

**NSF Material and Energy Balance (MEB) Virtual Community of Practice (VCP) – 2013  
Individual Project Summary**

**Name:** Helen Buettner

**University:** Rutgers University

**Number of semesters you have taught the MEB course:** ~10

**Summary of your fall implementation activity:**

Adapted peer-instruction model to one 80-minute class period per week, i.e., 5-15 minute targeted lectures, separated by questions that the students discussed in small groups (3 students per group), reached consensus, and answered using clickers. Questions ranged from 2 -30 minutes in length. Three undergraduate learning assistants circulated with me and helped facilitate group discussions. Questions were from drawn from the University of Colorado bank of ConcepTests for this course at LearnChemE.com, but I generated additional questions based on how the class was doing and what I thought they needed. I tended to use conceptual questions when introducing a topic, then shifted the focus to solving problems. During the other class period of each week, I lectured but broke up the lectures, sometimes with a clicker question or a short video, sometimes going over homework or example problems, so that we rarely had a solid block of lecture more than 20 minutes long. To account for active learning time in the classroom, I assigned brief textbook readings to be completed prior to each lecture that targeted specifically the material to be covered, as well as LearnChemE screencast videos. Sapling Learning online homework was the primary source of homework problems, supplemented in a few instances with paper-and-pencil homework. Gave several extra credit opportunities throughout the course, which were well received.

**What worked well? Feel free to share qualitative and quantitative assessment results, if any, to describe student performance.**

The students loved the clicker problems and group work (after they became comfortable with the idea and understood that they were supposed to be working collaboratively, which took about 4 weeks). They also really liked the online homework. In general, the class (of 100 students) was much more active and enthusiastic (despite the 8:40 am class time), and seemed to feel very comfortable asking questions. The results of the end-of-the semester survey I gave them is attached. (The response rate was only 72/100 because it snowed that day and many students didn't make it to class.) Grades were better overall – more A's than usual, about the same number of D's and F's, but many fewer withdrawals.

**What could have been improved?**

- Too much variation in the length of time different groups needed to respond to the clicker questions.
- I would have liked to do more 'just-in-time' with the online homework
- Enormous time investment, too little support (good insights into support my colleagues will need)

**What would you do differently next time?**

- I plan to keep the same format, but also have learning assistants lead supplemental study groups outside of class next time
- I'll assign a little more paper-and-pencil homework
- Now that I've completed a lot of course set up, will be able to do more just-in-time with homework
- Will probably increase the number of conceptual questions somewhat
- Will increase availability of peer-tutoring

## Results from End-of-Semester Evaluation of Learning Methods Used F2013

Total responses = 72/100

% Agree/  
Strongly Agree\***Learning Assistants (LAs)**

1. Overall, the LAs did a good job this semester	83
2. Overall, the LAs helped me learn the subject	67
3. The LAs had a good working knowledge of the subject matter related to the course	84
4. The LAs acted in a professional manner	93
5. The LAs answered my questions clearly and were positive and/or constructive in their responses	80
6. The LAs could relate to my situation as a student	77
7. The LAs gave me insight about the course and the major	61

**iClicker exercises**

8. The iClicker problems helped me learn the course material	93
9. The number/difficulty of iClicker problems was about right	80
10. Solving problems in a small group was beneficial	89

**Homework**

11. Online homework helped me understand the course concepts and topics	92
12. I liked the immediate feedback and tutorials provided by the online homework	87
13. Smaller, more frequent homework assignments were more manageable than one large, weekly assignment	89

**Assigned Videos & Reading**

14. The assigned videos aided in understanding the material	68
15. The textbook readings were important for doing well	50
16. The daily assignment sheets helped me focus on the relevant material and use my study time efficiently	85

**Additional resources**

17. I would have used one-on-one tutoring if it had been available for this course	76
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\*Response categories were: Strongly Agree – Agree – Disagree – Strongly Disagree – No Comment

Please indicate changes you hope to see in other chemical engineering courses you will be taking (check all that apply):

Learning Assistants in class	36%
Learning Assistant office hours or outside-of-class study groups	44%
iClicker problems	52%
Online homework	71%
YouTube Videos to complement lectures and readings	58%
Tutoring	58%
Other:	8%

7. The grade I expect to earn in this course is

A	33%
B+	12%
B-B+	3%
B	30%
C+	8%
C-C+	2%
C	9%
D	3%
F	0%

8. This is \_\_\_\_\_ I hoped for

the same as	42%
better than	13%
worse than	45%

Because:

I generally only get As but I don't blame the way the course was taught. I think I underestimated how difficult the first exam would be because I had been doing so well with the homework.

I really made stupid mistakes which ruined by ability to pull up my grade

Not good time management/studying capabilities.

henry's law

I didn't use my resources properly

in the beginning, I thought I would have understood more and did better than I'm doing now.

There were a lot of tools that helped me understand this course.

The material was hard to grasp with the material given. The online homework was sometimes unrelated or unclear.

I underestimated the difficulty level of this course.

I didn't do as well on the exams as I wanted to; I felt prepared going into them but would forget information or just choke on the exams

I made stupid mistakes on the second exam which lowered my avg.

mediocre exam scores

I didn't devote as much time towards the course as I should have.

I was not expected to be as busy with other classes

I didn't have as much time to study as I had hoped.

the material was taught clearly and well.

I did not think I would do well.

not enough enthusiasm generated in course

I usually get As.

I'm an idiot and didn't do any homework.

I did not do very well in the 2nd exam

If I study and get a good grade I will get an A

The latter half of the semester was exponentially more difficult than the first.

I wanted a B or B+ after spending a lot of time studying

I didn't do as well as I would have hoped

I put in that amount of effort.

I didn't put in much time.

I expected it to be more difficult for me to understand

I didn't pre-practice

the material began to get tricky during the end of the semester.

I did not manage my time efficiently

I studied a good amount for everything, received decent grades on the midterms, did all homework.

Please add any other comments you wish to share (feel free to use the back of this page if you need more space):

I loved the iClickers and working with a small group. Also, I think it's a better idea to just get the new edition of the book.

I really enjoyed the material taught, and both the lectures and homework assignments were very effective for learning and test preparation. I hope future engineering courses are taught in a similar fashion.

The course could be more interactive (writing out processes on board, not just posted in one slide on ppt).

The online HW problems could be quite harsh at times and took hours to solve. Do more "HW like" problems in class.

I really appreciate all the time you gave me to talk about the class during office hours and all the help that you offered.

The way the class was taught helped me understand the material well.

I like the class I just wish there were tutors/additional supplemental material.

I liked working in groups.

I wish there would be a curve

I wish there was a curve

Online Homework is detrimental to this. Traditional homework is much more conducive to this course's material.

Include more written homework so that students can have more practice writing the problems out/organizing work.

Can you drop lowest HW assignments/clickers

This class did lots of things right. Especially the amount of problems did

Allowed me to see my interest in chemical engineering.

Overall, I did enjoy the course, despite being very difficult

I really like the idea of tutoring for next semester

I really enjoyed the course! I learnt a lot and the LAs were awesome! Also, Dr. Buettner is really nice!

Homework was extremely helpful so much so that it was invaluable.