

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

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**Number of semesters you have taught the MEB course:** 28 (twice every academic year)

**Class size:** 21 – 30

**Summary of your fall implementation activity:**

- Sapling Learning Online Homework – homework problems similar to problems in the course text (Felder & Rousseau) were developed by Sapling Learning and each week, problems appropriate to the material covered in class were assigned to students online. Previous homework assignments that I used in the course served as a guide. Students received feedback (in real time) as they solved the assigned problems online. On completion of each assignment, the students received a grade. I reviewed periodically the performance of the students on the homework assignments to identify areas of difficulty and implement appropriate measures.
- Use of CATME as a tool for teaming and team evaluation– At the beginning of the semester, for the purpose of group activity (see below) teams of students were formed with the aid of CATME (Comprehensive Assessment of Team Member Effectiveness) available at <http://www.catme.org>. A number of criteria were used for the formation of teams including gender, GPA, race, and student availability. Each team comprised 3 to 4 students. After the first in-semester exam, students used another component of CATME for self- as well as peer-evaluation. Students were subsequently regrouped, and this time, the membership was limited to 3. The results from the evaluation were used in the calculation of the overall grade.
- In-class group work & Problem Sessions – The class met on Monday and Thursday each week. The duration for the Monday class was 1 hour 40 minutes while that of Thursday was 50 minutes. Based on this schedule, problem sessions were held on Mondays and the Thursday class was devoted exclusively to traditional lectures. In-class group activities were assigned to teams for execution on problem session days. For each in-class group activity, teams were given the same question and typically allowed about three to five minutes to discuss and come up with an answer. The questions were drawn from AIChE ConceptWarehouse and were multiple-choice in nature. In addition to the answer to each assigned question, the students were also expected to provide a solution to receive full credit. This was done to discourage students from engaging in guess-work. At the end of each group activity, students were called at random to explain their group’s solution. For each problem session, three such group activities were executed. I found the AIChE ConceptWarehouse to be an extremely valuable and rich resource for questions that test the understanding of the fundamental concepts of Material and Energy Balance. For the remainder of the problem session period, I went over two to three problems selected from the text and provided to the students the previous week. Students were encouraged to attempt these problems as a group prior to the problem session.
- Out-of-class group work – Each week, teams were assigned one or two problems for out-of-class activity. These problems require longer solution times than the in-class group activities and represent the types of problems the students will expect in exams. These questions were drawn from texts other than the recommended text, prior exams, and a personal library of questions.

- Grading of group work – Each team member received an overall grade based on a weighting of team and individual grades with the weighting factors of 75 and 25% respectively. The team grade was a single grade which was based on the performance of the group as a whole on in-class and out-of-class group activities, while individual grades were assigned based on the self- and peer-evaluation survey results from CATME (see above)
- Grading Scheme
 

Sapling Learning Online Homework	15%
In-class and out-of-class group work	15%
2 In-semester Exams (20% each)	40%
1 Final Examination	30%
<b>Total</b>	<b>100%</b>

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

At this point, it is too early to undertake an assessment of the overall effectiveness of the pedagogical approach implemented in Fall 2013 in my class, but suffice it to say that the activities worked as planned and I intend to continue with this teaching approach for some time to come. I will strongly recommend the use of AIChE ConceptWarehouse questions for group activities, Sapling Learning for Online Homework and CATME for teaming and team evaluation.

**What could have been improved?**

Sapling Learning Online Homework – Here are the recommendations I would like to make to Sapling Learning:

- Development of a much larger pool of questions
- Assigning different questions to different students
- Students should not be provided with process flow charts, creation of flow charts should be part of the skill to be developed by the students
- Students should be required to convert given process variables to appropriate units for use in problem solving (e.g. mole fraction of A to mols A/mols total)
- Allowing for submission and review of solution to a problem in parts instead of requiring the entire solution will be helpful to the students

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

- Allow a little more time for completion of in-class group work
- Add the use of “Notes with Gaps” for in-class group work
- Implement “Visible Quiz” during problem session
- Project slide of question for in-class group work during the discussion of the solution; this semester, the group work was collected when time given for completion elapsed, and sometimes the students had a hard time remembering the question
- Discuss solution of out-of-class group work problems during problem session