NEWS on Flipping a Course

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Instructor, Civil and Environmental Engineering
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N.E.W.S. for flipped courses

No additional workload

Experiential learning in classroom

Weekly assessment

Short videos segments < 10 minutes long
Flipped: Activity in class
# Flipping: Active in Class and Timely Assessments

<table>
<thead>
<tr>
<th>Lecture</th>
<th>Homework</th>
<th>Quiz or Test</th>
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<tbody>
<tr>
<td>In Class M, W, F</td>
<td>After Class Next week</td>
<td>After Class Next week</td>
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<td>In Class Next week or later</td>
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<table>
<thead>
<tr>
<th>New Info</th>
<th>Learning &amp; Applying</th>
<th>Assessment</th>
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<table>
<thead>
<tr>
<th>F</th>
<th>Before Class on Monday</th>
<th>In Class On M &amp; W</th>
<th>After Class Before F</th>
<th>In Class Friday</th>
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<tbody>
<tr>
<td></td>
<td>Watch videos</td>
<td></td>
<td></td>
<td>Turn in problems</td>
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<tr>
<td></td>
<td>Take on-line assessment</td>
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<td>Take Quiz</td>
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<td></td>
<td>Review</td>
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<td></td>
<td>Problem Solving</td>
<td></td>
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<td></td>
<td>Prepare for Quiz</td>
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</table>

- **T**: Lecture: In Class M, W, F; Homework: After Class Next week; Quiz or Test: After Class Next week
- **F**: New Info; Learning & Applying; Assessment
- **T**: Before Class on Monday; In Class On M & W; After Class Before F; In Class Friday
- **F**: Watch videos; Take on-line assessment; Review; Problem Solving; Prepare for Quiz; Turn in problems; Take Quiz
No additional workload

- Don’t pile on additional assignments

- Use class time to work on “homework”

- Flip it – don’t double it.
Experiential Learning in class

- Students work on “Homework” after brief review
- Brainstorm & Discuss
- **Field trips** (split up the class of 90 students)
  - Wastewater treatment plant
  - Recycling tour
  - LEED building

- Group Projects?
Weekly Assessments

- Pre-class Assessments on-line before class
  Tests general understanding
  Prepares them to work on Problems
  Handles Q & A

- Weekly Quizzes in class on Friday
  11 Quizzes in semester
  30 – 40 minutes in length

Students love Weekly Quizzes!
**SHORT video segments**

- Keep between **5 – 15 minutes**
- Shorter attention span
- Allows students to selectively review material
- Each module < 2 hours

<table>
<thead>
<tr>
<th>Module</th>
<th>Duration</th>
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<tbody>
<tr>
<td>Wastewater Components</td>
<td>16 Minutes</td>
</tr>
<tr>
<td>Primary Treatment</td>
<td>5 Minutes</td>
</tr>
<tr>
<td>Types of Bioreactors</td>
<td>6 Minutes</td>
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<tr>
<td>Bioreactor Conditions</td>
<td>7 Minutes</td>
</tr>
<tr>
<td>Material Balance in an Activated Sludge Tank</td>
<td>18 Minutes</td>
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<tr>
<td>Design of an Activated Sludge Tank</td>
<td>14 Minutes</td>
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<tr>
<td>Qualitative Questions About the Activated Sludge Tank</td>
<td>4 Minutes</td>
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<tr>
<td>Sludge Processing</td>
<td>9 Minutes</td>
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<tr>
<td>Nitrogen &amp; Phosphorous Removal</td>
<td>6 Minutes</td>
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<tr>
<td>Phosphorous Removal</td>
<td>2 Minutes</td>
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<tr>
<td>Nitrogen Removal</td>
<td>8 Minutes</td>
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<tr>
<td>UAJA Process</td>
<td>7 Minutes</td>
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</table>
How do you know when to use a Batch Reactor, CSTR or PFR?
For each scenario below, determine the control volume and write out the material balance equation. Determine if it should be modeled as a CSTR, Batch or PFR. State all assumptions.

Ask yourself these questions:
1. Is there flow in or out?
2. Is there a reaction? Creation or destruction?
3. Is it at steady-state?
4. Is it well mixed?

A. Algae are growing in a pond near your house. Write a material balance on algae.

\[
\frac{dC}{dt} = kC \quad \Rightarrow C(t) = C_0 e^{kt}
\]

B. A tank at the wastewater treatment plant is used to degrade organic material ("bug" food). The wastewater flows in and out of the tank. Write the material balance for the bug food.

Made with Continuing Education office...
Another video option: Khan academy

http://www.khanacademy.org/
If Dr. Velegol were teaching another course in your major and offered it as both a flipped course and a traditional (lecture based) course, which one would you choose?

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<td>77%</td>
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- Problem solving during class time (40%)
- Having more freedom in learning (40%)
- Being able to re-watch (30%)
40% mentioned **Experiential** learning

We were able to work on the homework in class **with other students**. Being able to ask questions to the teacher is also a huge help.

“I like … working on the homework in class because I have **more questions about the homework than the lectures.**”

“. . . allows for the information to be put to real **applications** during class. Coming to class ready with questions or homework lets the **student interact with the instructor** more hands on.”
Short on-line lectures give more flexibility in learning

“Flipped courses allow **you to decide** when you want to complete the work required for the week.

“Flipping the course gave **me more freedom** toward how I wanted to complete the work.

“It has given me the **flexibility** of choosing when to 'go to' a lecture.”

78% of students reported skipping less than 10 segments (out of 132)
Short Lectures allow reviewing of the lectures

“The pause and rewind features of the flipped classroom eliminate the concern for copy notes quickly and allow me to pay more attention to the lecture.”

“I watch the videos on my computer, if I miss something or if I just go into a daze for a minute, I can go back and watch that part again.”

83% of students reported re-watching at least 1 video segment
What are some of the concerns about flipping?

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- Takes too much time (5/66)
- Class time not valuable (5/66)
- Can’t ask questions (3/66)
- Less accountability (3/66)
No additional work (truly flipping the course) will not take up more time

Students reported spending less or the same amount of time as other classes (< 8 hours)

- 50% said 6 – 8 hours
- 40% said 3 – 5 hours
Lesson learned: Review less than 10 minutes per class

“The flipped course was suppose to use class time to work on problems...we barely did work in class and went over the same material provided online.”

“We wound up taking in class and didn’t get to do too much work.”

How long should Dr. Velegol spend on reviewing the material in class?

40% said less than 10 minutes
40% said 10 – 20 minutes
Weekly Assessments allow MORE questions before class

- Students are encouraged to ask questions and/or clear and muddiest points on on-line assessments before coming to class

- Can review in class

- More students ask questions!
Weekly Assessments help student’s accountability

- Weekly assessment before class
- Weekly quiz
Final Exam scores don’t change with teaching method
SO, why flip?

- Students prefer it

- Memorable Experiential Learning
  79% of students agreed that field trips increased their interest in Environmental Engineering

- Improved Classroom Climate
  Less blank stares – more interaction
  More enjoyable for Faculty!
N.E.W.S. for flipped courses

No additional workload

Experiential learning in classroom
- Less than 10 minutes review
- Field trips & discussions

Weekly assessment
- For accountability
- For Q & A

Short videos segments < 10 minutes long