Adventures in Flipping a Course
How fiscal constraints, student complaints and colleague skepticism helped me achieve my goal

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Active Learning
A Constructivist Approach to Learning

“Active learning increases student performance in science, engineering, and mathematics”
Freeman *et al.*, 2014.
*PNAS* **111**:8410-8415

www.cartoon-clipart.com/
The Flipped Classroom

Students introduced to material outside class, work on “homework” (application) in class
What are the Challenges?

Instructor’s time limitations

Class size

Student resistance

Classroom design

Resource limitations

Loss of control
My story: “Methods in Microbiology I”
Fall 2012-14

- New Winter 2012, replacing “Microbial Growth”, a traditional bacterial physiology lecture + lab course

“This course uses a hands-on approach to investigate microbial growth and factors that impact growth and the interactions of microbes with biotic and abiotic environments. This course will explore the ecological diversity of microorganisms of selected environments. Students will develop a wide range of microbiology-related laboratory skills.”

- 1 weekly “Lecture” + 3hr Lab
- Fall enrolment* 48 → 48 → 54 → 63 students (Fall 15)
- Winter enrolment ~120 → 142 students
The Plan
Fall semester – pilot individual and group activities for implementation in the larger Winter course

The Design
Figuring out where and how to begin

Community of Practice
Ontario Consortium of Undergraduate Biology Educators (oCUBE) [https://sites.google.com/site/ocubeorg/home](https://sites.google.com/site/ocubeorg/home)

oCUBE

National Center for Case Study Teaching in Science
Fall 2012 conference
[http://sciencecases.lib.buffalo.edu/cs/about/](http://sciencecases.lib.buffalo.edu/cs/about/)
Fall 2012: 1\textsuperscript{st} Iteration

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Seminars

Online: LMS Discussion Board

Traditional Lab Exercises

lab Exam

Flipped Structure:
weekly reading, screencasts + reading quizzes
permanent groups & contract
formative/terminal assessment of distribution of effort
for individual grades
Fall 2012: 1st Iteration

Problems: STUDENT RESISTANCE, SCALABILITY, 50 min. not enough, student perception of “lab methods” course, jigsaws
Brainstorming @ oCUBE 2013
UnConference
### Fall 2013: 2nd Iteration

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**Melanie Wills – resource GTA**

**Flipped: Reading, screencasts, team-based learning**

**Groups of 6 & interrupted case w. lab activities:**

"Delicate Balance, Deadly Obsession"

**Jigsaw discussions moved to lab: peer marking**
### Fall 2013: 2\textsuperscript{nd} Iteration

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Problems: student resistance, seminar too short, “lab methods” course, peer marking, colleague skepticism (marking, complexity, consistency)
### Fall 2014: 3rd Iteration

**Methods in Microbial Culture & Physiology [1.5-3]**

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#### Lectures + ad hoc group work

- **LMS disc. board & PEAR tool**

#### 9 Weeks lab exercises

- **DBDO lab activities**

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**Before Class:** weekly reading/screencasts + reading quiz

**Seminars:** Lectures & unmarked group work

**Lab - weeks 8 to 10:** DBDO lab activities

**UofG online PEAR tool** [http://www.uoguelph.ca/peartool/](http://www.uoguelph.ca/peartool/)

- for online jigsaws & assessment of group performance

**Group lab exam**
Fall 2014: 3rd Iteration

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- **lectures + ad hoc group work**
- LMS disc. board & PEAR tool
- 9 Weeks lab exercises
- DBDO lab activities
- Group lab exam

Problems: STUDENT RESISTANCE (work load)

New teaching assignment: MICR2430 F15 AND W16

Settling on a final version of the course…
Consultation with UofG Educational Developer

**Keep:**
1. Screencasts
2. Midterm (2-stage w. IF-AT)
3. Flipped term 2 (lab & seminar)
4. *Delicate Balance, Deadly Obsession* case
5. Case-related discussions in lab, online
6. PEAR jigsaws
7. PEAR assessment of group performance
8. IF-AT quizzes
9. Group lab exam component

**Stop:**
Reading quizzes, case work in seminars

Winter 2015
How can we help students learn to learn?

Start: collaborate with learning specialist

1. Term 1 seminars: group work on metacognition, worksheets, lecture

2. Before term 2: explicit discussion on effective group work

3. Term 2: students fill out worksheets, ad hoc group work, Clickers + JITT

4. Seminar 12: students write reflective letters to next class
## Fall 2015: 4\textsuperscript{th} Iteration

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- **Explicit teaching of material & metacognition**
- **(2-stage mt)**
- **ad hoc group work clickers, JITT**

**online: LMS disc. board, PEARtool**

- **5 weeks traditional lab exercises**
- **Delicate Balance, Deadly Obsession**
- **group lab exam**
# Flipping my class: Active Learning for the Instructor!

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## Flipped seminar
- **F12**: Seminar/online: DBDO case, DBDO Ad hoc disc.
- **F13**: Seminar/online: DBDO case, DBDO Ad hoc disc.
- **F14**: Seminar/online: DBDO case, DBDO Ad hoc disc.
- **F15**: Seminar/online: DBDO case, DBDO Ad hoc disc.

## Flipped lab
- **F12**: IFAT, Jigsaws.
- **F13**: IFAT, Jigsaws.
- **F14**: IFAT, Jigsaws.
- **F15**: IFAT, Jigsaws.

## Online activities
- **F12**: LMS group disc.
- **F13**: LMS group disc.
- **F14**: LMS group disc.
- **F15**: LMS group disc.

## Additional tools
- **F12**: Clickers
- **F13**: Clickers
- **F14**: Clickers
- **F15**: Clickers
WCSE 2015: “Gather + Create + Improve”

Ideas?

Questions?

Supplementary Resources:
PEAR alternatives - iPeer (UBC), Peer Mark (Turnitin), Calibrated Peer Review (UCLA), Gradient (Purdue), peerScholar (UTSC/Pearson)
National Center for Case Study Teaching in Science: [http://sciencecases.lib.buffalo.edu/cs/about/](http://sciencecases.lib.buffalo.edu/cs/about/)

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