

TA Elise Gervais, Biology Department

Enzyme Lab Before Flipped Classroom:

- Pre-lab assigned week prior: read through lab handout
- Start lab with 90 minute lecture on enzymes, from the most basic concept through how the lab would be conducted. Clearly explain what type of data the students will collect, how they will graph it and what those graphs should look like.
- Short Demo experiment (10-15 minutes)
- Remaining lab time for students to gather materials, run experiment, graph data (1.75 hours).
- 30-40 minutes during following lab period to discuss writing lab report

Enzyme Lab With Flipped Classroom:

- Pre-lab assignment assigned week prior: read lab handout, watch video lecture about enzymes and short video about spectrophotometer operation.
- Start lab with a quiz based on pre-lab material (10 min) and go over quiz questions together (2-3 min)
- Flipped classroom slides – pre-designed questions to assess students understanding of the topic using 4 colored cards (about 20 minutes).
- Short Demo of experiment (10-15 minutes)
 - In the future, this will be assigned as part of the pre-lab materials
- Remaining lab time for students to gather materials, run experiments, graph data (2.25 hours)
- Handout with directions for writing lab report provided. Students were able to ask specific questions before leaving the lab.

Benefits/ drawbacks of flipped classroom:

Benefits:

- No long lecture that bores some students and are too complicated for others
- Students can go through pre-lab videos and information at their own pace and ask questions before coming to lab.
- Pre-lab quizzes make the students responsible for the material and allow me to judge whether pre-lab materials were effective or not.
- Asking questions (with colored card answer system) allows me to see exactly who does not understand what concepts. Depending on the number of students keeping up, I can address specific issues with a single student after getting the others started on the day's activity.
- Students that understand the concepts stay engaged, and those that are confused can alert me to that without embarrassing themselves (showing the wrong answer or multiple answer cards)
- Answer cards allow me to see quickly how well understood a specific concept is, moving the lecture (question/ answer period) along faster.
- BIG BENEFIT: Students get almost 30 more minutes to work on the lab activity!!

Drawbacks:

- Videos available on the internet don't always have all of the information you want the students to have, or have too much extra information not relevant. Both of these things frustrate the students.
 - You could make your own pre-lab materials to ensure relevance to the course.
- Flipping a class that you have taught for several semesters will require a significant amount of prep-time for each lecture. Some student activities will not work and will have to be replaced for the following year.