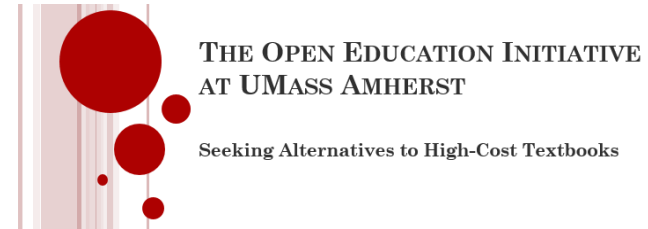


Physics 131 – Use of Open Resources

B. Toggerson
MASSPRIG Panel
5 April 2017



Physics Department
University of Massachusetts Amherst

UMassAmherst
Flex Grant Program

The Physics TBL Group



**Brokk
Toggerson**

Lecturer
Develops materials
Leads data analysis



**Heath
Hatch**

Lecturer
Pioneer in Physics TBL
at UMass



**Paul
Bourgeois**

Director of Physics
Teaching Laboratories
Began Teaching P131
Fall 2015

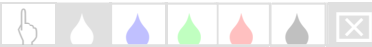


**Chasya
Church**

Undergraduate assistant
P390T Student
Data analyst
Works on prep materials

**Christopher
Ertl**

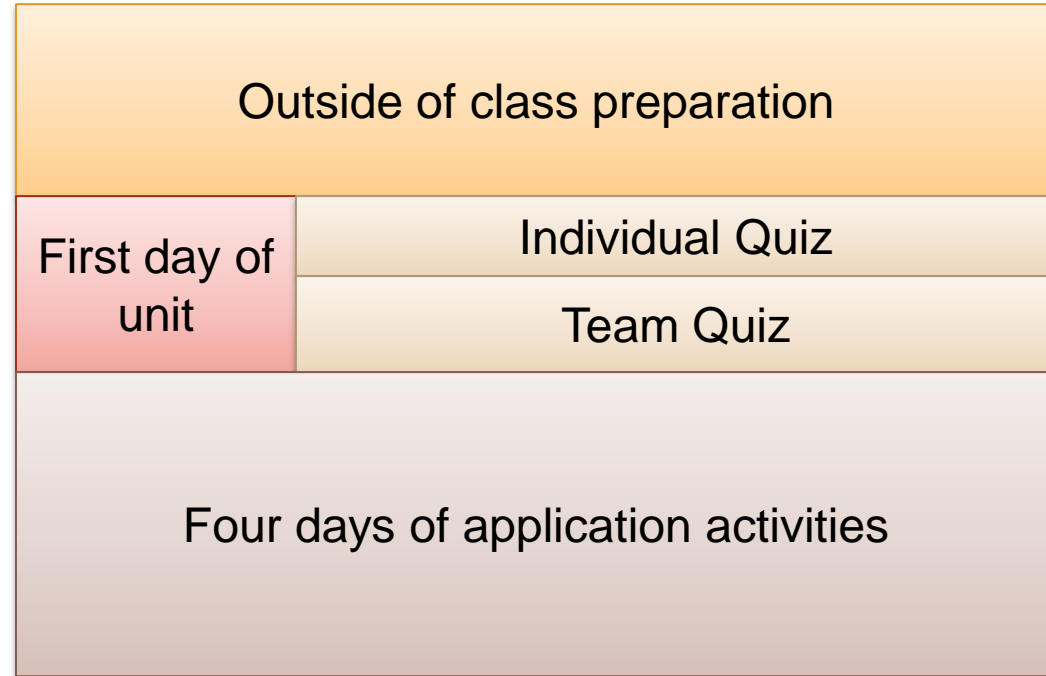
Lecture Prep Manager
K-12 Education
experience
Lab development



Course structure for P131

In this model:

- Course is divided up into units each of two to three weeks
- Process repeated for each unit
- Preparation for class is critical in this model!



Application Days

- P131 is taught in a TBL classroom
- Students work in groups of 5 to solve problems and complete laboratory activities



Preparation

- Goal is to ensure that students are prepared for the unit
- Preparation is a mix of readings, videos, and problems to solve to ensure that students get what we want them to get
- This preparation is assessed on the first day of the unit



Challenges with Preparation

- Students are not used to preparation (buy-in)
 - Not actually *needed* for most science courses
 - Not used to learning on their own – lack the skills to do so
 - Can feel that it is “unfair” to be assessed before a topic is addressed in class
- Students tend to skip to the problems without doing reading
 - The preparation readings/videos must closely link with any questions
 - There should be an incentive to read as well as do problems
 - These connections must be visible to the students
 - Students must see the benefit of the preparation in class
- The objectives of preparation must be achievable for students
- Students must be able to easily navigate the resources and identify what is important

Something we have very much observed!



Our Preparation is Hosted within the MasteringPhysics Online Homework System (\$35/semester)

Previous versions had multiple sources – led to student confusion.

One central source is easier to navigate

MasteringPhysics: Unit 2 - ...

https://session.masteringphysics.com/myct/assignm

UMass PHYS 131 Fall 2016 Signed in as Brokk Toggerson, Instructor

Unit 2 - Forces Prep

Unit 2 - Forces Prep
Due: 8:00am on Wednesday, September 21, 2016

You will receive no credit for items you complete after the assignment is due. [Grading Policy](#)

A Message from Your Instructor:
Total video time: 1hr 3min Total readings: 7

A Message from Your Instructor:
Introduction and Phenomenology vs. Mechanism

[Introduction to Unit 2 Readings](#) is for practice
Incomplete

[Phenomenological vs. Mechanistic](#) is for 1 point(s)
Incomplete

A Message from Your Instructor:
Forces as Vectors

[Forces as Vectors Readings](#) is for practice
Incomplete

[Tactics Box 4.1 Drawing Force Vectors](#) is for 1 point(s)
Incomplete

A Message from Your Instructor:
Object Egoism and Newton's First Law

[Object Egoism and Newton's First Law Readings](#) is for (point(s))
Incomplete

[Golf on the Moon](#) is for 1 point(s)
Incomplete

[Ice Skaters and Object Egoism](#) is for 1 point(s)
Incomplete

A Message from Your Instructor:
Newton's Second Law

Total video time and number of readings listed at top to be honest with students

Modular structure allows for students to divide work

These problems go with these readings



The Readings

Presented as a checklist within MasteringPhysics

As much from reading as possible in line with our goals!

MasteringPhysics: Unit 1 - ...

https://session.masteringphysics.c

UMass PHYS 131 Fall 2016

Signed in as Brokk Toggerson, Instructor

Unit 1 - Mathematical Tools and Found... Position and Velocity Readings

Rework for Practice

Item Type: | Difficulty: -- | Time: --

- Read Section 2.2 in Perusal
- View the Section 2.3 Reading Guide on Youtube: [Open Stax Chapter 2 Reading Guide](#)
- Read Section 2.3 in Perusal
- Watch this video on the course YouTube channel: [Thinking about the connection between average velocity and position](#) (Length: 17:11)

Reading guide videos go through the text and highlight important points

Readings in the Perusal^[12] system

Additional videos on other topics

Submit My Answers Give Up



Perusall

- Has been a critical addition to preparation
- Groups of 20 students share a copy of the readings and provide annotations
 - Questions
 - Answers to the questions of peers
 - Comments
- These comments are graded by an AI on a 0, 1, 2 scale
- Students can get full marks by a mix of 1 and 2 point comments
- Students are required to distribute their comments across several readings
- AI produces a “Confusion Report” with the most common questions
- I address these questions in class before the quiz – took 20 minutes to lecture *ALL of Unit II: Forces.*



Level of Preparation

What students can learn

- Definitions of terms (lots of fill-in-the-blank problems in prep homework!)
- How to “turn the crank”
 - Think long division, you can learn to do it without understanding what it means

Not appropriate for prep

- Problem solving skills, i.e. anything with multiple steps
 - Need feedback immediately
 - Otherwise will develop bad problem solving habits
 - They feel that this is inappropriate as well (less issue with definitions)
- Nuanced applications of ideas

This is very difficult to get right!



Future Directions

- Further improve organization of materials
- Want to create a custom version of the OpenStax textbook for UMass P131
 - Other resources such as UMD articles placed in context
 - Videos embedded within the pdf with transcripts for Perusall
- Move on to organizing materials for P132



THANK YOU

