YOUR PLANS?
WHAT DO YOU WANT STUDENTS TO TAKE FROM YOUR COURSE?
WHAT DO YOU WANT STUDENTS TO TAKE FROM YOUR COURSE?
WHAT DO YOU WANT STUDENTS TO TAKE FROM YOUR COURSE?

CONTENT KNOWLEDGE

INSPIRATION

SKILLS
 WHICH CAN THE BEST LECTURE ACHIEVE?

CONTENT KNOWLEDGE

INSPIRATION

SKILLS
HOW EFFECTIVELY DOES LECTURE TEACH CONTENT KNOWLEDGE?

YOUTUBE: “FIVE MINUTE UNIVERSITY”
WHICH CAN THE BEST LECTURE ACHIEVE?

CONTENT KNOWLEDGE?

INSPIRATION

SKILLS
GOOD TARGET: 5-15 MINUTES OF INSTRUCTOR TALKING

1976, A. H. Johnstone and F. Percival observed students in over 90 lectures, with 12 different lecturers, recording breaks in student attention. They identified a general pattern of attention breaks: after three to five minutes of “settling down” at the start of class, one study found that the next lapse of attention usually occurred some 10 to 18 minutes later, and as the lecture proceeded the attention span became shorter and often fell to three or four minutes towards the end of a standard lecture” (p. 49 - 50). These findings, except for the “settling period,” seem to be confirmed by Ralph A. Burns 1985 study. Burns asked students to write summaries of presentations and tallied the bits of information reported by the “half-minute segment of the presentation” in which they occurred. He reports that students recalled the most information from the first 5 minutes of the presentation. “Impact declined, but was relatively constant for the next two 5-minute portions, and dropped to the lowest level during the 15- to 20-minute interval” (Burns, 1985). Both of these studies note the severe lapse of attention 15 to 20 minutes into a lecture. P. J. Fen sham explains this phenomenon, “During
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IF NOT LECTURE, THEN WHAT?
IF NOT LECTURE, THEN WHAT?

1. What do we do in class?

2. How will information transfer happen?
PEER INSTRUCTION

BRIEF PRESENTATION

QUESTION

VOTE

IF 30-70% CORRECT:

PEER INSTRUCTION

BRIEF PRESENTATION

QUESTION

VOTE

IF 30-70% CORRECT:

DISCUSS
PEER INSTRUCTION

BRIEF PRESENTATION

QUESTION

VOTE

IF 30-70% CORRECT:

DISCUSS

RE-VOTE
PEER INSTRUCTION

BRIEF PRESENTATION

QUESTION

VOTE

IF 30-70% CORRECT:

DISCUSS

RE-VOTE

BRIEF EXPLANATION
PEER INSTRUCTION

BRIEF PRESENTATION

QUESTION

VOTE

IF MORE THAN 70% CORRECT:

DISCUSS

RE-VOTE

BRIEF EXPLANATION
PEER INSTRUCTION

BRIEF PRESENTATION

QUESTION

VOTE

IF LESS THAN 30% CORRECT:
PEER INSTRUCTION

1. Brief presentation
2. ConcepTest
3. Clicker poll 1
   - Less than 30% correct: Revisit concept
   - 30-70% correct: Peer discussion
   - More than 70% correct: Explanation
4. Clicker poll 2
5. Repeat from start
LET’S TRY IT!
LET’S TRY IT!
WHEN METALS HEAT UP, THEY EXPAND
QUESTIONS?
WHAT HAPPENS TO THE DIAMETER OF THE HOLE AS THE PLATE IS HEATED UNIFORMLY?

a. increases  
b. decreases  
c. stays the same
WHY PEER INSTRUCTION WORKS

Inspiration

Skills

Content Knowledge
WHY PEER INSTRUCTION WORKS

INSPIRATION
• you’re invested

SKILLS

CONTENT KNOWLEDGE
WHY PEER INSTRUCTION WORKS

INSPIRATION
• you’re invested

SKILLS
• you’re applying knowledge

CONTENT KNOWLEDGE
WHAT HAPPENS TO THE DIAMETER OF THE HOLE AS THE PLATE IS HEATED UNIFORMLY?
WHAT HAPPENS TO THE DIAMETER OF THE HOLE AS THE PLATE IS HEATED UNIFORMLY?
WHAT HAPPENS TO THE DIAMETER OF THE HOLE AS THE PLATE IS HEATED UNIFORMLY?
WHAT HAPPENS TO THE DIAMETER OF THE HOLE AS THE PLATE IS HEATED UNIFORMLY?
What happens to the diameter of the hole as the plate is heated uniformly?
PEER INSTRUCTION WORKS!

- Peer Instruction
- Lecture
PEER INSTRUCTION WORKS!

[Diagram showing a comparison between peer instruction and lecture over years 1990 to 2000. The chart indicates that peer instruction leads to higher FCI normalized gain compared to lecture-based instruction.]
WHY PEER INSTRUCTION WORKS

INSPIRATION
• you’re invested
• you’re getting feedback

SKILLS
• you’re

CONTENT KNOWLEDGE
WHY PEER INSTRUCTION WORKS

INSPIRATION
• you’re
• you’re getting

SKILLS
• you’re

CONTENT KNOWLEDGE
• you’re getting to *elicit, confront, resolve*
WHY PEER INSTRUCTION WORKS: ELICIT, CONFRONT, RESOLVE
WHY PEER INSTRUCTION WORKS

INSPIRATION

• you’re
• you’re getting

SKILLS

• you’re

CONTENT KNOWLEDGE

• you’re getting to elicit, confront, resolve
• you’re being tested
WHY PEER INSTRUCTION WORKS: TESTING
WHY PEER INSTRUCTION WORKS: TESTING
WHY PEER INSTRUCTION WORKS: TESTING

![Chart showing the impact of testing conditions on learning outcomes.](image)

- **No test**: .11
- **Test with no feedback**: .33
- **Test with immediate feedback**: .33
- **Test with delayed feedback**: .11

[TRENDS in Cognitive Sciences](#)
WHY PEER INSTRUCTION WORKS: TESTING

![Bar chart showing the proportion correct on a final test across different learning conditions.](image)
WHAT QUESTIONS DO I ASK?
CURRICULUM

1.

2.

3.
CURRICULUM: BACKWARD DESIGN

DEFINE YOUR COURSE BY LEARNING GOALS NOT CONTENT
CURRICULUM: BACKWARD DESIGN

Assignments
Activities
Assessment
ASPECTS OF CURRICULUM DESIGN

1. backward design
LET’S DO ANOTHER QUESTION
WHAT IS -2-3? (SUBTRACT 3 FROM -2)

A. 1
B. -1
C. 5
D. -5
E. 6
WHAT IS -2-3? (SUBTRACT 3 FROM -2)

A. 1
B. -1
C. 5
D. -5
E. 6

What's wrong with this question?
ASPECTS OF CURRICULUM DESIGN

1. backward design

2. find out what’s hard, but achievable
WHICH OF THE FOLLOWING AIRLINES TRIES TO SAVE FUEL BY SUGGESTING THAT ITS PASSENGERS USE THE BATHROOM BEFORE BOARDING?

A. Aeroflot

B. All Nippon

C. Delta

D. Lufthansa

E. Are you kidding me? None of the above.
WHICH OF THE FOLLOWING AIRLINES TRIES TO SAVE FUEL BY SUGGESTING THAT ITS PASSENGERS USE THE BATHROOM BEFORE BOARDING?

A. Aeroflot
B. All Nippon
C. Delta
D. Lufthansa
E. Are you kidding me? None of the above.

How were your discussions?
WHICH OF THE FOLLOWING AIRLINES TRIES TO SAVE FUEL BY SUGGESTING THAT ITS PASSENGERS USE THE BATHROOM BEFORE BOARDING?

A. Aeroflot
B. All Nippon
C. Delta
D. Lufthansa
E. Are you kidding me? None of the above.

What’s wrong with this question?
ASPECTS OF CURRICULUM DESIGN

1. backward design
2. find out what’s hard, but achievable
3. elicit, confront, resolve
ASPECTS OF CURRICULUM DESIGN

1. backward design
2. find out what’s hard, but achievable
3. elicit, confront, resolve
4. assess
HIGH-TECH IMPLEMENTATIONS
HIGH-TECH IMPLEMENTATIONS

Engage the class

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HIGH-TECH IMPLEMENTATIONS
HIGH-TECH IMPLEMENTATIONS
LOW-TECH IMPLEMENTATION
LOW-TECH IMPLEMENTATION
SUMMARY SO FAR

- Limit lecture. 5-15 minutes.
- Use Peer Instruction during class
- Choose or write ConcepTests that
  - are backward designed
  - focus on what’s hard, but achievable
  - elicit, confront, resolve
- Go high-tech or low-tech
PEER INSTRUCTION AROUND THE WORLD
Member Profile

Eric Mazur

- eric@learningcatalysts.com
- Physics

Cambridge, MA
United States

Harvard University

What should the Pi community know about me?


Other Information:

I teach:
- Introductory Undergraduates
- Intermediate Undergraduates
- Faculty (e.g. Workshops)
- Other Audiences

Professional Role:
- Primarily research, some instruction, some admin

Class (or Audience) Size:
- Small (1-25)
- Medium (26-75)
- Large (76-200)
- Extra-Large (201-500)
- Mega (500+)
SEARCH BY DISCIPLINE AND LOCATION
How do I get my students to prepare before coming to a flipped class?

April 20, 2012 · Best Practices, ConcepTests, Flipped classroom, Implementation, Just-in-Time-Teaching, Peer Instruction

Print Post

How do I get my students to prepare before coming to a flipped class?

In 2 wildly popular blog posts 1 and 2 on the flipped classroom, “notable advocates of the flipped classroom” clarify what is meant by the term. They include Jonathan Bergmann and Aaron Sams, who are credited with developing the most prevalent implementation of the flip. In the first post, the 8 advocates write: “In most Flipped Classrooms, there is an active and intentional transfer of some of the information delivery to outside of the classroom with the goal of freeing up time to make better use of the face-to-face interaction in school.”

The eight flipped classroom gurus also write, “This can look very different from classroom to classroom and we recognize no two Flipped Classrooms look exactly the same, just as no two traditional classrooms look alike. The Flipped Classroom is a pedagogy-first approach that strives to meet the needs of the learners in our individual schools and communities. It is much more an ideology than it is a specific methodology...there is no prescribed set of rules to follow or model to fit...Practitioners of the various flipped classroom models are constantly tweaking, changing, rejecting, adding to, and generally trying to improve the model through direct experience with how effective it is for kids.”

We want to be clear, for ourselves and our readers, about what those most famous for the flip mean by the term. We think it’s a wonderful model and a great way to describe some of the core features of Peer Instruction, despite many differences.
ENCOURAGE INFORMATION TRANSFER BEFORE CLASS

1. in-class quizzes
ENCOURAGE INFORMATION TRANSFER BEFORE CLASS: IN-CLASS QUIZZES

Which of the following topics were not part of last night’s reading?

- momentum
- energy
- radiation
- Kelvin
ENCOURAGE INFORMATION TRANSFER BEFORE CLASS

1. in-class quizzes
2. JiTT
ENCOURAGE INFORMATION TRANSFER
BEFORE CLASS: JITT

READING/Coverage

WHAT SINGLE POINT IN THE MATERIAL WAS MOST CHALLENGING?
ENCOURAGE INFORMATION TRANSFER
BEFORE CLASS: JITT

READING/Coverage

Online Assignment:
  2 Conceptual Questions
  1 Feedback Question
ENCOURAGE INFORMATION TRANSFER BEFORE CLASS: JITT

READING/COVERAGE

ONLINE ASSIGNMENT:
  2 CONCEPTUAL QUESTIONS
  1 FEEDBACK QUESTION

WHAT SINGLE POINT IN THE MATERIAL WAS MOST CHALLENGING?
ENCOURAGE INFORMATION TRANSFER
BEFORE CLASS: JITT

READING/COVERAGE

ONLINE ASSIGNMENT:
2 CONCEPTUAL QUESTIONS
1 FEEDBACK QUESTION

WHAT SINGLE POINT IN THE MATERIAL
WAS MOST CHALLENGING?

REVIEW FEEDBACK
ENCOURAGE INFORMATION TRANSFER
BEFORE CLASS: JITT

READING/COVERAGE

ONLINE ASSIGNMENT:
  2 CONCEPTUAL QUESTIONS
  1 FEEDBACK QUESTION

  WHAT SINGLE POINT IN THE MATERIAL
  WAS MOST CHALLENGING?

REVIEW FEEDBACK

ADDRESS DIFFICULTIES IN CLASS
ENCOURAGE INFORMATION TRANSFER BEFORE CLASS

1. in-class quizzes

2. JiTT

3. homework: one-paragraph summary of main points
ENCOURAGE INFORMATION TRANSFER BEFORE CLASS

1. in-class quizzes
2. JiTT
3. homework: one-paragraph summary of main points
4. discussion forum
SUMMARY

• Limit lecture. 5-15 minutes.

• Use Peer Instruction during class

• Choose or write ConcepTests that
  • are backward designed
  • focus on what’s hard, but achievable
  • elicit, confront, resolve

• Go high-tech or low-tech

• Encourage information transfer before class
THANK YOU! QUESTIONS?

D-LAB, MIT, 2014. LAURA TUCKER.

PEER INSTRUCTION
IMAGE CREDITS

- http://fc01.deviantart.net/fs71/i/2012/054/8/9/reach_for_the_stars_by_pridescrossing-d4qp4co.jpg
- http://www.hobomom.com/wp-content/uploads/2012/05/Wrong-Feet.jpg

