

Engaging the Online Classroom

Goal: Create an online classroom environment that supports active learning, enables group work, and results in engaged peer-to-peer interaction through in-class problem-solving activities.

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Keywords

Online
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Why?

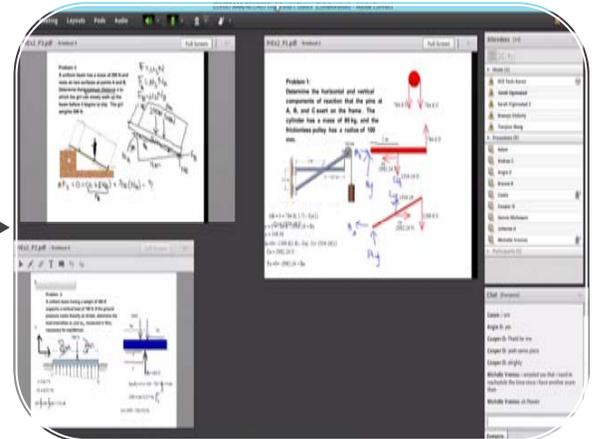
Can we maintain the benefits of a flipped classroom while changing the learning environment?

“ I hear and I forget.
I see and I remember.
I do and I understand.”
Confucius

- **A *flipped* classroom**
 - Passive learning outside the classroom
 - Active learning inside the classroom
- Group work and problem-solving in class
- Instructor is *guide on the side*
- Requires students to come to class prepared.

When?

After success flipping my class, my next goal was to provide students the same benefits of active learning with the accessibility and flexibility of an online classroom.



TRADITIONAL

When I first taught Statics, this was my classroom. My ability to interact with students was limited, and the lecture-style format meant that students watched me solve several problems in class, and left class thinking they were done learning the material. Despite implementing clickers, quizzes, and other activities, the first exam outcome was the same: low averages, despite high homework scores.

FLIPPED

In 2012, I flipped my classroom, so that all passive learning now takes place outside the classroom setting (via podcasts of concepts and examples), and classroom time is dedicated to structured, group-based problem-solving activities. As a result, students identified gaps in understanding while still in class, asking questions and clarifying misconceptions so that they left class ready to solve homework problems.

ONLINE

Since 2013, I have offered an online, flipped Statics class each summer that mimics the flipped in-class offering. Each week, we have two scheduled **online** classroom meeting times, where groups of three to four students work together to solve problems, fully online. My role as an instructor remains *guide on the side*.

Where?

Active online learning environment:

- Collaborative, instructor-guided online meetings twice-weekly
- Students can login and attend from anywhere
- Group work performed using virtual whiteboards
- Individual progress and contributions tracked through assigned pen colors and screenshots of group work submitted at end of class

The screenshot displays the Adobe Connect interface for a meeting titled "059:007:AAA/A01/A03 Eng Fund I: Statics (Collaboration)". The interface includes a top navigation bar with "Meeting", "Layouts", "Pods", "Audio", and "Help" options. The main area is divided into several breakout rooms, each showing a different statics problem and its solution. The problems include:

- Problem 1:** Determine the horizontal and vertical components of reaction that the pins at A, B, and C exert on the frame. The cylinder has a mass of 80 kg, and the frictionless pulley has a radius of 100 mm.
- Problem 2:** A uniform beam having a weight of 300 N supports a vertical load of 700 N. If the ground pressure varies linearly as shown, determine the load intensities w_1 and w_2 , measured in N/m, necessary for equilibrium.

The breakout rooms are arranged in a grid. A central whiteboard shows handwritten calculations for a problem involving a beam and a pulley, with equations such as $\sum F_x = 0$, $\sum F_y = 0$, and $\sum M = 0$. A participant list on the right side of the screen shows the "Main Meeting" and "Breakout 1" through "Breakout 12". The "Main Meeting" list includes participants like "DCE Tech-Aaron", "Sarah Vigmostad", and "Sarah Vigmostad 2". A "Raise Hand" button is visible next to "Sarah Vigmostad".

Three to four students work together in "breakout rooms" where they share a virtual whiteboard, speak to each other, and collaboratively solve example problems.

Students can request help using a "raise hand" signal.

Instructor can move between rooms, or monitor multiple rooms simultaneously.

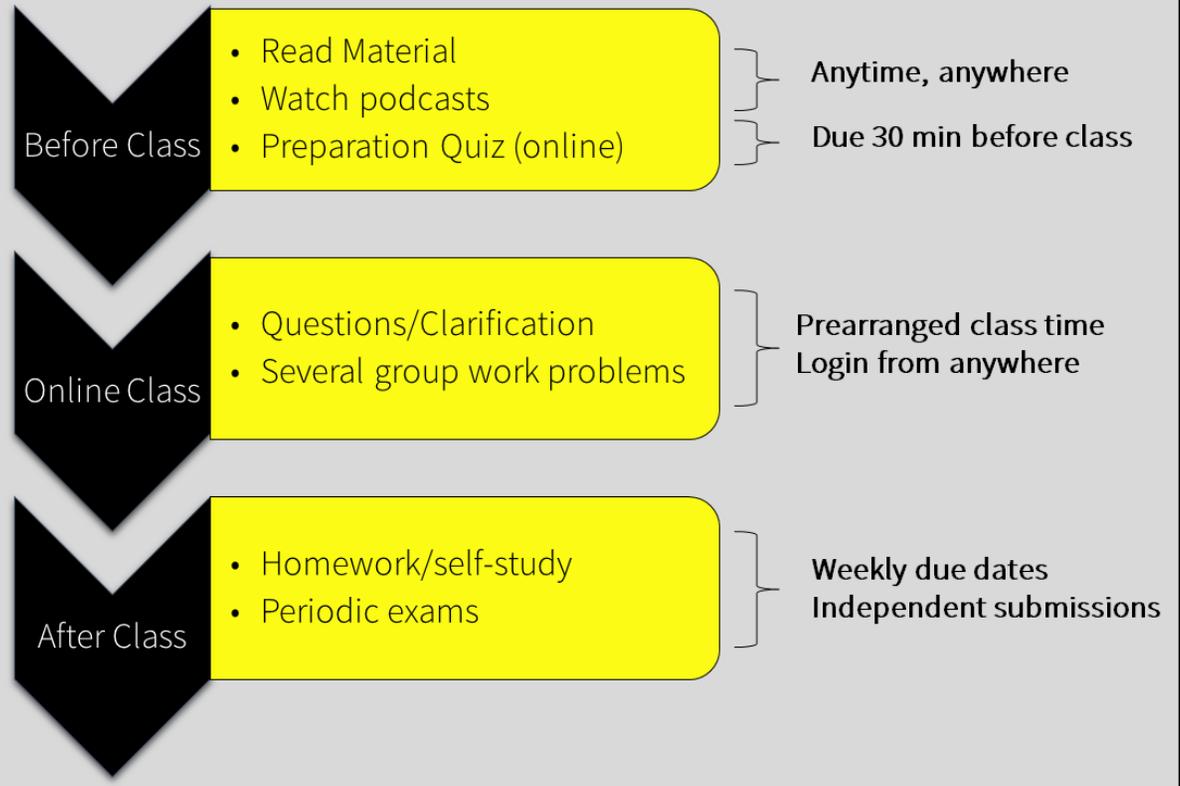
Instructor can view the progress of multiple groups simultaneously

What?

Through active, online learning:

- Students work at their own pace
 - Can re-watch podcasts to achieve **mastery**
 - Arrange to fit their schedule
- Group work and team-learning in every class
 - Peer-learning, peer teaching
- More intimate setting, even with large class
 - Meaningful contact
 - Important questions are asked much earlier
- Students interact with instructor when they are **prepared** to get the **most** from her
- Engaged classrooms + engaged students = more comprehensive understanding

Implementation of Active Online Learning: Schedule of Learning Activities



Group Problem Solving:

- 3-4 students
- Each student has assigned pen color
- Groups remain same for several weeks
- Students work together to solve example problems
- Between problems, class returns to “main room” and discusses problem as a whole

Equipment needed:

- ✓ computer with internet access
- ✓ microphone
- ✓ pen input device or tablet

Prognosis?

01 Expand impact

This approach has now been implemented in several engineering core courses offered online at the University of Iowa (including Circuits, Thermodynamics, and Heat Transfer). The formula is straightforward to apply to classes that focus on problem-solving.

Are there other types of classes that can similarly benefit?

02 Optimize

While it is clear from this implementation that flipped classroom formats do not require a specific type of classroom, the biggest limitation us bandwidth – with too many students, the system becomes very slow and inhibits productive collaboration.

Are there other software methods or online collaboration capabilities that exist or could be developed collaboratively, which would support a larger number of students online simultaneously?

03 Improve groupings

My goal is to create groups that have a productive collaboration that includes peer-learning/teaching. Because the class comes back to the “main” meeting room periodically during the online meeting period, it is ideal to have groups finishing a given problem at a similar time, so that at these check-in points, students are all at a similar point.

How can we form groups in a way that supports peer learning and ensures groups finish solving problems at roughly the same time?

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