

Experiences and Challenges Implementing Active Learning Techniques

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July 28, 2014



Background/Motivation

UC Davis

- ▶ Taught PER-based discussion/laboratory sections in grad school

City College of San Francisco

- ▶ Traditional lecture-based environment
 - ▶ Stadium seating, large classes
 - ▶ Verification labs with heavy emphasis on error analysis
- ▶ Courses taught
 - ▶ Calc-based mechanics
 - ▶ “Preparatory Physics”



Background/Motivation

Implemented

- ▶ Clickers
- ▶ Discourse Management

To Be Implemented

- ▶ Microcomputer Based Labs (MBL)...dept purchasing new equipment

Not Implemented

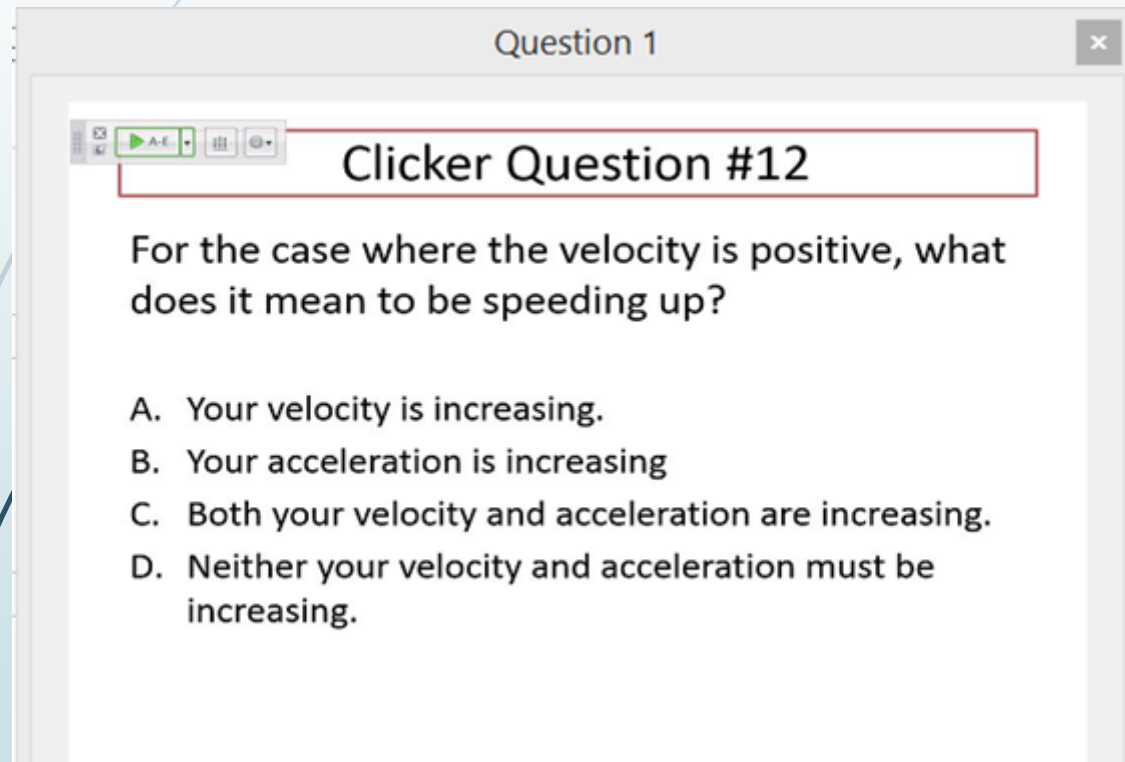
- ▶ Studio format



Clickers

- ▶ Need to sell the benefits of using clickers
- ▶ Lecture attendance increased from 50-60% to 75-85%
 - ▶ Assigned participation points for answering questions
- ▶ Avg 3.8 questions per 50 min lecture
- ▶ No such thing as an easy question
 - ▶ Out of 544 questions, only once did 100% answer correctly

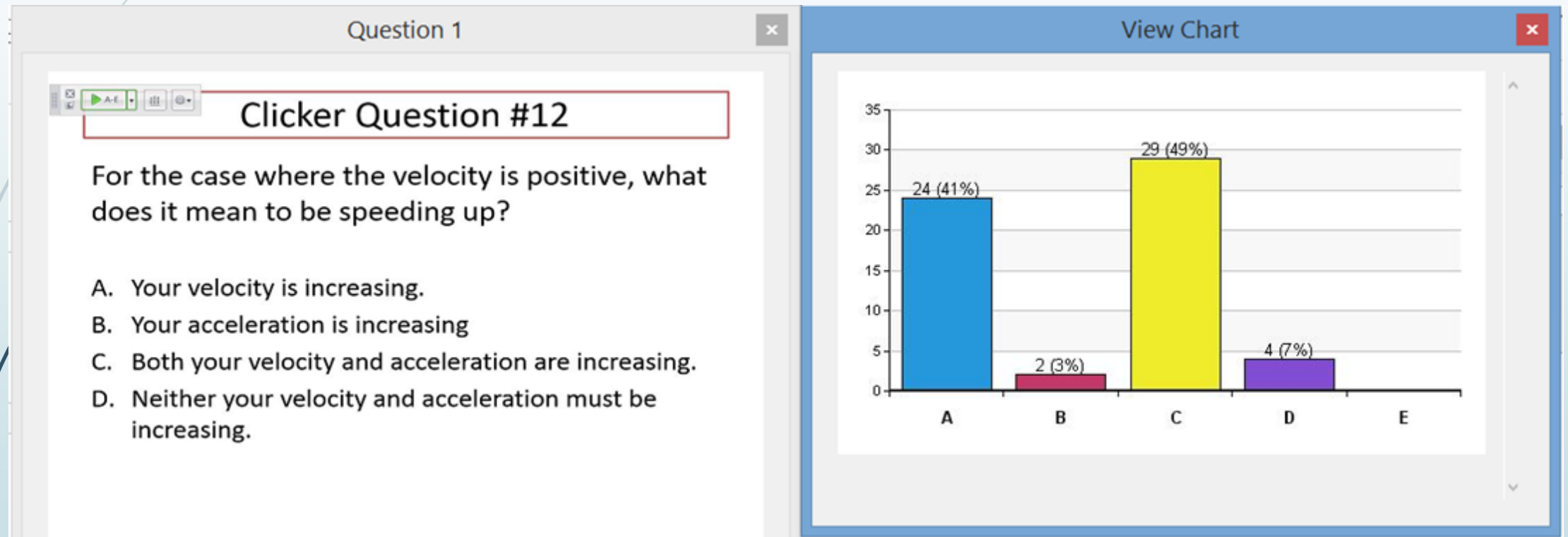
Clickers: Examples

A screenshot of a software interface for a clicker question. The window title is "Question 1". Inside the window, there is a toolbar with a play button and a dropdown menu showing "A-E". The main content area is titled "Clicker Question #12" and contains the following text and options:

For the case where the velocity is positive, what does it mean to be speeding up?

- A. Your velocity is increasing.
- B. Your acceleration is increasing
- C. Both your velocity and acceleration are increasing.
- D. Neither your velocity and acceleration must be increasing.

Clickers: Examples




Clickers: Examples

Question 4

Clicker Question #6

Is the magnitude of the force of gravity greater on a falling elephant or a falling feather?




A. Elephant
B. Feather
C. Neither, gravity is the same for both.
D. It depends how fast they're going.

Clickers: Examples

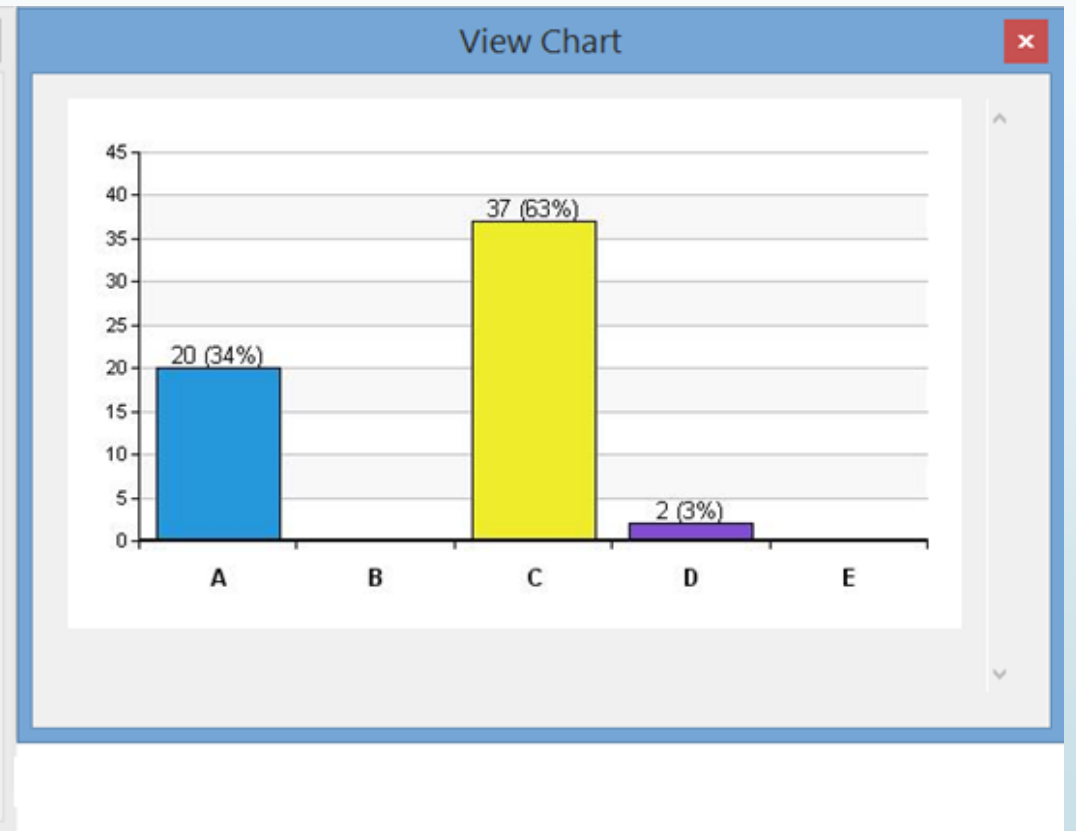
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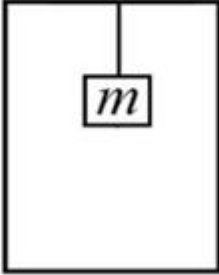
Clickers: Examples

Question 3

Clicker Question #9

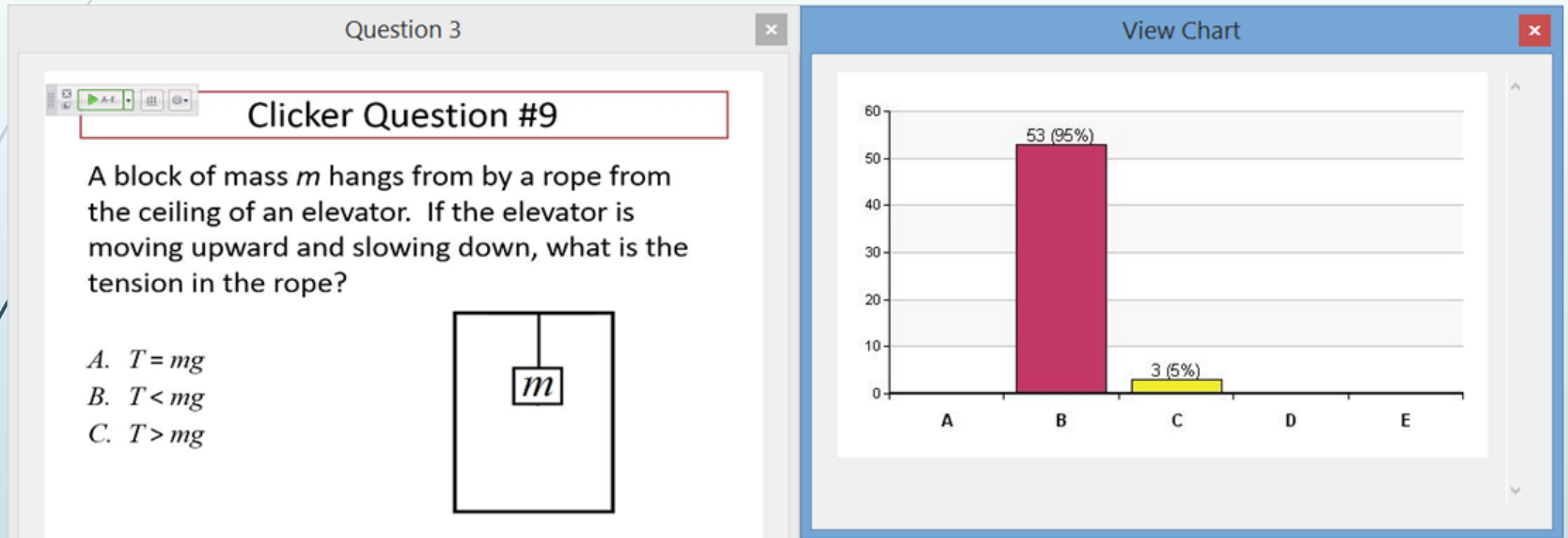
A block of mass m hangs from by a rope from the ceiling of an elevator. If the elevator is moving upward and slowing down, what is the tension in the rope?

A. $T = mg$
B. $T < mg$
C. $T > mg$



The diagram shows a rectangular box representing an elevator. Inside the box, a smaller square block labeled with the letter 'm' is suspended from the top edge of the box by a vertical line representing a rope.

Clickers: Examples



Clickers: Examples

Question 4

Clicker Question #10

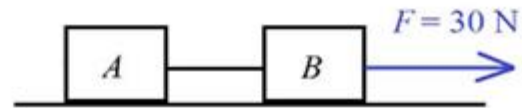
Two blocks, A and B, are connected by a rope and are on a horizontal, frictionless surface (think air hockey table). Block B is pulled to the right by a force of 30 N. What is the tension in the rope connecting the two blocks?

A. $T < 30 \text{ N}$

B. $T = 30 \text{ N}$

C. $T > 30 \text{ N}$

D. Could be any of these depending on the masses.



Clickers: Examples

Question 4

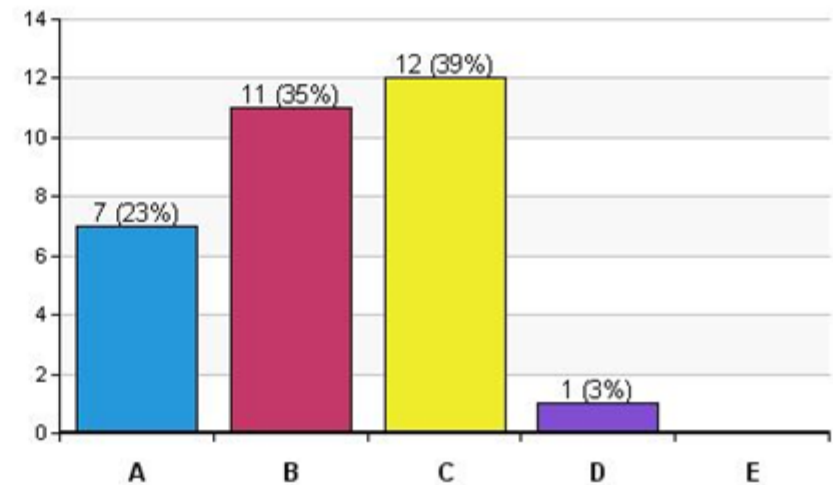
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View Chart

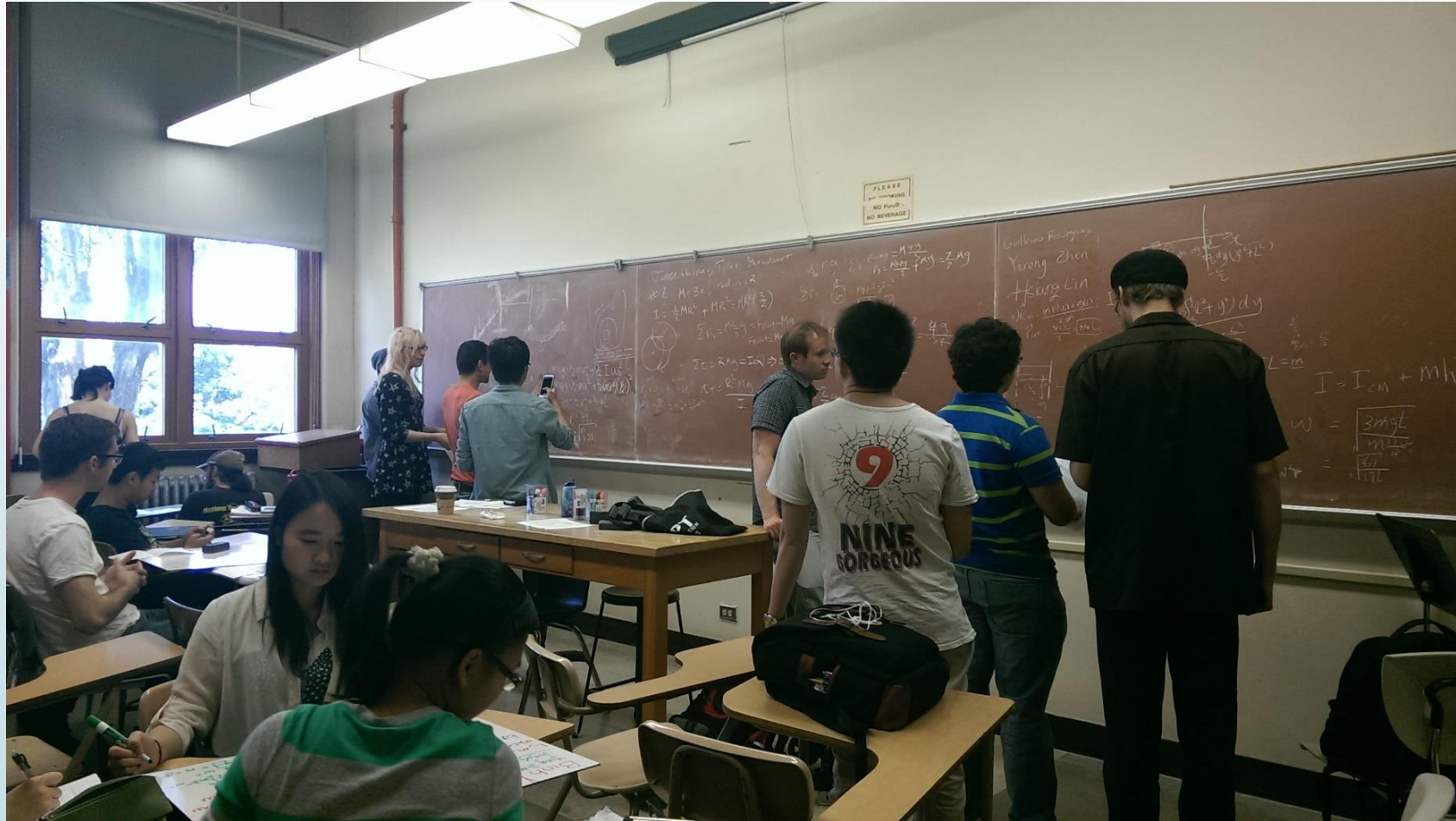


A dark grey arrow points to the right from the left edge of the slide. Below it, several thin, curved lines in shades of blue and grey sweep across the left side of the slide.

Discourse Management

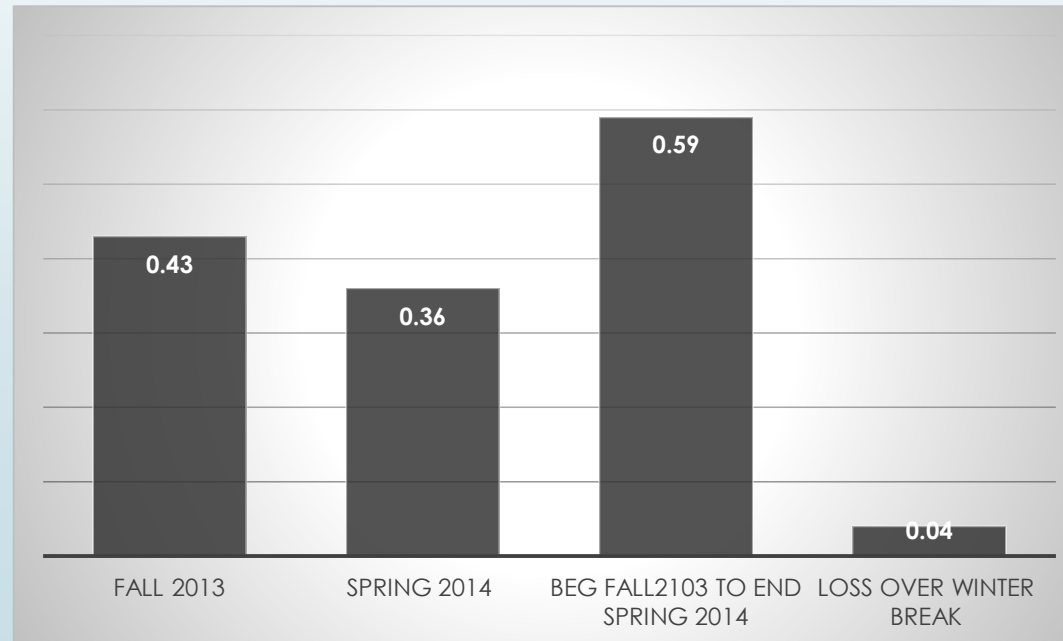
- ▶ Used during discussion section once per week
- ▶ Small whiteboards allowed everyone to be involved.
- ▶ Difficult with class sizes of 30-40

Discourse Management



FCI Results

- ▶ 0.36 -0.42 normalized gain
- ▶ 12 students followed me from Fall 2013 to Spring 2014





Challenges

- ▶ Requesting administrative changes
- ▶ Convincing other faculty to change labs

But overall VERY POSITIVE experience!