approached the SAS Center and the CNSM Advising Center with the idea of creating a single message that "studying was a full time job." After several email discussions about how to create a program that would help students understand that in science and math time was required for success, Study36 was created. FLC participants from both F11 and S12 were asked for feedback, and modifications were made as a result. This idea, generated by the S12 FLC discussion boards, culminated with the creation of a Study36 webpage with study tips for students and passing out copies of a Study36 flyer to all mailboxes of teaching faculty in the college.

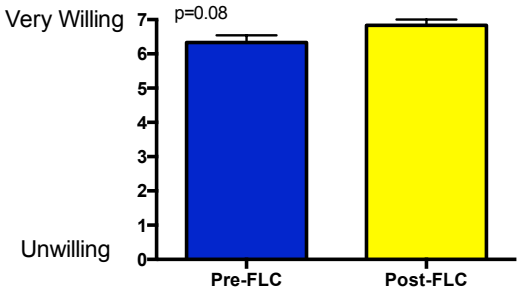


Post-FLC Survey Analysis

The S12 results were similar to the post-FLC survey results in that they describe a faculty that is engaged and interested in teaching, and benefitting from the resources and community support from the FLC.

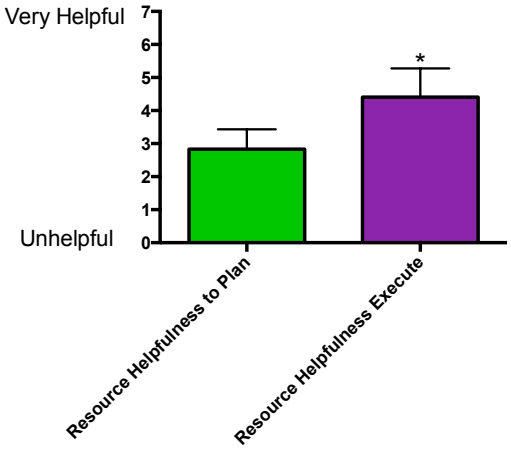
Similar to the F11 cohort, faculty members recruited for the S12 cohort were very willing to change to improve student learning, with participation in the FLC continuing that interest ($p>0.05$; Figure 1). This is the second eager group of faculty members, demonstrating that those interested in improving instruction and learning in the CNSM are not "few and far between".

Figure 1
How willing were you to change?



Overall, faculty members in the S12 cohort used the online resources during their semesters with the FLC. Interestingly, resources were more heavily used during the execution of the change in the S12 cohort, whereas in F12, the significant usage was during the planning. Regardless, faculty members are finding the resources to be helpful and are putting them to use. Given that the FLC was one of only a few teaching courses/workshops to which STEM faculty members had been exposed (Figure 3), these STEM-specific resources were a critical piece of the FLC. Of the S12 participants, two had received no formal training, one had received training to be a teachers assistant in graduate school and had taken workshops, and four had taken courses or workshops on teaching (Figure 3). However, many commented that the workshops were often not applicable to their science/math course, and considered the formal training of the FLC to be very helpful in assembling best practices for their STEM classroom.

Figure 2
FLC Resources were Helpful to Plan and Execute Course Changes



In the S12 cohort, faculty members were eager to teach prior to the FLC. Indeed, many commented positively about the FLC when they first started, indicating that they had heard about the program and its results prior to becoming participants themselves. Participation in the CNSM S12 FLC increased faculty feelings of being inspired to teach and engaged in their teaching ($p< 0.05$; Figure 4a, 4d). No changes were noted in faculty feelings of being privileged to teach vs. irritated to teach, or in being a contributing vs hindering aspect in undergraduate education. Both of these results were positive pre and post the FLC (Figure 5b, 5c).

Figure 3
Formal training in teaching prior to the FLC?

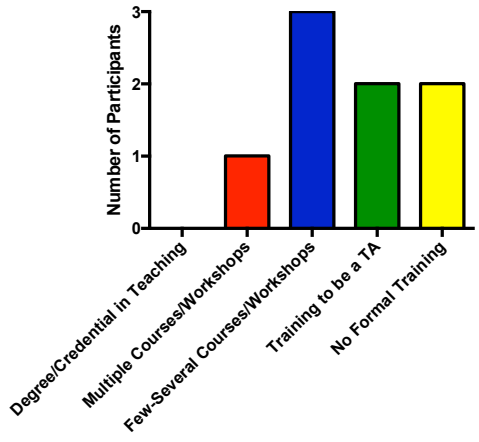
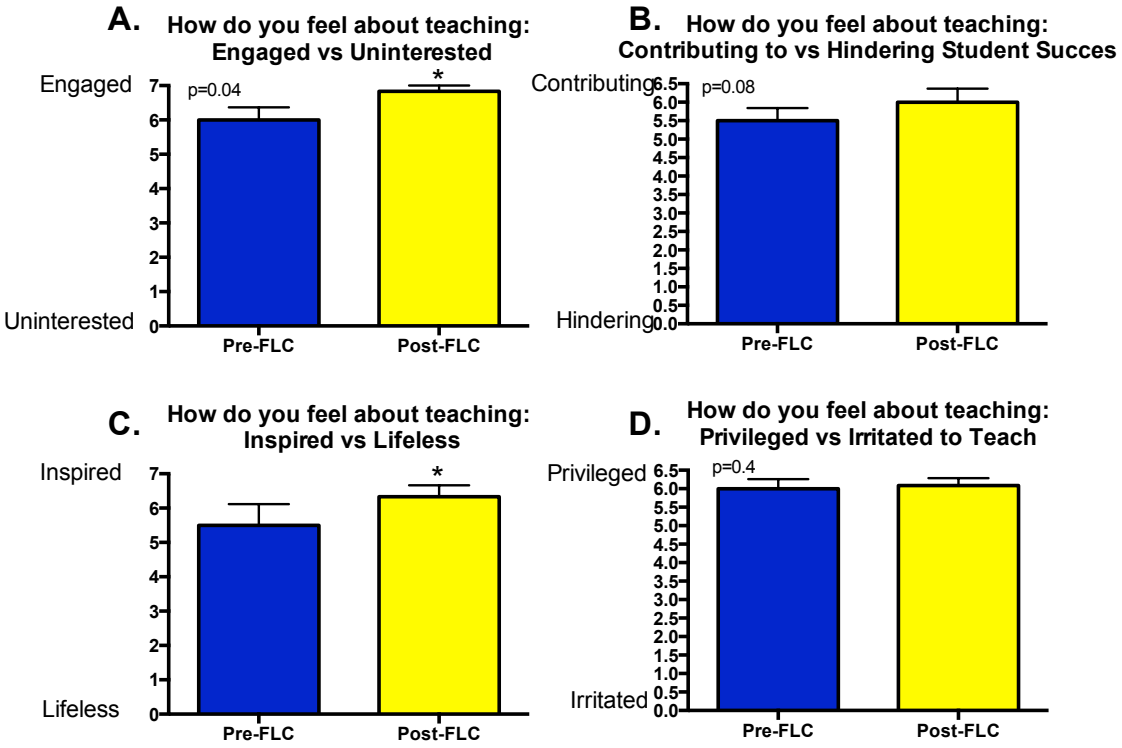
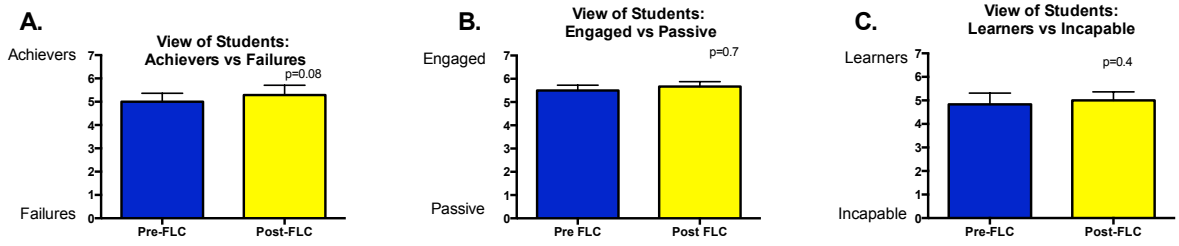


Figure 6
How STEM Faculty View Teaching



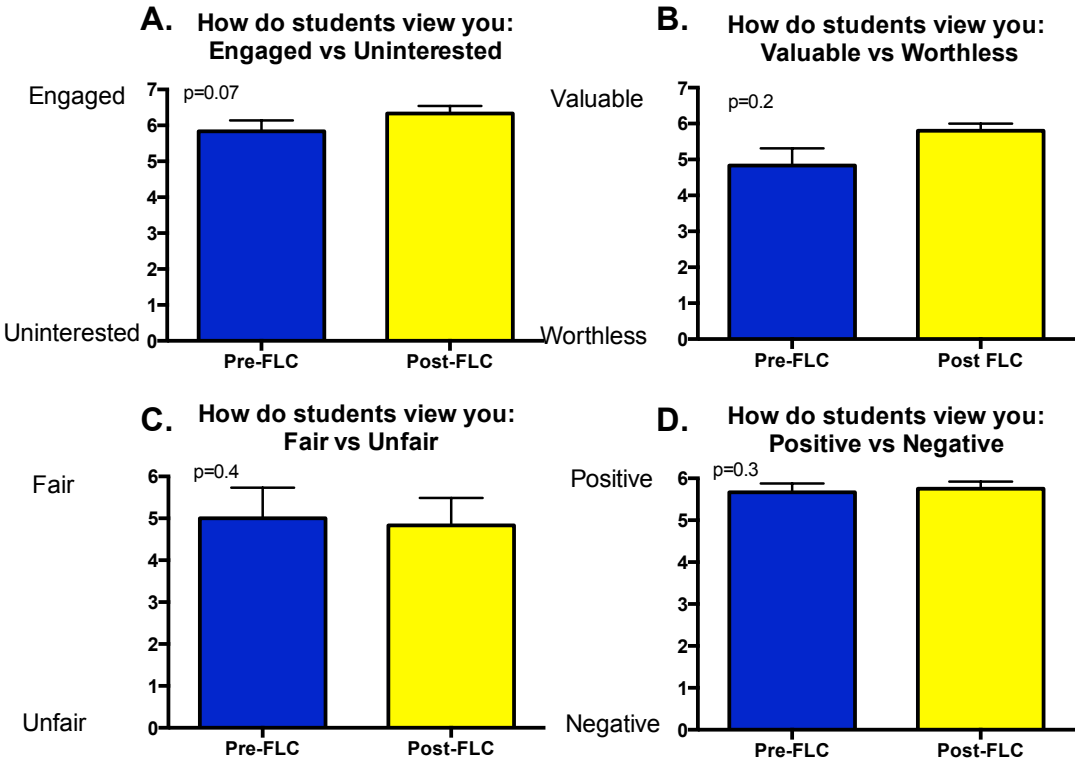
In addition to changes in how faculty viewed themselves, we surveyed how participation in the FLC changed how faculty viewed their students (Figure 5). Unlike in F11, the S12 cohort did not show a change in how they viewed their students following FLC participation; however, these faculty members viewed their students highly both prior to and following the FLC (Figure 5).

Figure 5 Faculty View of Students

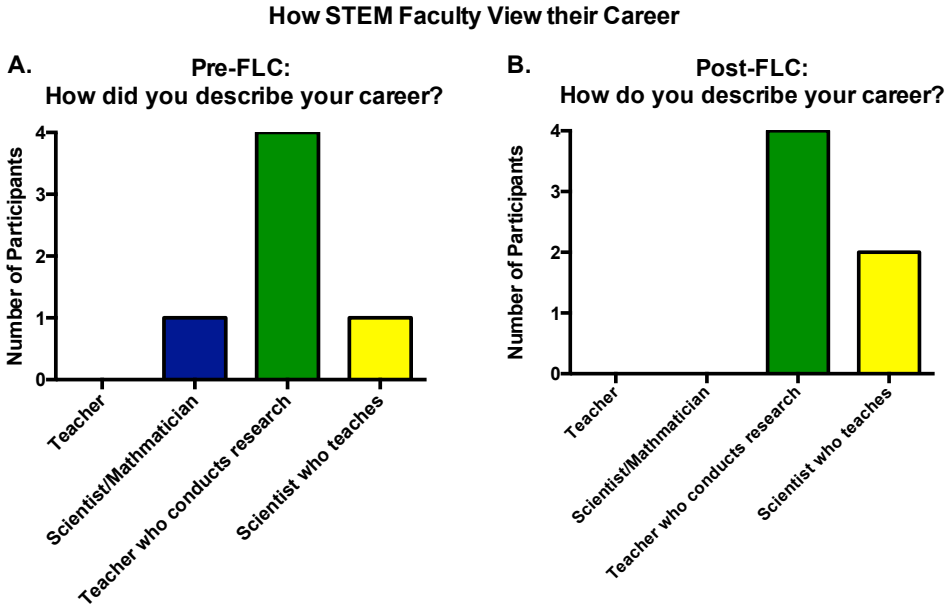


Finally, we also examined the faculty perception of how students *viewed them*. Unlike the F11 cohort, where several categories changed, here there were no changes in how faculty thought students viewed them prior to and following the FLC (Figure 6).

Figure 4
Perception of how students view STEM faculty pre and post FLC



The final survey item asked faculty how they perceive their career. In the S12 cohort, we did have a few shifts, where faculty members saw themselves still as the scientist/mathematician that they were, but also as a teacher following participation in the FLC. (Figure 7).



Summary of Reports, Full Reports Follow:

Dr. Andreas Bill introduced a team based learning technique that allowed students to dig deeply into Mathematical Methods in Physics (**PHYS 560A**). Student groups researched one of the following topics: Green functions, Hilbert spaces, integral transforms, ordinary and partial differential equations, complex analysis, distribution theory and group theory. The first group that presented went into great detail, and "definitely broadened the perspective" on why this topic was covered in the class. Due to the length of time for the presentation, the other groups did not present; however, Dr. Bill was eager to continue with novel approaches for this class in future semesters. He plans to flip part or all of the class to allow for the rich discussions that this course deserves. Overall, Dr. Bill found that the FLC gave him "a reason and opportunity to try something new and be bold about it."

Dr. John Brevik incorporated a "flip" of a different kind in his **MATH 123H** Calculus I course: he moved the in class exercises that he usually reserved until the end of the class period to the very start of the class period—and used them as "warm ups". Using ideas and feedback generated by the FLC community, Dr. Brevik created heterogeneous groups to solve these problems and was pleased with the overall result. Starting the class period with a problem solving opportunity increased the "energy level" of the class, and Dr. Brevik noticed that students took the problems seriously and became "invested in the answers". Taking part in the FLC was also beneficial for Dr. Brevik, who noted that it was a "tremendous learning opportunity."

Flipping the classroom to allow for more in-depth discussion of primary literature was the goal of **Dr. Jesse Dillon** in his marine microbiology course, **BIO/MICR 415/515**. The videos replaced much of his lecture, and students noticed a benefit from being able to watch the videos multiple times and "on their own time." Overall, most students believed that the videos "somewhat or greatly aiding their learning," and the class time spent on the literature was greatly enhanced. Dr. Dillon benefited from his FLC experience and will be joining the FLC leadership team to lead the F13 cohort.

In **BIOL 211** Introduction to evolution and diversity, **Dr. Beth Eldo**n teamed up with University Advising to implement an "Early Alert" system, which identified students who were at risk to fail in her low completion rate course. She sent out messages to all students following the first exam using the early alert widget in BeachBoard. Students earning fewer than 60% on the exam were sent to the CNSM Advising Center to discuss learning strategies and ways to succeed. While this did not change the overall grade distribution of the class, nor prevent withdrawals, it did highlight the fact that 20% of students did not return to retake BIOL 211 within three semesters, something that Dr. Eldon is continuing to investigate. Overall, Dr. Eldon appreciated the FLC resources and community interaction, and was grateful for the "forum to reflect on and discuss issues surrounding teaching and learning."

Employing a three-part hypothesis, **Dr. Chung-min Lee** enhanced learning in her **MATH 370A** Applied Mathematics I course. Dr. Lee required students to take pre-class quizzes, created online practice quizzes to replace her in class quizzes, and added the possibility to correct missed exam problems. These strategies increased learning in a semester where her population started off less advantaged than previous semesters. As a testament to the long lasting learning effects of being able to correct errors on an exam, Dr. Lee found that final exam scores increased on problems that were similar to question missed on the original exam. This enhancement was only observed among students who took the opportunity to actually correct and re-do the missed question. Students were pleased with most of the changes and felt that Dr. Lee's modifications did enhance

their learning, despite their hesitation to embrace pre-class quizzes. Dr. Lee plans to work on this and other small issues as she continues to refine her course for future semesters.

In **Dr. Ken Nakayama's** Organic Chemistry lecture, **CHEM 322A**, the number of pre-lecture quizzes was increased, their point value dropped, and a mini-exam given prior to the first midterm to set up expectations of keeping up with study for the course. These changes produced a huge increase in success on the first midterm, in addition to increasing the overall scores on the standardized ACS final exam. As a result of this trial semester, Dr. Nakayama plans to reduce the number of quizzes in future semesters to transfer the responsibility of learning back onto the students. He is interested in how to successfully motivate and engage students to view learning as an integrated process, not just something that occurs to pass an exam. Dr. Nakayama contributed much to the FLC discussions and benefitted from the college-wide interaction and "exchange of experiences and ideas on teaching".

Dr. Lora Stevens took some risk to improve two courses, **GEOG 240 and GEOG 465,** that already showed high passing rates. Although she already used an interactive format for her lectures, Dr. Stevens' participation in the FLC reinvigorated her approach to teaching and added additional interactive ideas to her arsenal of pedagogical techniques. Despite time being an issue, as it is for all CNSM faculty members, Dr. Stevens was able to incorporate multiple in-class exercises to increase student learning. In addition to content specific material, Dr. Steven's found it necessary to teach some basic academic skills, for example on note-taking, to enhance the success of her students. This flexibility was important, and her students ranked these in class activity sessions as very helpful.

CNSM Faculty Learning Community Final Report

Introduction
Name. Andreas Bill
Department. Physics & Astronomy
Class. PHYS-560A Mathematical Methods in Physics
Number of students in the class. 17 students.
Is this typically considered a low completion rate course? No.

Hypothesis
The change initiated in the class was to assign a topic to groups of two or three students. The students had to ask other faculty members and find material and examples to provide a motivation why the particular topic is taught in a Math Methods in Physics course. After discussing with me the material they gathered and how they intend to present their topic they had to give a 10-15min presentation at the beginning of the chapter during the semester.

The following topics were assigned to the seven groups: Green functions, Hilbert spaces, integral transforms, ordinary and partial differential equations, complex analysis, distribution theory and group theory.

Results
The experiment did not work as expected and the idea has to be reformulated. First, I bent the rule by allowing students to choose topics that are not taught in that particular class. Second, the presentation of the first group was too long. The three students who chose "complex analysis" presented an example of conformal mapping, the Mercator projection, the electric field of parallel conducting plates (student 1), the Kramers-Kronig relations and its application to Electron Energy Loss Microscopy and Angle Resolved Photoemission Spectroscopy (student 2) and the last student discussed the residue theorem for an example containing a singularity on the real axis and the use of the theorem for Fourier transforms.

The topics were interesting and definitely broadened the perspective on why we had a chapter on complex analysis in the course. But it was too long. Instead of 15min it took a full lecture together with my comments and exchanges of students on the work. This is not sustainable and the design of the proposed change has to be rethought. As a result I did not ask the other groups to present.

Discussion
I would not do this again in this format. The format was actually inspired from what I do in the Solid State Physics class, but the nature of the course turns out to be determinant for the way the idea is applied. In Solid State Physics one can discuss topics and relate to the content of the lecture in many ways that relate to experimental and theoretical physics. In Mathematical Methods in Physics the details of a calculation or derivation are essential.

The failed experience led me to think first on how I can modify the course so as to integrate these presentations in a more efficient and channeled way. I then came to the conclusion that I may want to try to flip the class altogether and use one of the interactive classrooms where one can write on the walls and engage students in applying the knowledge by working out solutions of problems on the walls in groups. I intend to flip this class next time I will teach it. This will

require a great deal of work since I will need to type my notes so that students can study the material before class. But it would be a first in our department, certainly at the graduate level.

I do feel that being part of the FLC was productive. It provided insight in the struggles and solutions other faculty members have faced and came up with for their respective classes. This was both comforting and useful. The FLC gave me a reason and opportunity to try something new and be bold about it. This broadened my perspective and will have a lasting effect.

CNSM Faculty Learning Community Final Report

Introduction
Name. John Brevik
Department. Mathematics and Statistics
Class. MATH 123H Calculus I
Number of students in the class. 34-40 students.

Using ideas from the Faculty Learning Community held during Spring semester of 2012, I made some modifications to my teaching in MATH 123 (Calculus II). The organization of this course is as follows: The full class, consisting of 34-40 students, meets twice a week in 75-minute "lectures"; they are separated into two pieces, each of which meets for two hours a week in an activity section. Because of the activity section and its opportunity for group work and one-on-one attention, I did not feel that MATH 123 the way it is taught here would be a good candidate for "flipping."
I am, however, intrigued by the idea of flipping and intend to follow through with a flipped classroom at my next opportunity to teach MATH 444, a low-completion-rate upper-division requirement for mathematics majors both in the general option and the option in Mathematics Education.

Planned Changes In my past calculus classes, during the last few minutes of a "lecture" I would typically assign one or two short problems, simply designed to check and reinforce the students' understanding of the day's lesson, to be worked on and discussed among them but not submitted. Due the students' flagging attention at the end of the "lectures," these exercises were not as successful as I would have liked; there was a lot of unfocused chatter, and students would often choose not to work on the problems at all. Of course, it was easy enough for these students to get away with their inactivity, as I was busy helping those students who were trying the problems. I wanted to retain the inclusion of some active work in these sessions but sought out a different strategy.

Another source of frustration for me was the extreme unevenness of the groups into which my students had divided themselves for the activity sections. Among the downsides I perceived were that friends would group together, not only increasing the amount of socializing in class but creating a marginalizing situation for those students who had no friends in the class and were thus thrown together; also, a given group would be likely to contain either at least two strong students or none at all, creating disparities and lessening the opportunities for weaker students to learn from their peers (and, indeed, for stronger students to learn by teaching). Again, something different was called for.

Implementation of changes I had already experimented toward the end of Spring 2012's FLC with moving the in-"lecture" exercises to the *beginning* of class. This idea seemed promising, so for this semester I re-tooled each of my lessons to begin with a 10-or-so-minute "warm-up," in which I have them work on one or two problems that tie the material that they have already learned with the day's new material; again, these problems are to be discussed among them and not to be handed in.

Following the literature from the FLC, in each discussion group I clustered students first according to gender and then according to major (engineering, science, other) and had them count off in order to heterogenize the groups relative to these attributes.

Assessment of effectiveness of changes I am comparing this class to the last MATH 123 class I taught, which was in Spring 2012. I had previously taught this course in Spring 2011, but this class contained a large number of students who had taken my MATH 122 course the previous semester, so I believe that using the Spring 2012 course is more appropriate. Still, it should be noted that in terms of student population these classes were quite different: The Spring 2012 class was a mixture of first- and second-year students, some of whom had placed into calculus out of high school and others who came through precalculus; the Fall 2013 class, on the other hand, consisted almost entirely of first-year students who scored well enough on the AP exam to place out of a semester of calculus. Clearly, then, a direct comparison of "the numbers" will not tell the whole story; in fact, while it might seem as though the Fall 2013 class would be at a great advantage due to their demonstrated aptitude, I found that many of them struggled with the lifestyle and workload transitions from high school. For these reasons, I am breaking my assessment into subjective and objective components.

My impressions: I am very pleased with the effects of both changes on the classroom dynamic. Putting the students on a task right away, and one that they feel they should be able to do (I always phrase the problems in terms of material previously covered) tends to lift the energy level, and remarkably, the students are nearly 100% on-board, day in and day out, with taking the problems seriously, discussing them (sometimes boisterously!), and becoming invested in the answers. On days when the problems were sufficiently well crafted, the students would largely succeed through collaboration, and at the end of the exercise they had taught themselves the key idea of the lesson. Recently, for example, the outcome of the exercise was to derive a Taylor series for the function e^x before having seen the definition of Taylor series. Anyone who recalls Taylor series from calculus will probably recognize this as taking a big swing! Unfortunately, this exercise was insufficiently "scaffolded" and so did not lead enough students to the correct solution, but for those who successfully completed it the subsequent definition of a Taylor series in general was no surprise, because they had already worked it out in a special case. I am confident that a better-crafted exercise will lead to a better result, with notoriously difficult material, next time.

Assigning heterogeneous groups has also had a positive effect. For whatever reason, it seems to me that division by gender was the most important improvement. The way the numbers played out this semester, there is one woman in each group but one, and the women tend to be the points of crystallization for their respective groups.

Data: In comparing the hard numbers, I should note that in Fall '13 I gave the students a few opportunities to re-do difficult homework assignments for partial credit, which I did not do for Spring '12; this likely had some – albeit relatively small – effect on the results. I make the additional caution that the two populations of students were very different, as spelled out above. The numbers of withdrawals for the two courses were comparable; in each case, four students who began the course did not take the final exam, and so I removed those from the data. The following table is a summary of the results for the two courses:

	A	B	C	D	F	Final Exam Avg. (raw)	Course Total Avg. (adjusted)
Spring '12	4	6	8	10	3	65.49193543	0.572727273
Fall '13	3	12	10	6	1	69.96875	0.636079545
t-test *p*-value (1-sided)						0.094971554	0.027153539

The pass rate is certainly better in the recent course, and the difference in adjusted course total is highly significant. The final exam average might be a more "objective" measure of the relative performance, and there also the *p*-value provides reasonably strong evidence of improvement.

Looking Ahead I believe that the changes I implemented were fairly successful, especially given that the next time through I will be more intelligent about the particulars of their implementation. I thank the Spring 2012 FLC and in particular the organizers for the tremendous learning opportunity.

CNSM Faculty Learning Community Final Report

Introduction

Jesse Dillon
Biological Sciences
BIOL/MICR 415/515
12 Students
Is this typically considered a low completion rate course? NO

I used Panopto for the first time during my marine microbiology course in Spring 2013. This course is reading and writing intensive with the majority of class time devoted to the discussion of scientific articles on topics that are familiar, but often quite new for our marine biology majors. In the past, I have given brief lectures (~20-30 minutes) in the class period prior to the discussion topic, for this semester, instead I posted Panopto videos of lectures linked to the PowerPoint slides to present the video. Videos were posted by Friday or Saturday prior to the Monday class. The course included 9 marine biology b.s. undergraduates and 3 micro/cell molecular M.S. students. Videos were 12-34 min. in length with a mean of ~19 min.

Hypothesis

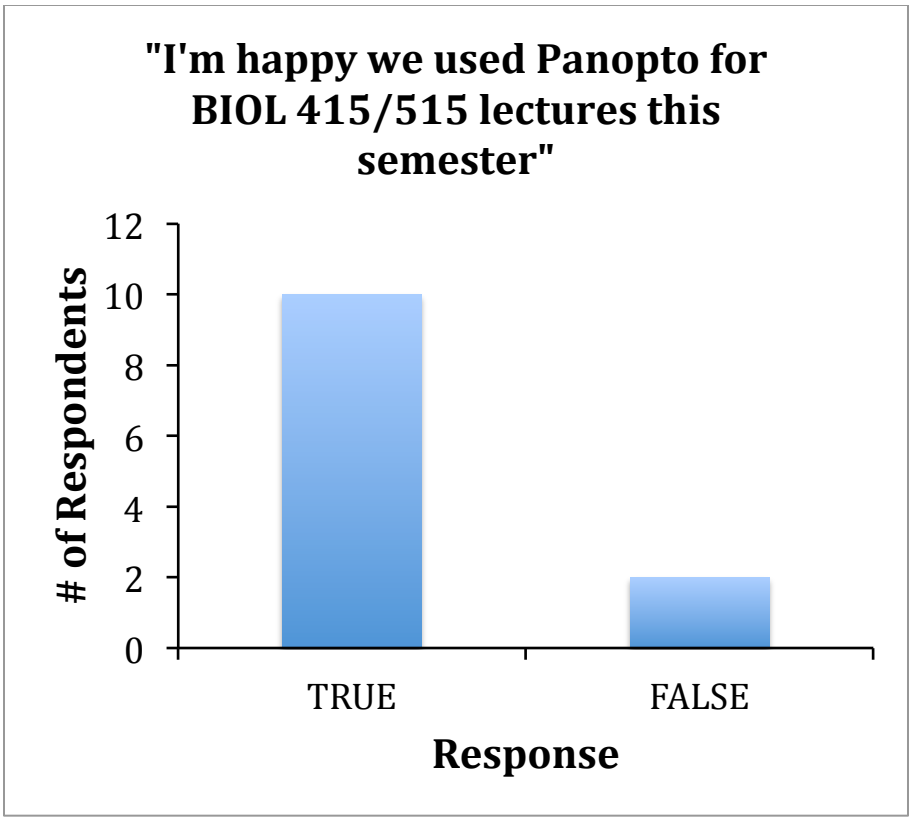
I hypothesized that using Panopto to deliver lectures for this senior/graduate level class would allow more in class time for students to learn from primary literature discussions and facilitate learning.

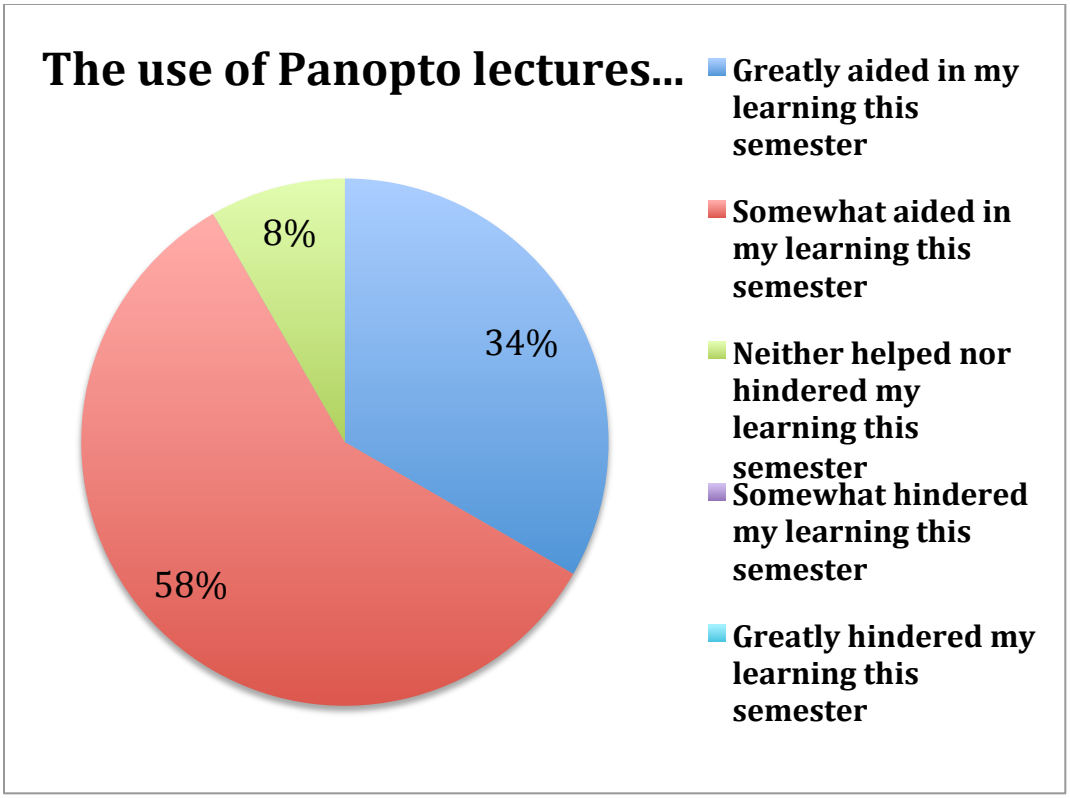
Results

Sorta. It was a small class and not everyone viewed the Panopto videos using the beachboard system (some used iTunes), so I was unable to correlate course performance with video viewer statistics. The GPA for undergraduates was 2.67, which was actually lower than the last offering 3.19 in Fall 2011, although the small sample size for this offering makes it hard to accurately compare.

However, I polled students on their attitudes toward the experience. Students were given nominal extra credit (<1% of grade), but all 12 took the survey.

The take home message was generally positive in terms of student attitudes toward Panopto usage. The majority of students liked using Panopto (10/12), and saw it as somewhat or greatly aiding their learning (11/12). The greatest benefit seen was the ability to watch videos repeatedly (7/12) or on their own time (3/12); the greatest drawback was the lack of interaction with the lecturer during the presentation (10/12). Three of 12 respondents would like to see video of the professor during the video to address this problem. The majority (7/12) wanted the videos poster earlier in the week, while interstingly, none reported they wished the videos were shorter. This differs from what Dr. Young has reported for her lower division course. The difference may be due to the class standing and indeed, 8/12, thought that usage of Panopto was best in the upper division, while 4 said it did not matter. None thought they would best be used for large, lower division courses. Despite this relatively positive feedback, only 5/12 indicated that they wished more classes used Panopto during their career at CSULB.


"I'm happy we used Panopto for BIOL 415/515 lectures this semester"
# of Respondents
12
10
8
6
4
2
0
TRUE
FALSE
Response


The use of Panopto lectures...
8%
34%
58%
Greatly aided in my learning this semester
Somewhat aided in my learning this semester
Neither helped nor hindered my learning this semester
Somewhat hindered my learning this semester
Greatly hindered my learning this semester

Discussion

Overall, I am glad I did this. It provided a baby steps approach to integrating Panopto lectures into a course without a radical revision of course approach. I think I will do this again the next time I teach this course, but I will learn from this experience and post the videos earlier and will consider including a discussion board forum on Beachboard so students can seek feedback before class while viewing the videos. I will also use Panopto again in other courses including the large introductory biology 211 course. That will require much more planning and a greater alteration of teaching approach and style.

Thinking about the FLC as a whole, I am really glad to be involved in the program and look forward to help promulgate it into the future by leading the FLC in Fall 2013.

CNSM Faculty Learning Community Final Report

Introduction

Elizabeth Eldon
Biological Sciences
BIOL 211

The issue: BIOL 211 is a borderline low completion rate course, which by the University's definition is a high enrollment course with a successful completion rate of less than 75% (http://www.csulb.edu/projects/wasc/WASC_accreditation_2006-11/capacity_review/appendix/appendix-III-4.htm).

In Fall 2012, 272 students were enrolled at census and took the first exam. At the end of the semester, 240 students earned a grade other than W (25), WE (4), or WU (3). However, six students earned F's and 26 earned D's. Thus 208 (76.5%) of the students completed the course with a grade of C or better.

Hypothesis

The goals of the Low-Completion-Rate Course Project described in the link above was

> "(1) To identify and diagnose factors that contribute to low completion rates for specific courses; (2) To define and adopt realizable solutions for managing/solving the identified problem(s)."

In keeping with the spirit of this initiative, which did not include BIOL 211, we tested the following hypothesis. **If struggling students were identified early in the semester (after the first exam), those students could receive one-on-one advising and adjust their behaviors and study habits to improve their performance in the class.** It was hoped that this would help remedy several factors leading to low completion rates: inadequate student preparation (by providing free passes for tutoring at the LAC), poor student motivation (by receiving individual attention), and inadequate student support (by informing students of the many sources of support available through the SAS Center, the LAC, and office hours, and encouraging them to take advantage of them).

Approach

We used the "Early Alert" widget in BeachBoard to send messages to students after the first exam. Those who earned scores of less than 60% received a message telling them that they had to make an appointment with an advisor in the college advising office or have a hold placed on their ability to register for the following semester. Those who earned scores 60-79% received a message encouraging them to do better by providing a link to the SAS Center's tutoring site, a link to the LAC's site for workshops, and a reminder of instructor office hours. Those earing 80-100% also received the links to the SAS Center peer tutoring and the LAC website, as well as a reminder of instructor office hours. All three groups were asked to fill out a Qualtrics survey developed by Angela Tuan in the CNSM advising office. Her summary is attached as Table 1.

Results

Comparisons were made among Fall 2010, Fall 2011 (semesters before Early Alert was used), and Spring 2012, Fall 2012 (semesters in which Early Alert was used) to determine whether student success was improved by this intervention. I am no statistician, but the numbers and percentages of students successfully completing BIOL 211 appear unaffected by the Early Alert effort (Table 2).

Since Early Alert assumes a correlation between grades on the first exam and final grade for the course, I next looked at whether the completion rate or final grades of the students failing the first exam differed before and after Early Alert was implemented. Two groups were compared for each of the four semesters: those earning 50-60%, and those earning less than 50% of the possible points. Note that approximately 20-33% of the students enrolled in the class are in this category of failing the first exam. It is difficult to detect an impact on numbers (percentages) of students either failing the course or withdrawing (Table 3A). Not all the withdrawals come from this category of students (Table 3B). Similarly, not all the D's and F's are earned by this cohort of students (data not shown). Perhaps surprisingly, even with the new policy restricting the number of units from which students may withdraw, several students earning B's and C's on the first exam ultimately withdrew. This was due to poor performances on later exams (Table 4).

Because Early Alert produced no change in student success rates, I determined whether or not students receiving D's, F's, or W's, WE's, WU's in Fall 2011 or Spring 2012 repeated the course in the subsequent semester. (I taught the course Fall 2011, Spring 2012, Fall 2012.) If so, how did they fare? I was surprised to see that fewer than 25% of the students earning D's, F's or W's enrolled in the course a second time. Of those who did, approximately 60% earned a passing grade on the second attempt (Table 5). I have no information on the students who elected not to re-enroll.

Why do more than 20% of the students enrolling in BIOL 211 fail to complete it successfully? What becomes of the vast majority of those who do not complete it? Do they change majors and earn baccalaureate degrees in different fields?

Discussion

Would you do this again? I would not carry out Early Alert warning and advising again without making further changes.

Why or why not? Early Alert did not seem to have any effect on pass rates, and there is little that advisors and instructors can do beyond what we're already doing. Are the students too poorly prepared? Do they lack the study skills? Do they lack motivation? Are they working too many hours for pay outside of their academic commitments? The Qualtrics survey asked these questions, all except employment seem to contribute. We inform students about resources at the SAS Center and at the LAC in class, on the syllabus, and on the calendar widget on BeachBoard. We hold office hours, and students have access to the online resources provided by the textbook publisher.

We have discussed making lectures more engaging, and perhaps increasing student motivation by flipping some lectures to allow us to implement more activities during class time. The hope is that as students take more responsibility for their learning they will become more engaged in the subject matter. This is a long-term project!

I understand that during Spring 2013 a section of Supplemental Instruction was to be opened after the first exam to assist students who did poorly. I am most curious to learn the results of this use of SI. The Qualtrix data from Fall 2012 suggest that the focusing on note taking skills, test taking strategies and skills, and time management would be highly beneficial to this group of students.

Any tips or ideas for other faculty attempting to try this in their own classes? More structured support of these students might help, such as signing them up for the appropriate study skills workshops at the LAC. Anecdotally, a few students mentioned that they didn't find meeting with an advisor to be very helpful. I do not know how widespread that sentiment was, or

what they expected the advisor to be able to do for them. I did not require the students failing the first exam to come to an office hour, something I may implement in the future. I know that the advisors did encourage students to come to office hours, and a few did. Unfortunately I did not keep track of their names so that I could track whether or not it helped their performance in the class. The majority of office hour visits, unfortunately, seemed to be to sign drop forms, or to discuss signing drop forms.

Do you feel that you accomplished something by being a part of the FLC? If so—what?
Yes. The FLC gave me more tools to continue to innovate in BIOL 211. The project discussed in this report is not what I had planned to do, but after this opportunity presented itself, there was no time to pursue my original plan, which was to develop some Panopto segments. I still hope to do that, with careful planning, this summer. Also, I have been collecting and using you.tube links to videos that are appropriate for the content for each week of the semester. It may be worthwhile to integrate them more into the course, rather than making their viewing optional.

I greatly appreciated the opportunity to participate in the FLC. I learned a lot from my colleagues as well as from the reading materials. As important as the content was, I also appreciated having a forum to reflect on and discuss issues surrounding teaching and learning. I plan to continue to make changes both in BIOL 211 and in my upper division courses. I will analyze these changes to determine whether they have the desired effect of improving student learning.

Table 1. Results of Qualtrix Survey (collected and collated by Angela Tuan, CNSM Advising Office

BIOL 211 Fall 2012

Group 1: 80% ≤ First Exam Score ≤ 100%	33 responses
Group 2: 60% ≤ First Exam Score < 80%	59 responses
Group 3: First Exam Score < 60%	61 responses
	151 total

Did you experience difficulty in this course with:
YES Responses

	Group 1	Group 2	Group 3
class attendance	3.03%	1.69%	4.92%
deciding what's important in lecture notes	27.27%	45.76%	55.74%
instructor's teaching style	18.18%	36.17%	32.79%
testing style	36.36%	79.66%	75.41%
this type of course in the past	12.12%	23.73%	37.70%
math skills	9.09%	1.69%	8.33%
setting up word problems as equations	15.15%	20.34%	26.67%
speed	30.30%	55.93%	60.00%
time management on the exam	21.21%	52.54%	51.67%
overall time management	48.48%	66.10%	78.33%
residential/living arrangements	6.25%	11.86%	15.00%
quiet place to study	34.38%	37.29%	48.33%
roommate difficulties	9.38%	6.78%	8.33%
health problems	9.38%	10.17%	11.67%
financial problems	25.00%	28.81%	26.67%
motivation problems	31.25%	42.37%	53.33%
adjustment to college	6.25%	13.56%	18.33%
personal problems	25.00%	38.98%	35.00%
family issues	12.50%	20.34%	16.67%

On average, how many hours per week do you spend:

	Group 1	Group 2	Group 3
studying (total time)	11.73	9.88	9.62
reading	7.91	7.58	8.37
using Bioportal	4.52	4.51	4.67
reviewing notes	4.33	6.51	6.33

paid employment	6.7	7.49	8.67
volunteer/internships	3.64	2.17	1.78
clubs & organizations	2.18	2.73	3.22
online	8.73	7.17	6.52
socializing	8.61	7.68	6.25
family	7.67	9.17	10.28
commuting	4.85	4.51	6.18

Table 2A. Student Success in BIOL 211 (expressed numerically)

Student Success	**Fall 2010**	**Fall 2011**	**Spring 2012**	**Fall 2012**	Average	SD.P
enrolled	270	266	270	272	269.5	2.2
grade assigned	241	244	236	243	241.0	3.1
A	30	27	22	28	26.8	2.9
B	55	99	77	85	79.0	15.9
C	125	103	103	95	106.5	11.2
D	21	14	28	26	22.3	5.4
F	10	1	6	6	5.8	3.2
WU	0	5	0	3	2.0	2.1
W	26	16	32	25	24.8	5.7
WE	3	1	2	4	2.5	1.1
pass	210	229	202	208	212.25	10.1
official W, WE	29	17	34	29	27.3	6.3
D, F, WU	31	20	34	35	30.0	6.0
Total D,F,W,WE,WU	60	37	68	64	57.3	12.0

Table 2B. Student Success in BIOL 211 (expressed as percentages)

Student Success	**F'10 %**	**F'11 %**	**S'12 %**	**F'12 %**	average	SD.P
enrolled	100.0	99.6	100.0	100.0	99.9	0.16
grade assigned	89.3	91.4	87.4	89.3	89.3	1.41
A	11.1	10.1	8.1	10.3	9.9	1.09
B	20.4	37.1	28.5	31.3	29.3	6.01
C	46.3	38.6	38.1	34.9	39.5	4.18
D	7.8	5.2	10.4	9.6	8.2	1.97
F	3.7	0.4	2.2	2.2	2.1	1.18
WU	0.0	1.9	0.0	1.1	0.7	0.79
W	9.6	6.0	11.9	9.2	9.2	2.09
WE	1.1	0.4	0.7	1.5	0.9	0.41
pass	77.8	85.8	74.8	76.5	78.7	4.21
official W, WE	10.7	6.4	12.6	10.7	10.1	2.28
D, F, WU	11.5	7.5	12.6	12.9	11.1	2.15
Total D,F,W,WE,WU	22.2	13.9	25.2	23.5	21.2	4.37

Table 3. Fate of Students Who Failed Exam 1

Semester	Ex1 score	No. students	Final B	Final C	Final D	Final F	Final W	Final WE	Pass
Fall 2010	50-60%	50 (18.5)	1 (2)	31 (62)	6 (12)	3 (6)	8 (16)	1 (2)	**32 (64)**
270 census	<50%	25 (9.3)	0	10 (40)	7 (28)	3 (12)	5 (20)	1 (4)	**10 (40)**
	Total	75 (27.7)	1 (1)	41 (55)	13 (17)	6 (8)	**13 (17)**	2 (3)	**42 (56)**
Fall 2011	50-60%	29 (11)	4 (14)	17 (59)	4 (14)	0	4 (14)	0	**21 (72)**
266 census	<50%	17 (6)	0	8 (47)	4 (23.5)	1 (6)	4 (23.5)	0	**8 (47)**
	unknown	6 (2)	0	0	0	0	6 (100)	0	
		52 (19.5)	4 (8)	25 (48)	8 (15)	1(2)	**14 (27)**		**29 (56)**
Spring 2012	50-60%	53 (19.6)	3 (6)	30 (57)	12 (23)	0	8 (15)	0	**33 (62)**
270 census	<50%	36 (13.3)	0	11 (31)	7 (19)	4 (11)	12 (33)	2 (6)	**11 (31)**
		89 (33)	3 (3)	41 (46)	19 (21)	4 (4)	**20 (22)**		**44 (49)**
Fall 2012	50-60%	41 (15)	1 (2)	19 (46)	10 (24)	1 (2)	8 (20)	2 (5)	**20 (49)**
272 census	<50%	27 (9.9)	0	3 (11)	6 (22)	5 (7)	12 (44)	1 (4)	**3 (11)**
	Total	68 (25)	1 (1)	22 (32)	16 (24)	6 (9)	**20 (29)**		**23 (34)**

Notes: 1)Number of students in each column are indicated along with percentages (in parentheses).

2) Percents in the number of students column refer to the number of students enrolled in the course.

3) Percents in the final grades column refer to the number of students with the exam 1 score being analyzed.

4) Fall 2010, Fall 2011 were before Early Alert, Spring 2012, Fall 2012 employed Early Alert.

Table 4. Exam 1 Score *vs.* Withdrawal

	Ex1 80-90	Ex1 70-79	Ex1 60-69	Ex1 50-59	Ex1 <50	No. W's
Fall 2010	1	4	9	7	5	26
Fall 2011	0	0	4	4	10	18
Spring 2012	2	3	7	8	12	32
Fall 2012	1	1	3	8	12	25

Table 5. Student Repeats.
Success of students who earned D, F, W, WU, or WE and repeated the course the following semester. (Note: one student who withdrew in Fall 2011 and repeated in Fall 2012)

Repeats	Original	No.	New B	New C	New D	New F	New W	% Pass	% Fail	Not Rep	% NR
Fall 2011	D	15	0	1	1	0	0	6.7	6.7	13	86.7
	F	1	0	0	0	0	0	0.0	0.0	1	100.0
	W	18	1	2	0	1	1	16.7	11.1	13	72.2
	WE	1	0	0	0	0	0	0.0	0.0	1	100.0
	WU	3	0	0	0	0	0	0.0	0.0	3	100.0
	Total	38	1	3	1	1	1	10.5	7.9	31	81.6
Spring 2012	D	28	1	2	5	0	1	10.7	21.4	19	67.9
	F	6	0	0	0	0	0	0.0	0.0	6	100.0
	W	32	1	6	0	0	0	21.9	0.0	25	78.1
	WE	2	0	0	0	0	0	0.0	0.0	2	100.0
	Total	68	2	8	5	0	1	14.7	8.8	52	76.5

CNSM Faculty Learning Community Final Report

Introduction
Name: Chung-min Lee
Department: Department of Mathematics and Statistics
Course to which changes were made: MATH370A Applied Mathematics I

The MATH 370A Applied Mathematics I course is an upper division course for engineering majors. The course covers linear ordinary differential equations and systems. Most of the students in this course have finished the Calculus I, II, III sequence, but some only finished Calculus II since the prerequisite of the course was changed to Calculus II a few years ago. In general the students in this course are diligent, but sometimes they can still be frustrated with some parts of the course such as Laplace transform methods and systems of differential equations.

Changes made in the Fall 2012 course:

1. Requiring students to finish two to three question pre-class quizzes on Beachboard before each lecture.
2. Posting practice quizzes instead of giving in-class quizzes.
3. Adding exam correction assignments.

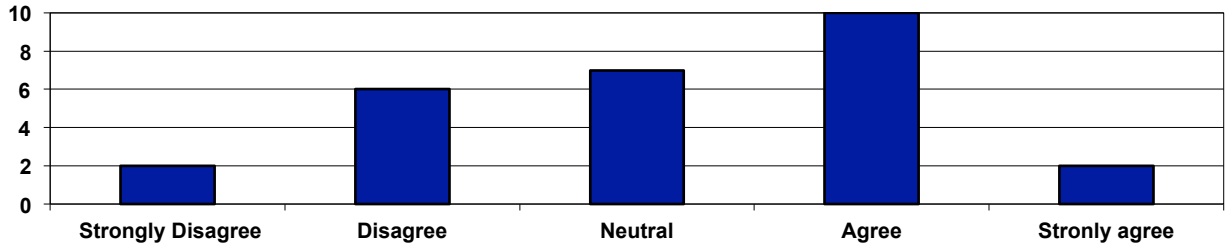
Number of students: 39, 2 withdrew

Student responses toward the changes

- Pre-class quizzes

  Pre-class quizzes consisting of 2 to 3 questions were due before lectures. Students were not happy with the pre-class quizzes. Throughout the semester, students complained about being tested on materials before they were introduced in lectures. In mid-semester surveys, students chose pre-class quizzes as the least helpful aspect of the course. At the end-of-semester surveys, students' responses to whether the pre-class quizzes enhanced their learning are shown in the Figure 1.

Figure 1. I find the pre-class quizzes enhanced my learning. (27 responses)



When asked what they like or dislike about the pre-class quizzes, the top three reasons and the votes are shown in the following table. 27 students responded to these questions, and students could select all the reasons they agree with in these two questions. Interestingly reading the textbook was considered favorable for some and unfavorable for other students.

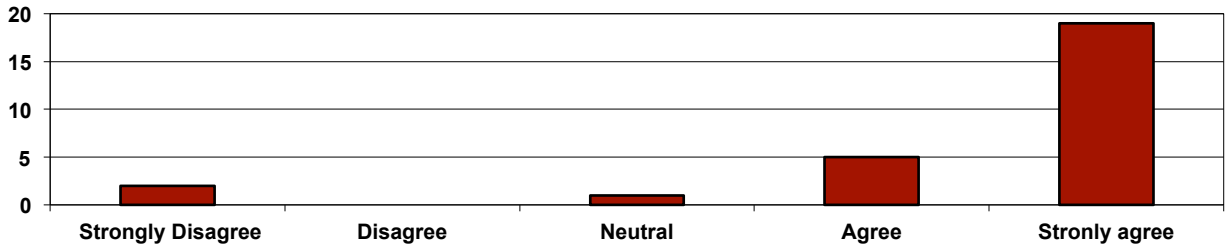
Top three reasons to like the pre-class quizzes		Top three reasons to dislike the pre-class quizzes	
They were useful for familiarizing me with what we will learn next.	17	The questions confused me a lot.	11
They forced me to read the textbook.	15	The questions were too difficult before the lectures.	8
They made me teach myself.	10	They forced me to read the textbook.	6

As an instructor I find the pre-class quizzes useful for giving students a pre-view of what will be covered in the coming class. The quiz problems did not ask students to solve differential equations, but instead asked students to write short answers about the topics that would be covered or to determine properties of the solutions of examples in the textbook. I am delighted to see some students looking for connections to other subjects or to their interests in answering some of the pre-class quiz problems. However, the choice of questions can be improved to be more general and conceptual.

- Practice quizzes

Practice quizzes were posted on Beachboard to replace the in-class quizzes. Unlike the pre-class quizzes, these quizzes aim to let students self-test their skills and knowledge of the materials after the lectures. Most students find these quizzes helpful; please see Figure 2 for students' responses on the end-of-semester survey.

Figure 2. I find the practice quizzes enhanced my learning. (27 responses)



When asked for the reasons to like or dislike the practice quizzes, the top three reasons and their votes are listed below. It appears that students generally think that the practice quizzes are helpful, but some are concerned that it does not enforce the habit of regular study as in-class quizzes do. However, a slightly larger number of students responded in favor of the practice quizzes not taking class time (9 votes) and not counted toward the grade (14 votes).

Top three reasons to like practice quizzes		Top three reasons to dislike practice quizzes	
They provided additional examples for the materials.	25	They were not done in class time.	8
They helped me prepare for the exams.	25	They did not force me to study regularly as in-class quizzes do.	6
They examined my understanding and skill of the course materials.	23	They did not count toward my grade.	5

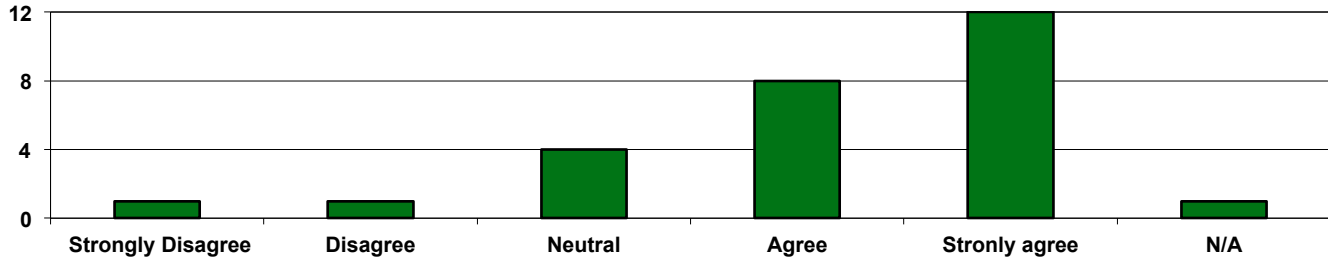
When asked if they prefer in-class quizzes or practice quizzes they can do outside of class time. 21 responded that they prefer the practice quizzes we did this semester, and 6 prefer in-class quiz.

The problems assigned in this 300-level course take longer to solve, so I find the practice quizzes a good way to save class time and communicate to students about the expectation of the course. The problems on the quizzes are at the intermediate and slightly difficult levels, and the expected time to finish each quiz was also listed. I am glad that students found them helpful. As for enforcing good study habits, I collected homework assignments and graded selected problems weekly.

- Exam-redo assignments

  Students were asked to submit corrections of the problems on which they did not get full scores in midterm exams. Each exam-redo assignment is counted as one homework assignment. In each problem, the maximum score between the redo assignment and the exam is used as the score of that problem on the redo assignment. Figure 3 shows that most of students find the exam-redo assignments helpful.

Figure 3. I find the exam-redo assignments enhanced my learning. (27 responses)



The top reasons to like or dislike the exam-redo assignments and their votes are listed below.

Top 3 reasons to like exam-redo assignments		Top 2 reasons to dislike exam-redo assignments	
They made me revisit the topics that I was not able to master before the exams.	24	They took too much of my time.	8
They made me realize what I did not understand before.	19	They were counted as homework assignments.	7
They helped me prepare for the final exam.	15	Other reasons received 2 or fewer votes	

Exam corrections require students to revisit the topics. However, many students chose not to do it and cited time constraints. The situation became more severe as the semester progressed. 32 students did the exam-redo assignment after the first midterm, 24 students did the exam-redo after the second midterm, and only 17 students turned in the exam-redo assignments after the third exam.

Changes in learning outcome

- Within the Fall 2012 semester

  In the final exam, there were two similar problems that required the same conceptual understanding and skills to problems in the first and the second midterm exams. The percentages of points students received on the problems are listed in the following tables.

  Problem: Tank flow problem that is described by a first order linear equation

Midterm 1 class average	Final exam class average	Midterm 1 average of student who redid the problem	Final exam average of student who redid the problem
74.49%	77.92%	67.46%	79.29%

  Problem: The method of variation of parameters on second order nonhomogeneous linear equation

Midterm 2 class average	Final exam class average	Midterm 2 average of student who redid the problem	Final exam average of student who redid the problem
56.43%	68.57%	47.22%	71.77%

  The whole class averages improved from the midterm exams to the final exam in both problems. However, the average of students who redid the problems after the midterm exams increased in a much larger percentage. It is true that the students who turned in the exam-redo assignments were more likely to be the ones who performed poorly in the midterm exams, but it is encouraging to see their improvements surpassed the improvements of the whole class. The averages listed in the tables are taken from students who took the final exam, and do not include students who withdrew from the class.

- From the Fall 2011 semester to the Fall 2012 semester

  The class in the Fall 2012 consisted of more seniors and fewer sophomores than the previous year:

	Sophomore	Junior	Senior	Post-Bac	Graduate
Fall 2011	9	16	8	0	1
Fall 2012	5	17	16	1	0

  Although the students were potentially weaker in Fall 2012, the semester grade distributions are very similar in both Fall 2011 and Fall 2012:

	A	B	C	D	F/WU	W
Fall 2011 34 students	5 (14.71%)	11 (32.35%)	10 (29.41%)	5 (14.71%)	2 (5.88%)	1 (2.94%)

Fall 2012 39 students	5 (12.82%)	13 (33.33%)	12 (30.77%)	4 (10.26%)	3 (7.69%)	2 (5.13%)

The final exam in the Fall 2012 semester required more calculus maturity and skills than the final exam did in Fall 2011. This resulted in a lower average in the Fall 2012 final exam (68.31%) than in the Fall 2011 exam (70.06%). However, for the tank problem mentioned above, the Fall 2012 class received a higher percentage of points (77.92%) than the Fall 2011 class did (72.81%) despite the fact that the problem in Fall 2012 added one more layer of difficulty.

Conclusion

With a student body that is not large, it is difficult to compare results between semesters. The composition of students may easily dominate any changes in students' learning outcomes. It is reassuring to see that students' abilities to apply their mathematical knowledge and skills to problems were improved during the semester.

Since the exam-redo assignments appear to be effective in making students re-study the materials that they did not master before the exams, I plan to continue this practice in my future course. It does take extra time to grade these exam-redo assignments, but I feel the substantial benefit to students makes it a worthwhile effort. Practice quizzes seem to be well received, too. These practice quizzes only have to be created once, and modifications in future semesters will not take much time. I would like to use these practice quizzes again in the coming semesters. The pre-class quiz was the change that students were unsure about. Students recognized some of the benefits, but were uncomfortable with the idea of being questioned before lectures. There are definitely ways to improve the implementation of the pre-class quizzes and the types of questions being asked, and it will require more efforts from both the instructor and the students.

CNSM Faculty Learning Community Final Report

Introduction
Name. Ken Nakayama
Department. Chemistry and Biochemistry
Name and number of class where development occurred. Organic Chemistry lecture, CHEM 322A (fall 2012)
Number of students in the class. 70
Is this typically considered a low completion rate course? Yes

Hypothesis
Brief (few sentences) description of what it is that you tried and how you thought it might increase student learning/success/retention. If you tried several things, organize as best you can to be clear.

In previous semesters of this course, I used to administer weekly 10 minute pre-lecture quizzes for a total of about 10 quizzes for the semester. These quizzes were attempts to motivate students to read the assigned textbook material before the lecture so that I could focus on more advanced or difficult concepts during lecture. They would also take three midterms (100 pts. each) roughly spaced 4 weeks apart.

During the fall 2012 semester, I decided to increase the number of pre-lecture quizzes to everyday and make them into 5 minute quizzes. These quizzes were administered during the first six or so weeks. Then, I backed off to giving weekly quizzes for the remainder of the semester, for a total of 16 quizzes. I also administered a 50 point mini-exam on week three to get students engaged with the course material from very early on, before their first midterm (100 pts.).

Results
Did it work? Briefly describe your results- ideally providing some figures to share.

The table shows the averages for the various categories along with the course passing rate over the past three times that I taught this course. The passing rate reflects only students who completed all assignments in the course, including the final exam.

	Midterm 1	Midterm 2	Midterm 3	Final Exam	Course	Passing Rate
Spring 2011	67.6%	68.1%	66.3%	63.5%	67.6%	81%
Fall 2011	58.9%	66.3%	67.7%	54.6%	63.3%	69.8%
Fall 2012	75.4%	62.7%	62.7%	57.1%	64.7%	69.8%

The comparison of the fall12 data with the previous two semesters indicates that my effort to engage students early in the semester was somewhat successful. This is borne out by the very high midterm #1 average for f12. The mini-exam was administered during the third week, while midterm #1 was given in the fifth. The data also suggests, however, that there was no sustained engagement throughout the semester since the averages for midterms #2 and #3 as well as the final exam settled down to within values seen in earlier semesters.

Discussion

Would you do this again? Why or why not?

I will not do this again, unless I receive additional support from the chair or the dean in the way of a grader. This experiment seems to bring to the fore some somewhat disturbing attitudes among science majors in our college, which I have been recognizing for some time now. For one, many, if not most, seem to be incapable of sustaining an attitude of success in our courses on their own. This becomes absolutely disasterous later in their career as they start to enter more demanding and specialized upper division courses. Secondly, there is a culture of viewing course work in a very disjointed way where attention is paid to topics and concepts in a very myopic manner. Thus, they often fail to see how concepts from earlier in the course are essential to success and understanding later in the same course. This problem seems to exist among different but related courses (for example, biochemistry vs cell biology) as well so that there is a general lack of interest in most courses not directly related to a student's area of focus. I can't be very optimistic about the outcome of such an attitude after 4 (or more) years of university studies.

In some respects, I think I played into the hands of these students by offering more (excessive?) quizzes and exams in fall 2012. I think the pressure to learn should be moved back a lot more to the student side.

Any tips or ideas for other faculty attempting to try this in their own classes?

Be sure to secure additional resources from the chair or dean to assist you in processing the daily quizzes and other assignments.

Do you feel that you accomplished something by being a part of the FLC? If so—what?

I thought that the exchange of experiences and ideas on teaching was very valuable as we all seem to face the same or similar challenges throughout the college. The meeting at the end of fall semester where some of us were given a chance to show what we did in our classroom was very useful. However, they were also a bit too short for everyone to really gain a feel for what was being implemented.

CNSM Faculty Learning Community Final Report

Introduction
Instructor: Lora Stevens
Department: Geological Sciences
Course: GEOG 240 and GEOG 465

Overview

I participated in the FLC during Spring 2012. I made small changes in all my classes but report only on two in which I can provide assessments: my 200-level Historical Geology class in Fall 2012 and my 400-level Oceanography class in Spring 2013. Neither class has a low Pass rate. Historical Geology (Geol 240) is a required course in the Geology major and is content heavy (essentially 4.6 billion years of Earth History). The typical student in this class is a CC transfer student in their first semester at CSULB. Physical and Chemical Oceanography (Geol 465) is a required course in the Marine Biology major. The typical student in this class is an upper division Marine Biology major, although significant numbers of upper division Geology majors and Environmental Science & Policy majors also participate. Basic science courses are similar among these three groups although applied skills are not.

I did not assess my classes on overall grades—rather my assessment was question specific. That is, I used targeted test questions to determine if specific FLC activities led to a greater understanding of a key topic. To do this assessment, I used identical test questions from 2011/2012 exams (before FLC) on my recent exams. However, this limited my assessment as I did not keep exams from semesters prior to Fall 2011.

Impressions from Behind the Lectern

My typical lecture style is already interactive. Although I am concerned about content, my main goal in any class (even Historical Geology) is to get students to "connect the dots" and build on their existing knowledge—thus, I frequently return to information from previous lectures. Lower division students used to "memorization-only" classes find this adjustment difficult at times. I ask numerous questions during lectures and have done informal "pair shares" for years.

What the FLC did for me was to refresh my commitment to interactive learning styles and to provide me with concrete ideas that I could take to my classroom. I felt my own attitude improving with the *esprit de corps* and dedication of the other faculty participants. I was able to tap into a wide variety of sources for help and ideas. For the first time, I didn't feel as if I was out there on my own. Even so, my "results" are mixed. Re-doing classes is very time consumptive, and I found that I did not have sufficient time to make all of the alterations I would have liked. Although minor changes can be made, it isn't possible to make large changes with our current teaching loads while maintaining active research programs without release time or some type of support.

Results

Historical Geology

I adopted two techniques from the FLC seminar: Fishbowl Questions (e.g. Paulson) and Concept Maps. Although I used Fishbowl questions and had students try to explain concepts to convince one another of an answer, I was unable to assess whether this had a scholastic impact on the students. However, it did tend to make them more comfortable with asking questions in class. The concept maps were used to help them understand cause and effect in past environmental

changes. We did one as a class and then one independently. Questions specific to the concept maps but identical to Fall 2011 (pre-FLC) were given on exams. The average score for Question 1 (class concept map) actually dropped by nearly one point between 2011 and 2012. The average score for Question 2 (individual concept map) was the identical between the two years.

Note: My original intent was to "flip" certain lectures in another fall course (Geol 300i: Earth Systems and Global Change). However, I ended up with 16 WTUs in the Fall and simply did not have the time to do this credibly. Although it was in my syllabus, the technological know-how and the time it would have taken to create the exercises for the class exceeded the time I had for the class. In the end, I did not flip any lectures.

Physical and Chemical Oceanography

Because I was unable to flip my lectures in the fall, I intended to flip two lectures for my spring Geol 465 (Oceanography) class. Once again, due to oversights in my course scheduling, I ended up with a full load (12 WTUs) rather than a reduced load as was promised due to my fall overload. Other circumstances due to poor departmental plannin and an NSF grant panel consumed most of January and the end result was that once again I found insufficient time to credibly flip the lectures.

Instead, I made the conscious decision to delete content and to "quasi-flip" my lectures. I took 5 topics with which students struggle, and lectured on them for the first 40 minutes class and then had the students do a 30 minute exercise in class. Ideally, the lecture would be watched by the students before coming to class. I based two assessments on these exercises: one on performance and the other on student perceptions.

Performance Assessment

To assess whether the in-class activities of 2013 had a positive effect on the students, I gave the exact same test question related to an in-class activity on the 2013 final as I did on the 2012 final. In addition, I also used a "control" question, which was also identical between 2012/2013 but was on a topic for which there was no in-class exercise. In both questions, the average score dropped for the 2013 class by about 1 point out of 10. To make sure I wasn't grading more harshly on the 2013 exam, I randomly picked 4 exams from 2012 (they never pick them up) and regraded them. I got the exact same scores. Although it is tempting to conclude that the in-class exercises didn't help, it should be noted that this particular class was small and students frequently missed class. In fact, all students were in attendance for only one of the in-class activities. The question on the exam related to this topic had a higher overall score by 2 pts compared with the other questions related to the other in-class activities. Given that the number of students in the class was 16, the absence of 2-3 students during those days could significantly contribute to the lower overall scores.

Perception Assessment: An Argument for Flipping Lectures

I wanted to assess whether the students found the in-class activities helpful to their learning (regardless of their performance). I administered an anonymous questionnaire to the students during regular faculty evaluations, treating the questionnaire in the same manner including a sealed envelope.

On a scale from 1 (no help at all) to 5 (very helpful), I had the students rate each in-class exercise (Fig. 1). The average ranking of the exercises was a 4.6/5. I then had them indicate whether it would have been more helpful if they 1) had no exercises, 2) learned the topic first before coming to class and working on the exercise (e.g. flipping the lecture), 3) had homework on the topic. They could choose all that applied. The results show that 73 % of the students felt learning the topic first then coming to class would have been more helpful; 25 % of the students wanted additional homework for practice; 0% felt that having no exercises would be more

beneficial. In short, the students felt the exercises helped them understand the material better. Most thought that learning the material first and then coming to class for the exercises was better than learning the material then immediately doing the exercise. This is an argument for flipping the lectures. Flipping would also allow for a more in-depth exercise AND would open up time for more content. Although I favor flipping lectures, I am concerned about the time commitment needed to do so.

Analysis

In both classes, the scores on individual questions related to my FLC activities actually dropped, but so did the overall scores on each exam (Table 1). The reasons for this could be many—including improper application, poorly designed tests, etc. However, I believe that what I observed is mainly due to the natural variability of classes from year to year. Comparing the results from two years is simply not adequate for gauging the success of these techniques. In the case of Historical Geology, this was the first class in 5 years that I felt obliged to take one entire lecture period and "teach" the students how to study. They lacked the most basic skills, including proper note taking. I did this in response to the first exam in which 7 out of 17 students received an F and the average score was 10% points lower than any previous class of mine since 2008.

Question: For this weaker group of students, what could have worked better to enhance their learning?

Answer: I simply do not know. I outline each lecture, provide weekly quizzes on the reading, star key words that they must know, dovetail labs with lecture material, do fishbowl questions, and concept maps. This group seemed to have less academic preparation than previous years—and I tried to provide that.

With respect to Physical and Chemical Oceanography, the size of the two classes may have been a factor in the drop in scores. In 2012, I had 33 students, and in 2013, I had 16. Ordinarily the first exam scores are lowest as students adjust to my testing style (fill in the blank, short answer, diagram interpretation, essays). However, the 2013 scores decreased over time, which is atypical for any of my classes and suggests unusual conditions for that semester, which may or may not be linked to the FLC activities. More classes are needed before a true assessment can be made.

Table 1: Average Scores for Physical and Chemical Oceanography

	Exam 1	**Exam 2**	**Final**	**High Score Final**
2012	74%	80%	78%	95%
2013	75%	72%	68%	89%

Question: Did you feel that the in-class exercises contributed to your learning the key concepts of the following topics: Temperature-Salinity Diagrams, Chemical mixing, Alkalinity calculations, $\delta^{13}C$ tracing, and CCD.
5 = very help, 4 = helpful, 3 = neither helpful/unhelpful, 2 = unhelpful, 1 = very unhelpful

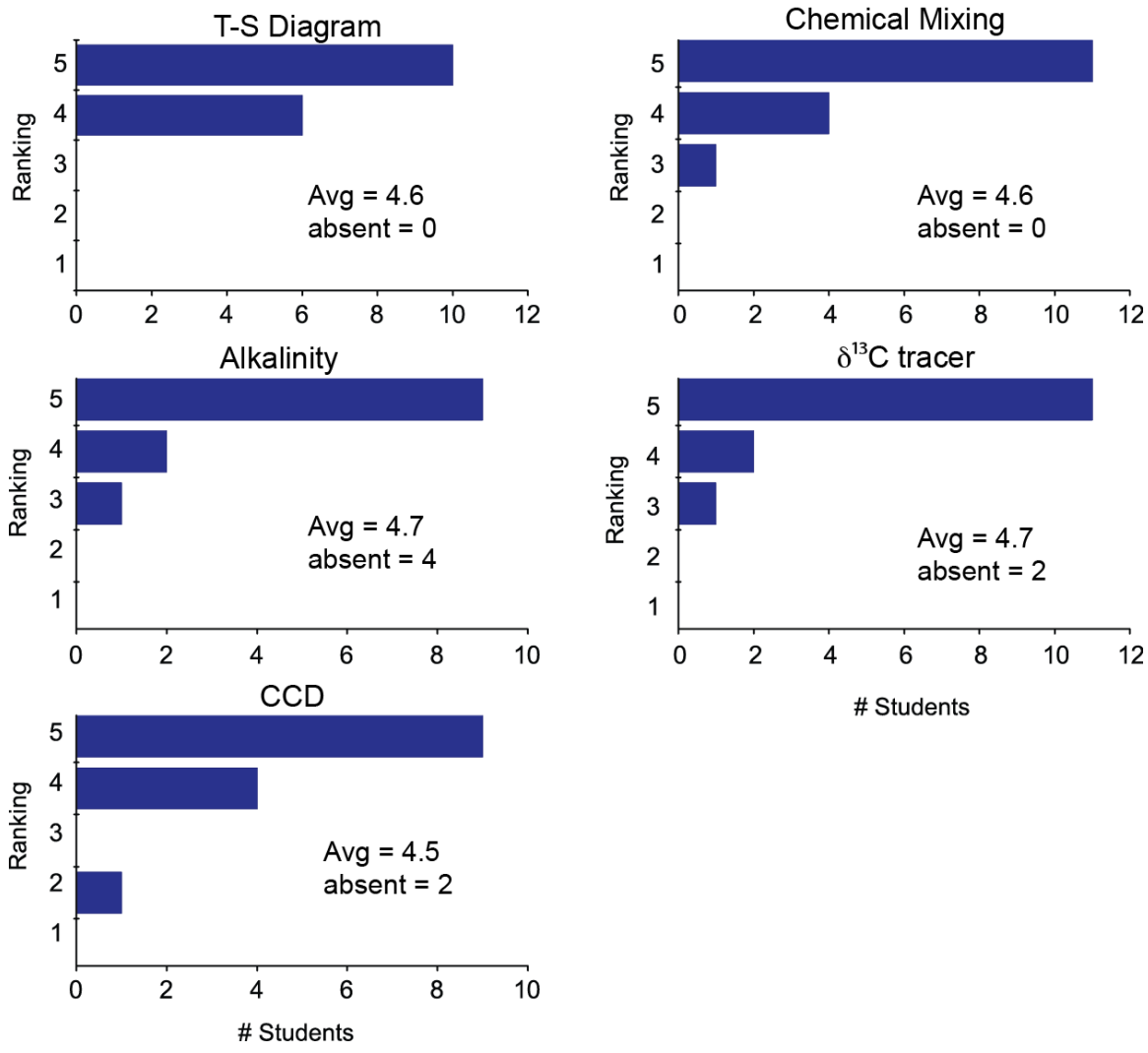


Fig. 1. Ranking of the efficacy of each in-class exercise by topic. Average score and number of students absent the day of the exercise given in each box.