Flipping the Classroom – experiences from General Chemistry

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• Flipping General Chem 2: Jack McKenna, St Cloud State
  – Modified POGIL to include flipped lectures
• The effectiveness of “time-shifting” in the General Chemistry classroom: Dominick Casadonte, Texas Tech
• Virtual Discussion Section, justin.tv: Randy Sullivan, Oregon
What is a flipped class?

- Reverse what would typically be done outside of class and what would be done inside of class
- Record lectures – watching them becomes a component of the homework
- Spend class working on group assignments, instructor circulates
- Encourage students to act in class as they would in their rooms when studying
General Chemistry, Fall 2012

- Class was closed until incoming freshmen were able to enroll
- 42 students – 31 of whom were first semester students
- 5 were members of the cohort group of Chemistry Scholars
- MWF 11:25-12:15
- Friday 4:10-6:10 pm reserved for exams
My approach for class

• All lecture notes were made available on Moodle in advance of class
• Brief lectures followed by group worksheets
• Students largely self-selected groups
• One worksheet would be turned in for the group – all members of group present get the same grade
• Three chapters were fully flipped
Immediate lessons

• Students “learn” by Googling
  – The professor has to be more useful than Google
• Students like talking in class when it’s face to face
• Students come to class when they know they’ll have something to do/learn
• Once students get used to worksheets, traditional lectures weird them out
Get to know your Moodle

Chapter 8: Thermochemistry

One of the primary uses of chemical reactions is in the generation of energy. In this chapter we look at how to define and measure energy, and how it can be seen as an intrinsic property of a molecule and a chemical reaction.

- Flip #1 for Lecture 29: Energy concepts
- Flip #2 for Lecture 29: Energy stoichiometry
- Lecture 29: Energy concepts (8.1-8.4)
- Flip for Lecture #30 - calculating energy transfer
- Lecture 30: Enthalpy and reactions (8.5-8.7)
- Flip #1 for Lecture 31: Calorimetry
- Flip #2 for Lecture 32: Bomb calorimetry example
- Lecture 31: Hess' Law and the Thermodynamic Cycle (8.7-8.8)
- Flip #1 for class on November 9 (there are no new lecture notes)
- Flip #2 for class on November 9 (no new lecture notes, just these two flips)
- Lecture 32: Molar Enthalpy of formation (8.8-8.10)
- Flip #1 for Lecture 33 - Second Law of Thermodynamics
- Flip #2 for Lecture 33 - temperature and spontaneity
- Lecture 33: Bonds, combustion and entropy (8.10-8.12)
- Flip for class November 16 - the Born-Haber cycle
How I create a flip

- Think of a 5-minute segment (1-2 learning outcomes)
- Create a powerpoint presentation, maximum five slides
- Introduction slide
- Record narration
- Use Powerpoint 2010 to create a .wmv video
- Use zamzar to convert to .flv
- Upload and link to Moodle
Results from Fall 2012

- One withdraw, one F
- Most students had excellent attendance
- Excellent feedback on flips and worksheets
- Encouragement to continue with the flipping approach
Fall 2011

- 46 students enrolled
- 2 W’s
- 8 A’s
- 13 B’s
- 15 C’s
- 1 D
- 6 F’s

Fall 2012

- 44 students enrolled
- 1 W
- 9 A’s
- 17 B’s
- 14 C’s
- 2 D’s
- 1 F
Results from Student Evaluations

• Above Department averages in every category
• Highlights: Accessible 4.6, Encourages Involvement 4.3, Useful Assignments 4.6, Think 4.6
• Overall instructor rating 4.5
Major strengths of instructor

- Funny, makes the classroom fun, easy to involve with conversation
- Keeping students engaged. Providing outside work that enforces what is learned in class, and requiring use of knowledge while in class. Provides worksheets during class which require us to think, and allows us time to absorb the information and ask questions.
- Dr. Heard was extremely relatable while he was teaching. This helped me to engage more in the class and take more from what he taught. Also he did short lectures and more worksheets in class which works much better to understand the material rather than a full class lecture.
- He is always very enthusiastic about the topic which makes it easier to listen and comprehend what he is saying. He also did everything he could to make sure students understood the material.
- Dr. Heard is engaging and knows how to reinforce the material with supplemental materials, activities, and assignments. Additionally, he is incredibly adept at presenting the material efficiently. What you hear from his lectures really is exactly what you need to know
What aspects of this course were most beneficial to you

- The "Flipped" classes
- Mastering Chemistry, flips, working in groups
- Worksheets in class provide increased understanding and are very beneficial as we can ask relevant questions.
- Group work and worksheets... also the flips on moodle
- The fact that lectures were short and most of Dr. Heard's time was spent helping understand worksheets really helped me. Understanding the worksheets really makes everything else make sense, therefore I'm glad he was there to help us with the worksheets during class time.
- Work sheets in class
- Working in groups
- Developing better understanding of course material due to instructor's style of teaching. Engaged interest in learning.
Weaknesses of instructor

- I don't think the online lectures are done very well
- Dr. Heard seems to have difficulty in returning assignments
- Not lenient about individual student's circumstantial needs
- He can sometimes move through a lecture rather quickly
- Hardly explained material in class, then handed out worksheets which we had to stumble through. Things made sense only after reviewing everything at home for a second or third time
- Doesn't fully explain things when you go switch to the flips in class if you do a review.
What do you suggest to improve the course?

• The idea of the flips need to be more enforced
• Flips are hard to understand. I felt like I was having to teach myself and it was hard to do the work sheets in class the next day
• more in class practices
• RETURN OUR ASSIGNMENTS. Also, check over the tests, worksheets, and quizzes before you hand them out to students
• The flips are great in theory, but the information is too condensed to be useful as a learning tool.
Flipping 2.0: Spring 2013

- Simplify worksheets to make them easier to grade
- Flip every class – pre-record flips for each lecture
- Ensure viewing the flips by starting each class with a comprehension quiz
- Reduce the number of questions asked on Mastering Chemistry
Chapter 2: All about the atoms

In this chapter, we will look at how we came to get the current experiments, one little chapter!

Chapter 2 discussion forum

Flip 1 (of 3) for Lecture 3: John Dalton’s Atom
Flip 2 (of 3) for Lecture 3: Multiple Proportions
Flip 3 (of 3) for Lecture 3: Inside the atom
Lecture 3: Meet John Dalton (section 2.1-2.4)
Flip 1 (of 3) for Lecture 4: Nuclear notation
Flip 2 (of 3) for Lecture 4: Average mass
Flip 3 (of 3) for Lecture 4: Percent abundance
Lecture 4: Naming a nucleus (2.5)
Flip #1 (of 2) for Lecture 5 - The Mole
Flip #2 (of 2) for Lecture 5: Mole calculations
More things I have learned

- It takes about 1-2 hours to produce 3 flips for a class
- Student Athletes can be tricky
- Catch good and bad habits early
- Explain relevance of questions on worksheets
- Many students watch the flips multiple times
Thanks!

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- Bert Holmes
- UNC Asheville Chemistry Department