

# Some thoughts and ideas about flipped classrooms

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Course flipped: Phys 123 (Physics of the Life Sciences I) in Fall 2013 and Fall 2014

Audience: Pre-Pharm, Bio, Forensic Bio, Forensic Chem., Health Sciences

Motivation for flipping:

- Increase student preparation for class
- Increase active learning opportunities without sacrificing content coverage
- More guided problem-solving to make up for lack of recitation sessions
- Provide students with more study materials

Elements of my flipped classroom:

1. **Pre-lectures:** Have to be completed before coming to class; voice-over PowerPoint presentations (20-30 min), converted to wmv-file and posted on ECHO360; include presentation of material with derivations of equations and sample problems worked and discussed in detail; slides posted in PDF format for students to take notes on; about two pre-lectures per week (30 in Fall 2014).
2. **Reading Assignments:** Sections of chapters of textbook directly related to topic of pre-lecture
3. **In-class quizzes:** Six questions, multiple choice to check conceptual understanding of material covered in pre-lecture; students that have finished quiz start working on worksheet/problems of the day in order not to rush students that need more time; results are discussed right after everybody is finished
4. **Practice quizzes:** About 10 questions, multiple choice with answers; similar in style to in-class quizzes and covering the same topics, but not the same questions
5. **Use of class time:** Start with answering questions about pre-lecture and practice quiz; in-class quiz; discussion of quiz; sometimes lecture demonstration and discussion; usually problem solving in groups and/or on board; rarely: mini-lecture (10-15 min); some classes only problem solving
6. **Homework assignments:** Online homework system; about 15 problems per week; tutorials and standard end-of-chapter problems; homework split into two parts: one due Wed., one Fri.

Results from Fall 2013:

- Exam averages were better/same (better in Fall 2014), but needs more careful analysis
- Negative attitudes of students (especially Pre-Pharm) towards flipped classroom model as flipped courses had never been taught at WNE in the Sciences
- Students had preconceived notions of what a science course should look like (e.g. standard lecture, memorization)
- Some students did not watch any pre-lectures or only some of them
- Reluctance of students to engage in active learning activities
- Usual problems encountered when learning physics were now blamed on flipped classroom model

### Changes implemented in Fall 2014:

- Spent more time on selling approach during first class meeting
- First pre-lecture required for second class meeting
- Introduced participation points for watching pre-lectures and actively participating in in-class group work
- Practice quizzes triggered questions which I used sometimes as scaffolding for mini-lectures on difficult concepts
- Adjusted ratio between solving problems in groups and solving problems on board

### Results so far for Fall 2014:

- More engagement of students in in-class activities
- Students seemed more accepting of the approach but I haven't seen the student evaluations yet
- Use of participation points seems to have increased the overall number of pre-lectures watched by students
- Even better exam averages

### Recommendations:

- Expect resistance and lower student evaluation scores, especially the first time around
- Make sure to be very explicit about why you are doing it and how students benefit from this approach
- Without quizzes on content of pre-lectures, students will not take pre-lectures seriously
- Give students some participation points for watching pre-lectures
- In class, find way of giving students enough time to do quizzes without idle times for those done quickly
- Carefully design in-class activities
- Don't abandon out-of-class homework
- Don't underestimate the work it takes to pull it off