Overview

- What is a Flipped/Inverted Classroom?
- My Flipped/Inverted Classroom
- Linking with Cognitive Learning Theory
- Reflections on Flipping/Inverting
- Flipping YOUR Class

Motivating Question

- When you prepare a lecture or class presentation, what do you think about?
  - What material do I need to cover?
- What should you be thinking about?
  - How is my time with students best spent?
  - What do you want them to learn or know?
  - How can you best deliver that content?
  - How quickly can you clarify misconceptions?
  - How will you assess their learning?
  - Is there transparency of expectations?
  - Are all students engaged at their level?

Knowledge Needed to Teach

- Content Knowledge
- Pedagogical Knowledge
- Learning Theory
- Assessment of Learning (Summative) vs. Assessment for Learning (Formative)
- Technology use

What is a Flipped Classroom?

- Discipline-specific
- Students do work ahead of time, Professors don’t repeat lectures
- Class-time spent clarifying misconceptions and “high-touch” activities
- Leverages power of technology

My Flipped Classroom

- Statistical Methods for quantitative majors
- Each module designed around two classes
- Research question: How does this impact student attitudes, learning, and course evaluations?
Module Structure

<table>
<thead>
<tr>
<th>Before Practice</th>
<th>During Practice</th>
<th>After Practice / During Lab</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Professor</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Learning outcome guide</td>
<td>Respond to muddiest points</td>
<td>Prepare lab</td>
</tr>
<tr>
<td>Learning resource guide</td>
<td>(Review material)</td>
<td>Guide students on problems (both in and out of class)</td>
</tr>
<tr>
<td>Pre-assessment</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Student</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reviews learning outcome guide</td>
<td>Clarifies misconceptions (group/individual)</td>
<td>Practice deeper value and understanding “Play” with data</td>
</tr>
<tr>
<td>Books, videos, apple, other</td>
<td>Engaged with material at their level</td>
<td></td>
</tr>
<tr>
<td>Complete pre-assessment</td>
<td>Review material, study for quiz</td>
<td></td>
</tr>
</tbody>
</table>

Example of Learning Resources

<table>
<thead>
<tr>
<th>Type</th>
<th>Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tutorial/Applet</td>
<td>Getting repair estimates from garages (paired vs. independent tests, power calculation)</td>
</tr>
<tr>
<td>Video</td>
<td>The effect of leaf removal on fruit growth (combined methods)</td>
</tr>
<tr>
<td>Video</td>
<td>Predicting house values (regression)</td>
</tr>
<tr>
<td>Video</td>
<td>Determining optimal pizza production to maximize profit</td>
</tr>
<tr>
<td>Video</td>
<td>Determining the number of smoke detectors needed to install in order to detect a fire reliably (probability)</td>
</tr>
<tr>
<td>Video</td>
<td>Who is the best hitter in baseball (standardization)</td>
</tr>
<tr>
<td>Video</td>
<td>How many stars are in the sky (sampling)</td>
</tr>
<tr>
<td>Book</td>
<td>Tangram competition (inference and design)</td>
</tr>
<tr>
<td>Book</td>
<td>Misconceptions clarified in class</td>
</tr>
<tr>
<td>Book</td>
<td>Quiz feedback given next class</td>
</tr>
<tr>
<td>Book</td>
<td>Learning time controlled by professor</td>
</tr>
<tr>
<td>Book</td>
<td>Allows (but relies on) student-centered learning</td>
</tr>
</tbody>
</table>

Examples of “Labs”

- Determining the number of smoke detectors needed to install in order to detect a fire reliably (probability)
- Determining optimal pizza production to maximize profit (expected value and graphics)
- Who is the best hitter in baseball (standardization)
- How many stars are in the sky (sampling)
- Tangram competition (inference and design)
- Predicting house values (regression)
- The effect of leaf removal on fruit growth (combined methods)
- Getting repair estimates from garages (paired vs. independent tests, power calculation)

Cognitive Learning Theory

- Webb’s Depth of Knowledge/Bloom’s Taxonomy
- Common themes in successful international mathematics education (Stigler & Hiebert)
  - Time on task / practice
  - Making connections
  - Struggle
- “Applying Cognitive Theory to Statistics Instruction” (Lovett & Greenhouse)
  - Time on task / practice
  - Knowledge is context-specific and learning must integrate new knowledge with existing beliefs
  - Real-time feedback promotes efficient learning
  - Learning decreases as mental load increases

Traditional vs. Flipped Classroom

<table>
<thead>
<tr>
<th>Task</th>
<th>Traditional</th>
<th>Flipped</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time on Task</td>
<td>Class-time, homework</td>
<td>Pre-learning, Class-time, studying for quiz</td>
</tr>
<tr>
<td>Making Connections</td>
<td>Some real-world applications possible</td>
<td>More time on real-world applications (during lab)</td>
</tr>
<tr>
<td>Real-time feedback</td>
<td>Homework feedback given 1+ weeks later</td>
<td>Misconceptions clarified in class</td>
</tr>
<tr>
<td>Competing Mental load</td>
<td>Learning time controlled by professor</td>
<td>Allows (but relies on) student-centered learning</td>
</tr>
<tr>
<td>Formative assessment</td>
<td>Optional</td>
<td>Optional</td>
</tr>
</tbody>
</table>
So...How Was My Class?

- My flipped classroom experience was...
  - Mixed!
  - Went well for students who did the work
  - Videos didn’t work well
    - Many students chose to use the book
    - The way I shared it with them can be improved
  - Covered more material – projects

Reflections on Flipping

- My Reflections
  - Preparation time is different and much more (at beginning)
  - Student-centered learning works well if students are motivated
  - Be clear regarding expectations/assignments
  - Covered more material and had time for student projects

- Student Feedback
  - I don’t like it. I like learning in class.
  - Complain to Chair – “no teaching” going on and he didn’t warn us about the class
  - It was hard at the beginning but became easier
  - I like it a lot!!! I wish more classes, especially math and science ones, ran this way. It just makes sense – particularly at a college level.
  - You as an individual spend more time learning the basics and then come in to class where the professor serves to help fine-tune what you’ve learned and make sure you have your cards in the right order.
  - I like this set up because it allows me to spend as much time as I need to learn the material and then stop once I understand the material. In many classes, teachers either spend too much time or too little on topics making the classes harder to follow and some he harder to complete. I also like the flipped because it allows me to do more problems in class where I can get help from classmates or the teacher if needed.

For Next Time...

- Provide more guidance on what is expected
- Make my own videos
- Require product from labs
- Framing the next week’s lesson
  - “3-2-1” instead of “muddiest point”
    - 3 things you learned, 2 questions you have, 1 thing you want to know more about

Flipping YOUR Class

- So, if you designed a flipped class, how would you do it?
  - How is your time with students best spent?
  - What do you want students to learn or know?
  - How can you best deliver that content?
  - How and how quickly can you clarify misconceptions?
  - How will you assess their learning?
  - Do the students know what is expected of them?
  - Are all students engaged at their level?

Resources

- Flip Your Classroom: Reach Every Student in Every Class Every Day. Bergman & Sams.
- Flipped Learning Network: www.flippedlearning.org
- Susan Murphy – Multimodal Development - Simpson College
- Dr. Karen Porter - Wilson College Every State Tour
- Dr. Robert Reith – Princeton – North Carolina State University
- Michelle Pacansky-Brock - Art History - Mt. San Jacinto College - has a presentation called “How does and why I flipped my classroom”.
- She also did a great online workshop for Wiley Learning Institute (vendor), called “Flipping the Lecture Classroom: Making the Most of Student Time”.
- MindShift: The Flipped Classroom Defined
- LearningMastery.com
- Engineer: Create 10 to 15 minute video to reframe education
- The Flipped Class Network
- The Flipped Class: What does a good one look like?
- Faculty involved by engineering professor at the University of Utah, Dr. Cindy Furse
  - A Physics professor - Mark Jaffin, from the University of Utah at Citizens
  - @MarkJaffin
- The Physics Education Research Group, who use interactive online resources in large physics classes.

Assessment and SoTL

- VITAL Faculty Associate - Classroom-based Research
- What is the Scholarship of Teaching and Learning?
  - Teaching can always become more effective and learning more significant and enduring. Growth in students and their learning is the life-juice of being a teacher. SoTL can stimulate those juices to flow in innovative, effective, and reflective ways.
  - SoTL is not only the engagement by individuals in vigorous research on teaching and making that research public in building a body of knowledge, but also an attitude and a way of thinking about teaching. SoTL emphasizes that teaching is serious intellectual activity that can be both deeply personal and highly collegial. SoTL, as understood in an expansive sense, is perhaps the best way to improve teaching for student understanding. That is a lofty claim, yet one not only possible, but when done well, probable.
Change is Hard!

*If you would attain to what you are not yet, you must always be displeased by what you are. For where you are pleased with yourself there you have remained. Keep adding, keep walking, keep advancing.*

~Saint Augustine

Thanks

- …to you!
- …to my students!
- …to VITAL for my minigrant!
- …to Carol Weiss for inspiring and supporting teaching and learning!
  Villanova will not be the same without you!