Experience, Explain and Expand: 
**Double-flipping the Learning Cycle**
(in a Statistics Class)

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WHAT’S THE CONTEXT?
EDUC 200C: Introduction to Statistical Methods in Education.

• Introductory course for PhD in Education.
  – Taught by many instructors over the years.
  – We aimed to improve student learning and engagement.

• Used our own theories on human learning to redesign the class.
  – Course is currently in its 3rd year in this form.
WHAT DID WE DO?
Not ... The STANDARD model

Tell-and-Practice Learning Cycle

Tell in class

Practice at home
Not ... The Nouveau STANDARD model

*Flipped classroom* Learning Cycle

Tell at home

Practice in class

Does not flip Learning Cycle
The Double-Flipped Learning Cycle

1. EXPERIENCE
   a problem for homework

2. EXPLAIN
   the solution or reason in class

3. EXPAND
   with practice at home
The Double-Flipped Learning Cycle

1. Invent a formula to describe how “spread out” these data are.

2. Students see lecture as a solution to a problem they encountered.

3. Students read text and practice canonical solution.
Secret Sauce

• Students experience the problem the theory solves.
  – For cell division:
    • How would you get rubber ducks to center of pool without touching?
  – For psychology:
    • Graph important (to you) results from a simplified classic experiment.

• In statistics:
  – How to handle different sample sizes?
  – How to compare data on different scales?
Comparing Pitching Machine Consistency

- Companies make pitching machines.
- The Certification Board of Tests and Measures (CBTM) checks the machines. It pitches several balls at a target and records where the balls land.
- Consumers want a consistency index so they can pick the right machine. A child needs a consistent machine, but a pro might want an inconsistent one.
- **Your task:** Find a way to compute a single number that describes the consistency of any given pitching machine.
  - The less consistent a machine, the larger the number should be.
  - Use the same method to assign an index to each of the six machines on the next page.
  - Email solution as an attachment to
The Grading Nightmare

A professor has a physics class with five sections that each have 10 students.

In each class, the TA makes his/her own final exam.

Students took the final exam. The graphs on the left show the score distributions.

The Grading Nightmare: Your Task

You need to invent a way to compute a fair score for determining what grade a each student in the class should get. Here are the criteria:

- It needs to rank students.
- Your procedure should be the same for each section.
- You should produce a single score for each student.
- A higher score means a higher grade.

You need to be able to rank all of these students from best to worst performance, despite having different tests. *Hint: Nobody should get the same value.*

Here are the students you care about:

- Section A: Mary got a 7.
- Section B: Enrique got a 6.
- Section C: Arafat got a 6.
- Section D: Sharia got a 5.
- Section E: Bob got a 3.

• Email your solution to with the subject “grades”
WHY DO WE DO IT?
Lectures Can Overshadow Learning

- Students learn the solution, and never learn the problem.
- They cannot recognize when to use a solution.

Creating a Time for Telling

- Experiences create a need to know.
- Explanation solves problems students have experienced.

Preparation for Future Learning

- Recoup time spent experiencing.
- Lecture goes smoother and practice is easier.
HOW TO USE THIS IN YOUR CLASS?
The Major Challenge

• Many people focusing on perfecting lectures.
  – Better to expend energy on experiences that make lectures click in.

• How to design experiences that prepare students to learn?
  – Asking students to solve end-of-chapter questions before lecture?
  – These questions are designed to improve efficiency not initial learning.

• Collaborations between disciplinary experts and learning scientists may be best approach for now.
  – We are eager to help generate tasks that can prepare students to learn from subsequent expositions. For us, it is a basic research question.
THE END