Inverted Classroom—Retool your lessons.

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Inverted Classroom

THE TRADITIONAL CLASSROOM

Outline
I. The Traditional Classroom
II. The Inverted Classroom
III. What do we do in class?
IV. How does the teacher make this happen?
V. Evidence of effectiveness
VI. Student feedback

THE TRADITIONAL CLASSROOM

Traditional Classroom

1. Come to class and listen to lecture and take notes.

2. Some time allowed for class work and questions.

3. Go home and attempt the homework (probably get stuck on the more difficult problems)

4. Come to class and perhaps there is time to go over a couple of questions.

5. The class moves on to a different section. If you were lost, you had to get caught up.
Lectures

• Students often see lectures as dispensable, especially if they are mostly one way in their communication.
• It is more efficient to get it out of a book or from the Internet than to get up, get dressed, find a parking space, and run to class.

THE INVERTED MODEL

Why?

WHAT THE STUDENTS DO BEFORE CLASS

THE INVERTED CLASSROOM

The Inverted Classroom

• An inverted class takes events that used to take place outside of the classroom (e.g. homework), are now done in the classroom, while things traditionally done during class (e.g. the lecture) are done outside of class.

Lecture vs. Process

<table>
<thead>
<tr>
<th>Class Time</th>
<th>Lecture-based teaching</th>
<th>Process-based teaching</th>
</tr>
</thead>
<tbody>
<tr>
<td>First Exposure</td>
<td>Students first hear or observe facts, ideas</td>
<td>Process (student applies, analyzes, argues, solves problems using first-exposure material)</td>
</tr>
<tr>
<td>Student Study Time</td>
<td>Process</td>
<td>First exposure (Video Lectures)</td>
</tr>
</tbody>
</table>

The Inverted Class

1. Watch a video lecture before class
2. Take video lecture quiz*
The Inverted Class

3. Do a few online homework problems

4. Print the concept workshop and bring to class.

First Experience Homework

How to get students to come to class prepared
- Created video lectures using Camtasia and a Tablet PC
- Required them to do a few problems from MML
- Embed quizzes in the videos. (Or do a 1 question VL Quiz.)
- Go around and review their notes.

WHAT DO WE DO IN CLASS?

WHAT DO WE DO IN CLASS?

What we do in class

• Concept workshop

Summary

Students will do the following:
1. Watch video lecture BEFORE class.
2. Take video lecture quiz*
3. Do a few online homework problems
4. Print the concept workshop and bring to class.

When students come to class, they will form groups and work on the concept workshop.
*Not for every course
Concept Workshops and in-class activities
- Example 1 (College Algebra—Linear Functions)
- Example 2 (College Algebra—Quadratic Functions)
- Tell me what you know—Quad/Rational

Stats Activity 1 (M&Ms)
Stats Activity 2 (Sampling Variability-computer sim)
Stats Activity 3 (Ghostbusters-video)

What we do in class
- Concept workshop
- Graded Boardwork (Rubric)
- Activities

Projects/Presentations
- Project
- Example Presentation: Race Walking
What we do in class

- Concept workshop
- Graded Boardwork (Rubric)
- Activities
- Projects/Presentations
- Math in the movies
- Textbook Activities
- Interactive Java Applets
- 3-Act Math

Textbook Activities

Java Applet

Math in the Movies

What we do in class

- Concept workshop
- Graded Boardwork (Rubric)
- Activities
- Projects/Presentations
- Math in the movies
- Textbook Activities

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- Math in the movies
- Textbook Activities
Advantages

- Students can pause/rewind the lecture as often as needed

Advantages

- Students work at own pace

Advantages

- Can spend a greater proportion of class time doing the critical thinking and actively analyze/synthesize problems that are based on the assigned videos.

Advantages

- No strict time limit for covering material

Advantages

- More like an “expected” pace.

Class time

- Processing

Disadvantages/Issues

- Getting students to come prepared
- Time
- Bandwidth/Plug-ins
- Scapegoat for the unsuccessful
- If they replay the video, they get the same explanation
- Questions are delayed until class time
- Strange conversations

Students are now responsible for their first experience learning outside of class; this in fact is their homework.

Advantages

- Can spot struggling students, who are more comfortable asking questions
- Students can get immediate feedback

Advantages

- Students engaged with other students
- Reinforces concepts when talking about it

Advantages

- Reaches instructor from the “tyranny of the content.” (Bowen)

HOW DOES THE TEACHER MAKE THIS HAPPEN
The process

1. Identify the learning outcomes for the course. You should have at least 1 per section.

2. Create the in-class “experience.”

In-class Experience

• This in-class experience may include the following:
  – Concept workshop
  – Graded Boardwork (Rubric)
  – Activities
  – Projects/Presentations
  – Math in the movies
  – Textbook Activities
  – Java applets

Out-of-class Experience

• Can include:
  – Video Lecture
  – Reading
  – Java applet exploration
  – Working through some basic problems

Learning Outcomes

• Example: Students will demonstrate the ability to solve linear equations, inequalities, and compound inequalities, and to represent solutions in set, interval, and graphical notations.

In-class Experience

• Align the in-class experience with the learning outcomes.

The Video Lecture

• Camtasia
  – Allows one to easily add audio and publish as SWF/mp4
  – Can be used with Tablet PC to easily audio-annotate.
  – Example 1 (CA 2.1) | Example 2 (Stats Normal) | Example 3 (CA 8.3)
  – Live Video (next slide)

The process

1. Identify the learning outcomes for the course. You should have at least 1 per section.

2. Create the in-class “experience.”

3. Create the out-of-class “experience.”

Live Video
ACROSS DISCIPLINES

Across Disciplines
- **Biology**: UC Irvine. Students in the inverted class had a higher improvement on final exam scores ($p < .001$) than the non-inverted counterparts. (Moravec, Williams, Aguilar-Roca, O’Dowd, 2010)
- **Software Engineering**: Miami University of OH; students showed strong self-ratings of their ability to write application of software at high-levels of engagement.

- **Math**: Students in a Linear Algebra course who were exposed to an inverted format had significantly higher success rates on final exam problems than the in-class lecture students (Talbert, 2012).
- **Intro Economics**: Seminal work where the authors note that the inverted format allows an instructor to present a variety of learning options while maintaining control over course content. (Lage et al. 2000)

Right for you?
- Do you already have a highly interactive class where students come prepared?
- Does your course content change often?
- If you don’t lecture during class, are there activities you can do in the classroom that will engage the student?
- Do you already have content in a digital format?

Suggestions
- Don’t try to flip your entire class for next term. Just pick 3-4 lessons to flip.
- Feel free to use outside content (e.g. http://ed.ted.com)
- Power of simple words
- Don’t make the outside content too time consuming in the beginning.

Student reactions
“I think that it not only gives the students an opportunity to take responsibility to learn on their own but gives the teacher time to explain the trouble problems in class. I love the method!” –Anonymous student 1530 Fall 2007

Student reactions
“I think it’s an excellent way to do a math course because you don’t need help with listening to the lecture, but you do need help applying the concepts and working through the problems. I believe if the class he been done as a traditional course is taught then it would’ve been much more difficult to learn the subject matter.” –Anonymous student 1530 Fall 2007
Student reactions

• “I loved it. I learned very well that way because you can rewind the video and you can take as long as it takes you to get it. But in class you cannot rewind what the teacher just said and you have a limited amount of time to go over everything.” – Anonymous student 1010 Fall 2007

Online format

• I use www.coursecompass.com (MyMathLab), but you could use any LMS (e.g. Blackboard, D2L, Moodle)
• If time allows, you will be shown how this is set up in coursecompass.
• Teaching Naked (or just Google “NPR Teach Naked”)

References and Software


Student reactions

“I think that it was awesome!! I have never been able to comprehend math until it was taught this way.” – Anonymous student 1010 Fall 2007

Useful Links

• http://mast.unco.edu/programs/vodcasting/
• http://vodcasting.ning.com/
• http://www.ted.com/talks/salman_khan_let_s_use_videos_to_reinvent_education.html
• http://www.mathpickle.com/K-12/Videos.html
• http://projecteuler.net/
• http://vodcasting.org/

References and Software


Student reactions

“It was so fabulous that I sold everything I owned to become a stats teacher and follow in Dr. McD’s footsteps.” — Nobody...yet!

References and Software


References

• Talbert, Robert (2012) “Inverted Classroom,” Colleagues: Vol. 9: Iss. 1, Article 7 Available at: http://scholarworks.gvsu.edu/colleagues/vol9/iss1/7
• At M.I.T., Large Lectures Are Going the Way of the Blackboard http://www.nytimes.com/2009/01/13/us/13pysics.html?_r=2&pagewanted=all&
References and Software


Software/Hardware Used

- **Software**
  - Camtasia Studio, Snagit, Winplot, Virtual TI
- **Hardware**
  - Tablet PC (Gateway and Dell)
  - Blue Snowball Microphone

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