

Teaching Flipped Physics 2100

Cal. State LA

Dept. of Physics and Astronomy, and College of Natural
and Social Sciences

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Expectations

After attending the flipped workshop, I had a set of expectations on what would happen teaching a flipped course.

- Learning curve for instructor who hadn't taught flipped classes
- Much preparation required for curricular materials
- Students would not be adjusted to the new method
- Success in students achieving learning outcomes not guaranteed
- Confounded with the transition to semesters, the transition to flipped would be even more difficult

Experience

So here were my experiences:

- Learning curve was not so steep
- Expectation of high level of preparation was reality, especially if developing your own material
- Students adjusted after several weeks, especially to the videos. The emphasis on quizzes assured students would comply with keeping up with the course
- Based on comparing data with the previous Physics 211 courses I taught, the midterm averages were higher
- With semesters, there is more time to give exams and short quizzes throughout the course of the term than in quarters

Videos

- Videos are truly essential to the process. If you don't have a video prepared, the students haven't been properly introduced.
- Videos were placed on YouTube (channel <https://www.youtube.com/channel/UC04jePqkIT28c2vRnxsEkKw>) to ensure compatibility with the wide variety of devices and media players. Unfortunately, the native Moodle player was not very helpful in this regard.
- Captions are necessary, but require a bit of effort.
- When quizzes on the videos were introduced, the number of views and the watch time went up.
- number of views: 1841 (12/12/2016)
- average view duration: 3-4 minutes , out of total length of videos 8-16 minute

YouTube

Physics 2100
Cal. State LA
Video #7 : Momentum, Impulse, and Collisions

Dr. Bijan Berenji

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0:02 / 16:05

CC Settings Full Screen

Analytics Video Manager

Navigation icons: Home, Back, Forward, Playlist, Search, Refresh

YouTube channel statistics (17 month)



Bijan Berenji

Created: Nov 2, 2011 · Videos: 15

CHANNEL

Sep 1, 2016 – Feb 10, 2018

Watch time

Minutes

15,549



Average view duration

Minutes

3:08



Views

4,956



Likes

18



Dislikes

6



Comments

1



Shares

19



Videos in playlists

19



Subscribers

35



Online Video Quizzes

- I developed a hosted website using WordPress.org tools, *calstatelaphysics.org*
- This site became a vehicle for quizzes, surveys, and embedded videos
- The quizzes were auto-graded.

Cal State LA Physics Forum

www.calstatelaphysics.org/wordpress1/quiz/no4-videoquiz/

67%

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no4-videoquiz

Welcome to your no4-videoquiz.

Name

In-class assignments

- In contrast, we used online resources (homework, etc) from Wiley. This corresponds to the award-winning textbook Halliday et al. (10th ed.).
 - College Physics, A Strategic Approach, 3rd edition
 - These exercises fall in the academic range between the activities and the types of problems assigned as homework
- We used worksheets to introduce problem solving for each topic (chapter)
- Most problems independently developed by B. Berenji.
- Some problems adapted from problems in the course text
- The solutions were posted online on Moodle.

Topics Actually Covered and the Course Proposal

There was a rearrangement of the material covered from a 3-quarter sequence to a 2-semester sequence.

- The original course proposal for Physics 2100 was to cover Mechanics and Thermodynamics
- With the flipped model, it was possible to cover the material more rapidly, and hence cover Thermodynamics as well.
- I switched the course back to focus on Mechanics, after the course description was rewritten by the department/college/university. This allowed the introduction of the topic of Oscillations.

Short Quizzes and Exams

- Short quizzes on the videos at an intro level are easy for the students, nearly 80% average.
- Exams (long quizzes) which take place every 3 weeks are challenging for the students, but help in the long run with preparation for the midterm and final.

Unofficial Performance Comparison of Flipped vs Non-Flipped

- Attendance was gauged on Moodle, the metric was above 95%.
- The final in Physics 2100 was roughly comparable in difficulty to the final in Physics 211, although there were the additional topics of Gravitation, Oscillations, and Wave Mechanics in Physics 2100.
- The final average in 211: 60%
- The final average in 2100 (fall 2017): 68% *Improvement which is nearly a 3σ effect! This might be considered a marginal detection of a new phenomenon in particle physics.*

Completeness of the course

- This course, to use the Wagnerian operatic term, is a *gesamtkunstwerk*. Which is a complete and balanced work, with layers of complexity, and all engrossing (just like a Wagner *Ring* Opera).
- Video quizzes, short quizzes, homework, midterms, final, in addition to the separate components of lab and activity, complete the mosaic.

What Worked

- in-class participation was high due to high attendance (82%)
- pre-lecture quizzes (based on the videos) had a positive response
- active learning was applied
- videos had a generally positive reception, according to course evals
- À la Eric Mazur (Harvard Physics), there was evidence that **peer instruction** was taking place in the tutorial sections

What didn't work

- A minority (10-20%) didn't think that this was an effective teaching strategy
- in-class discussion didn't engage the entire class

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