

Adventures in Flipping a Course

How fiscal constraints, student complaints and colleague skepticism helped me achieve my goal

UNIVERSITY
of GUELPH

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CHANGING LIVES
IMPROVING LIFE

College of Biological Sciences, University of Guelph

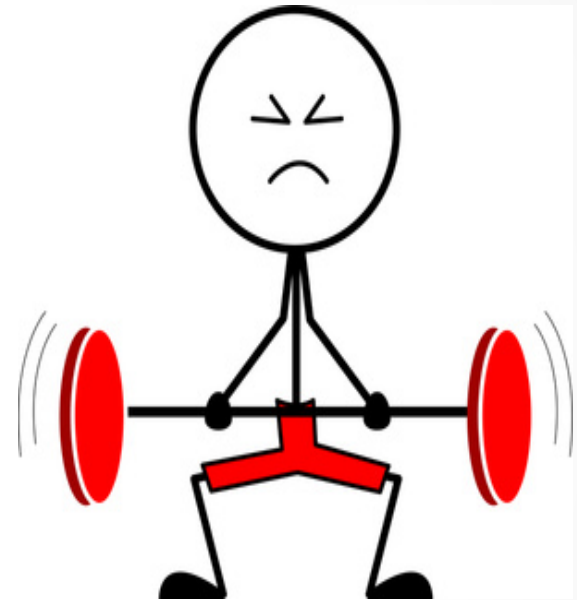
Active Learning

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/



www.clipartpanda.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>

oCUBE



National Center for Case Study Teaching in Science
Fall 2012 conference

<http://sciencecases.lib.buffalo.edu/cs/about/>

Fall 2012: 1st Iteration

Weeks:

1 2 3 4 5 6 7 8 9 10 11 12 Final exam

Seminars



Online: LMS Discussion Board

Traditional Lab Exercises Lab Exam

Labs

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

Fall 2012: 1st Iteration

Weeks:

1 2 3 4 5 6 7 8 9 10 11 12 Final exam

Seminars



Online: LMS Discussion Board

Traditional Lab Exercises

Lab Exam

Labs

Flipped Structure



Discussion boards, case studies, jigsaw discussions,

IF-AT quizzes

Problems: **STUDENT RESISTANCE, SCALABILITY**, 50 min. not enough, student perception of “lab methods” course, *jigsaws*

Brainstorming @ oCUBE 2013
UnConference

Fall 2013: 2nd Iteration

1	2	3	4	5	6	7	8	9	10	11	12
5 weeks traditional lectures						iRAT/ tRAT					
						online: LMS disc. board					
5 weeks traditional lab exercises										lab exam	



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: 2nd Iteration

1	2	3	4	5	6	7	8	9	10	11	12
5 weeks traditional lectures						iRAT/ tRAT					
						online: LMS disc. board					
5 weeks traditional lab exercises										lab exam	

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]

Weeks:

1 2 3 4 5 6 7 8 9 10 11 12

lectures + *ad hoc* group work

LMS disc. board & PEAR tool

9 Weeks lab exercises

DBDO lab activities

group
lab
exam

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/>
for online jigsaws & assessment of group performance

Group lab exam

Fall 2014: 3rd Iteration

Methods in Microbial Culture & Physiology [1.5-3]

Weeks:

1 2 3 4 5 6 7 8 9 10 11 12

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...

Winter 2015

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

How can we help students learn to learn?

Start: collaborate with learning specialist



www.thelandscape
oflearning.com

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: 4th Iteration

Weeks:

1 2 3 4 5 6 7 8 9 10 11 12

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!

	Flipped seminar		Flipped lab		Online activities
	1 st half	2 nd half	1 st half	2 nd half	
F12	✓	✓	×	×	LMS group disc.
	 Seminar/ online:	Cases	IFAT	Jigsaws	
F13	×	✓	×	✓	LMS group disc.
	 DBDO case	2 st. test	Jigsaws	Disc'n	
F14	×	×	×	(✓)	LMS group disc. PEAR < Jigsaws Dist. effort
	 DBDO	Ad hoc disc.	Group lab ex.		
F15	×	✓	×	✓	LMS group disc. PEAR < Jigsaws Dist. effort
	Learn. skills Clickers	DBDO 2 st. test	Ad hoc disc.	Disc'n Group lab ex.	

WCSE 2015: “Gather + Create + Improve”

Ideas?

Questions?

Supplementary Resources:

PEARtool - [http://bit.ly/Interest in PEAR](http://bit.ly/Interest_in_PEAR)

PEAR alternatives - iPeer (UBC), Peer Mark (Turnitin),
Calibrated Peer Review (UCLA), Gradient (Purdue),
peerScholar (UTSC/Pearson)

IF-AT cards - <http://www.epsteineducation.com/home/>

National Center for Case Study Teaching in Science:

<http://sciencecases.lib.buffalo.edu/cs/about/>

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