

Introduction to Peer Instruction



Physics and Astronomy New Faculty Workshop
Greenbelt, MD, 28 June 2010



My message



shift focus from “teaching” to helping students learn

Outline

- Education



Outline

- Education
- Peer Instruction



Outline

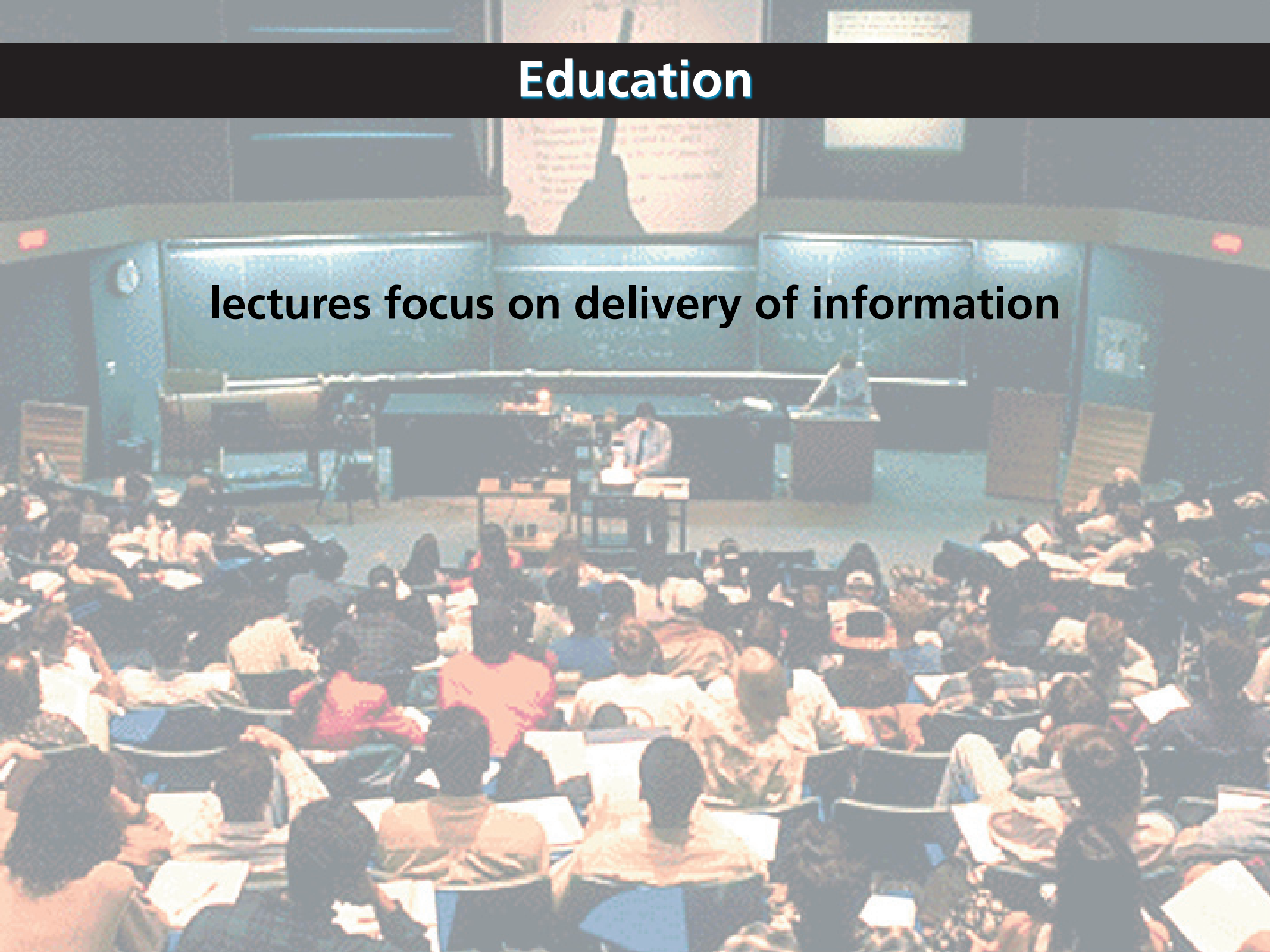
- Education
- Peer Instruction
- Results

Education



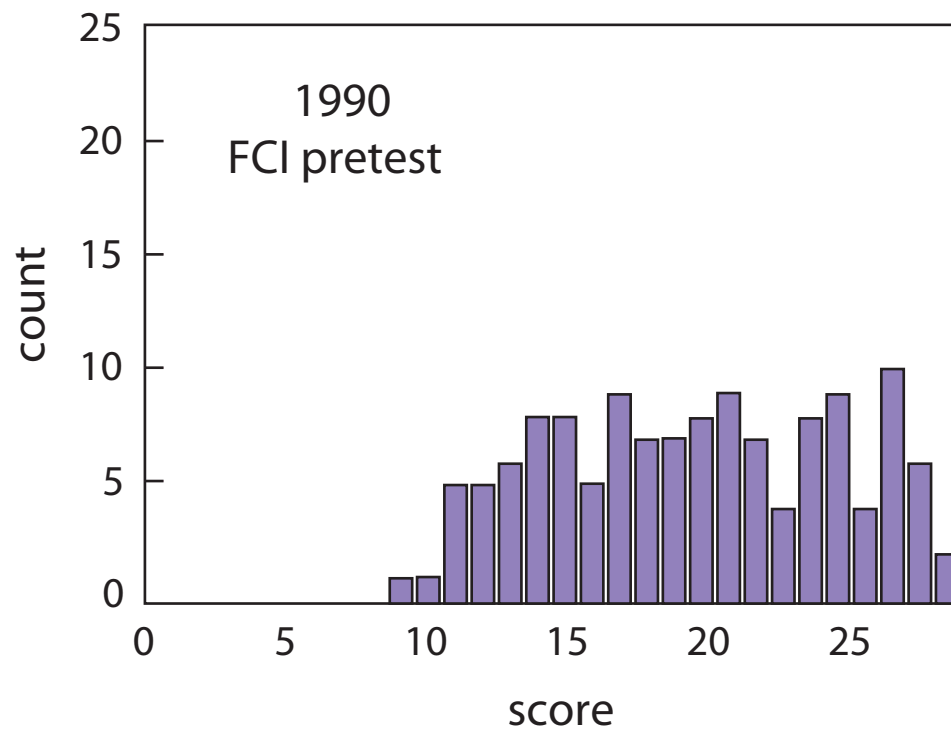
Education

lectures focus on delivery of information



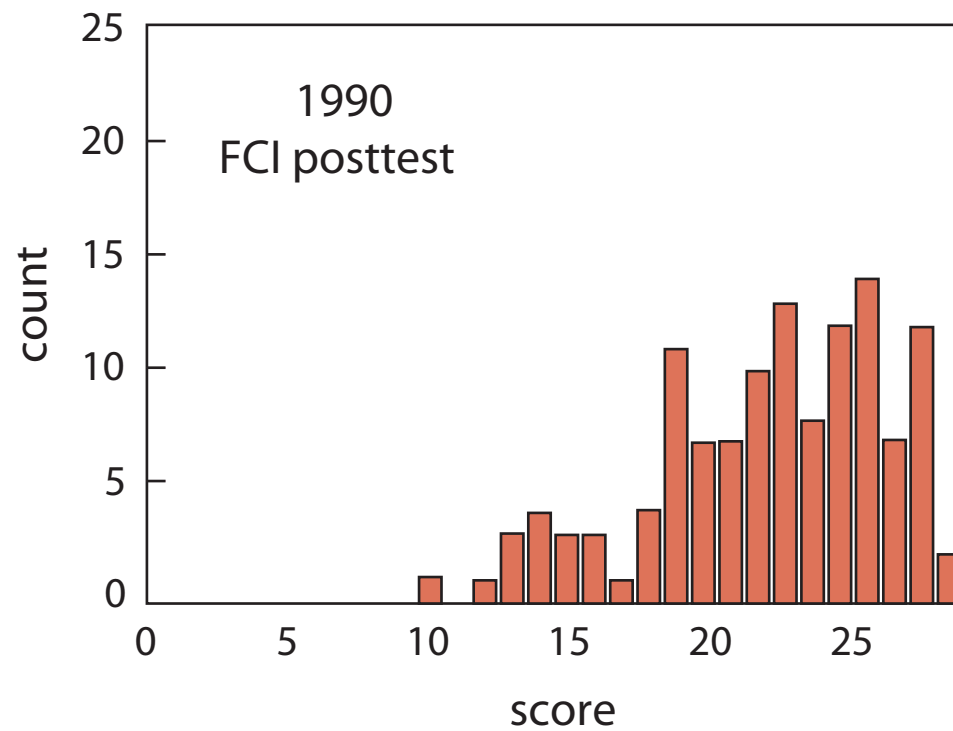
Education

education is not just information transfer



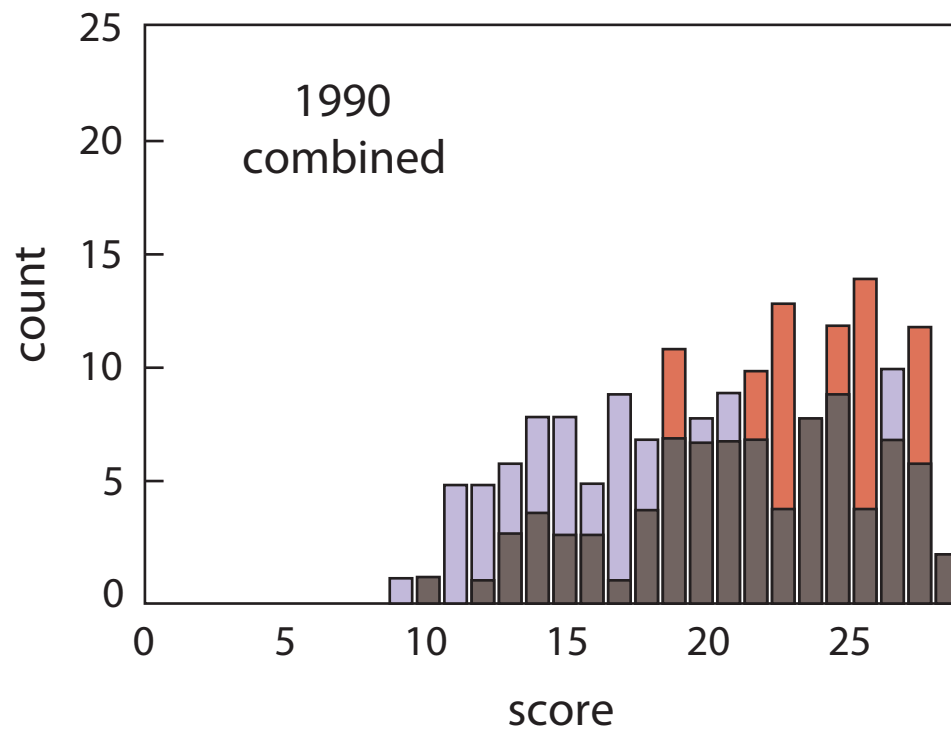
Education

education is not just information transfer

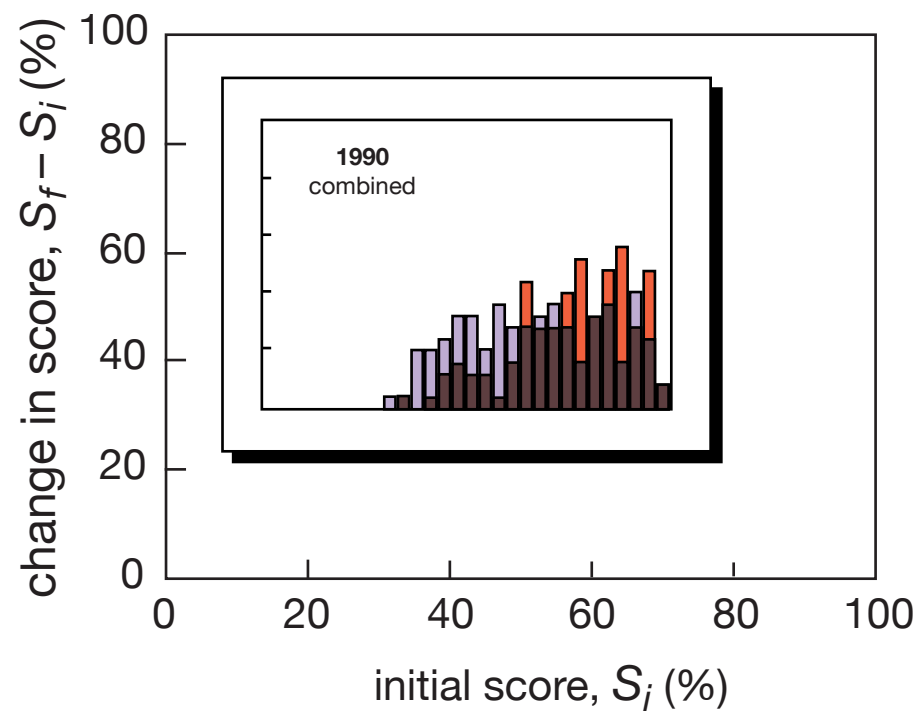


Education

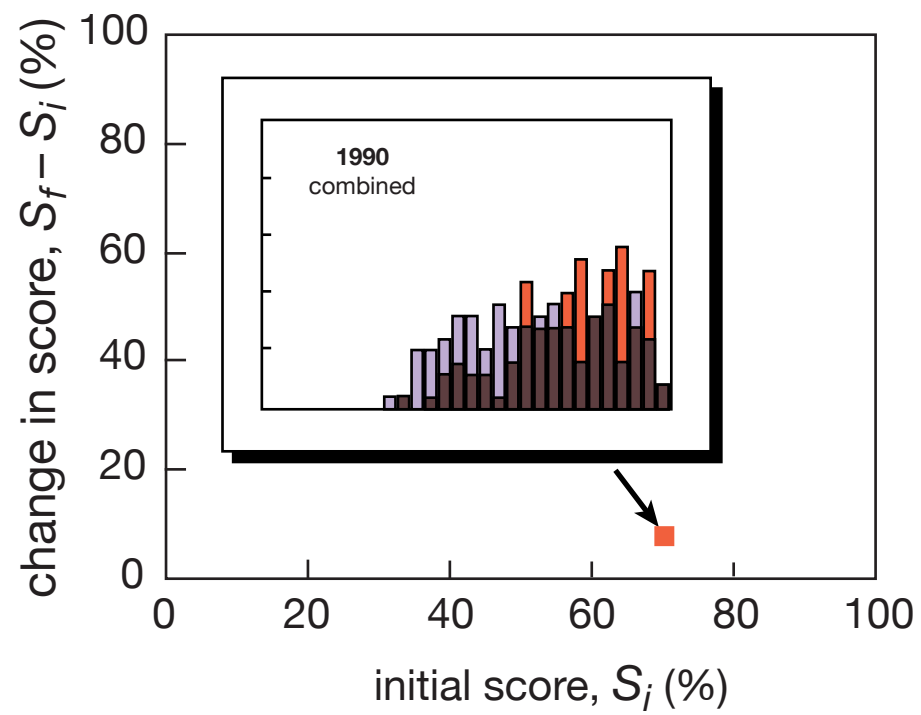
education is not just information transfer



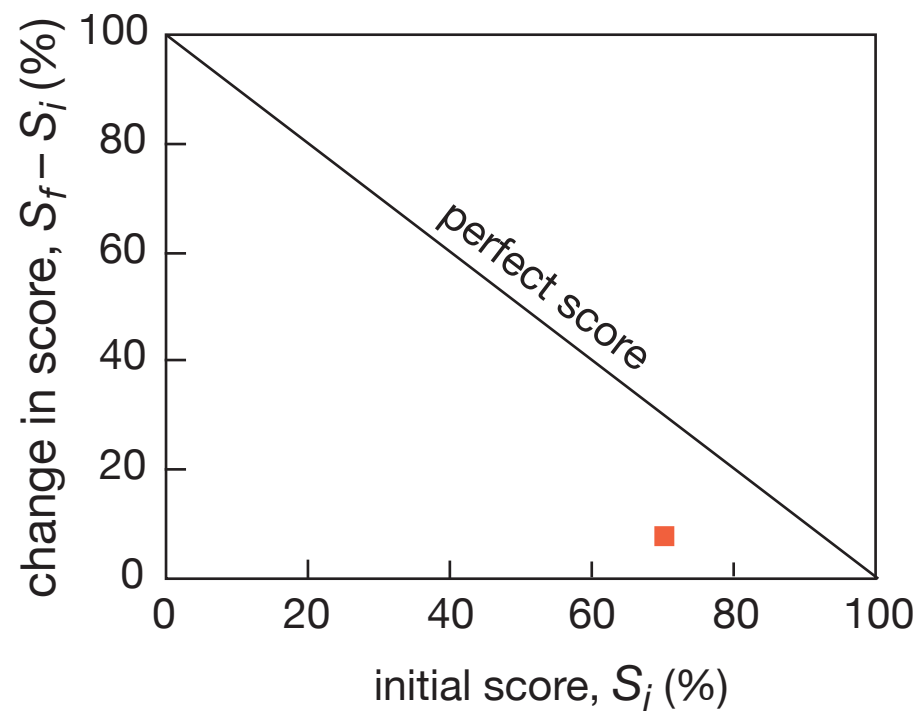
Education



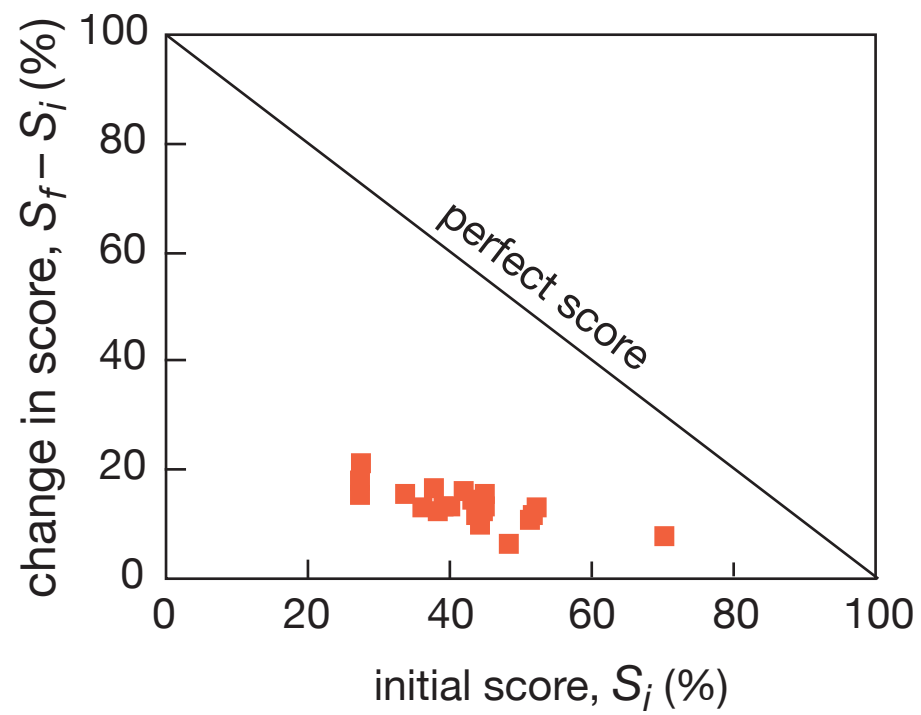
Education



Education



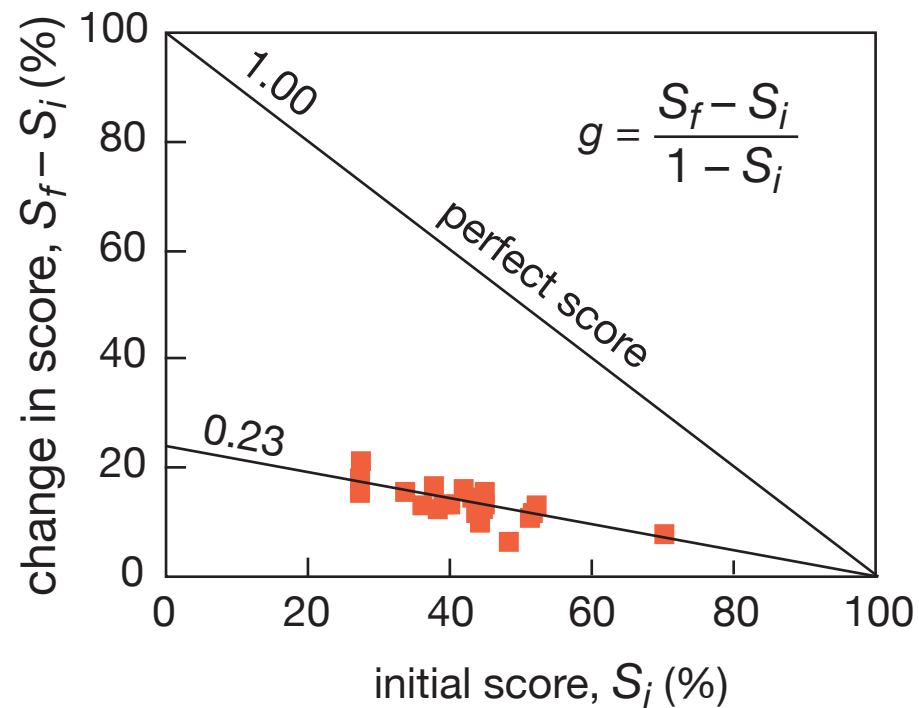
Education



R.R. Hake, *Am. J. Phys.* 66, 64 (1998)

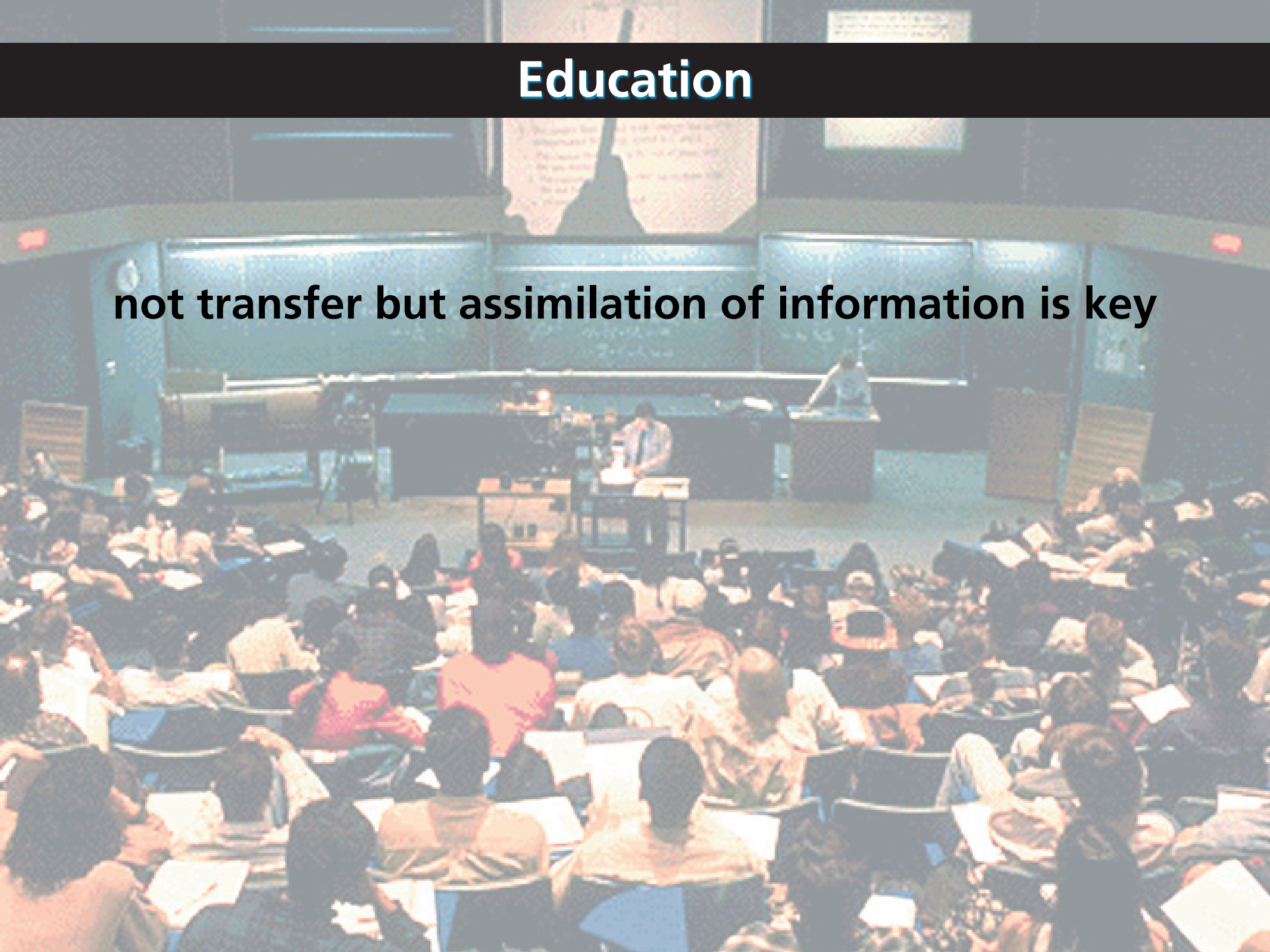
Education

only one quarter of maximum gain realized



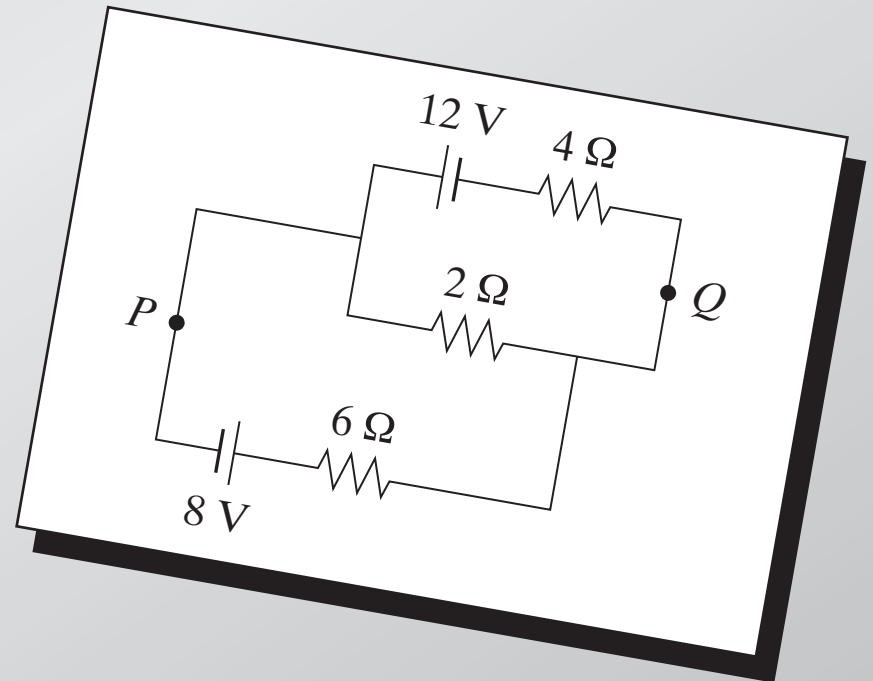
Education

not transfer but assimilation of information is key



Education

conventional problems misleading



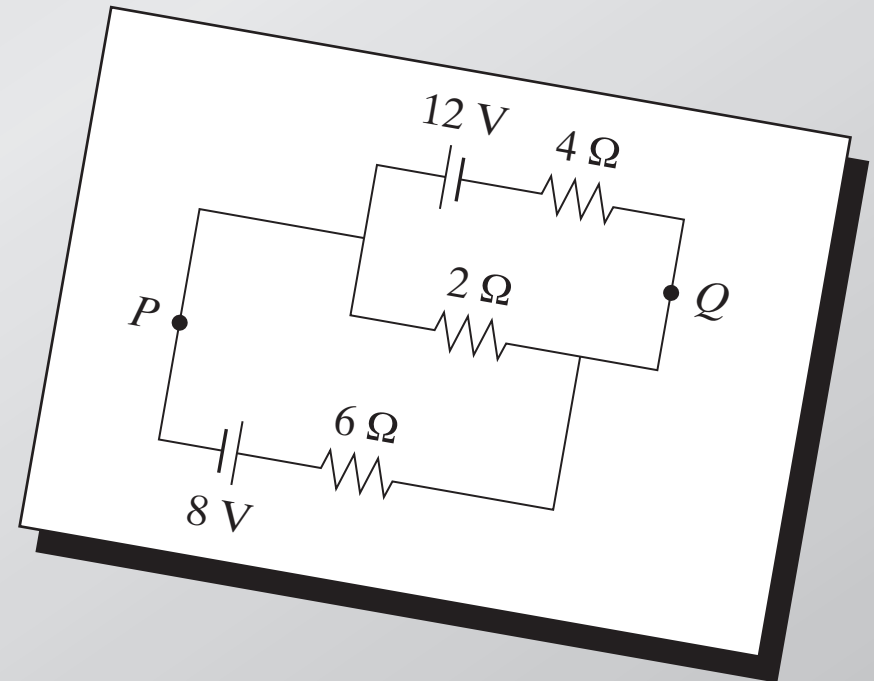
Education

conventional problems misleading

Calculate:

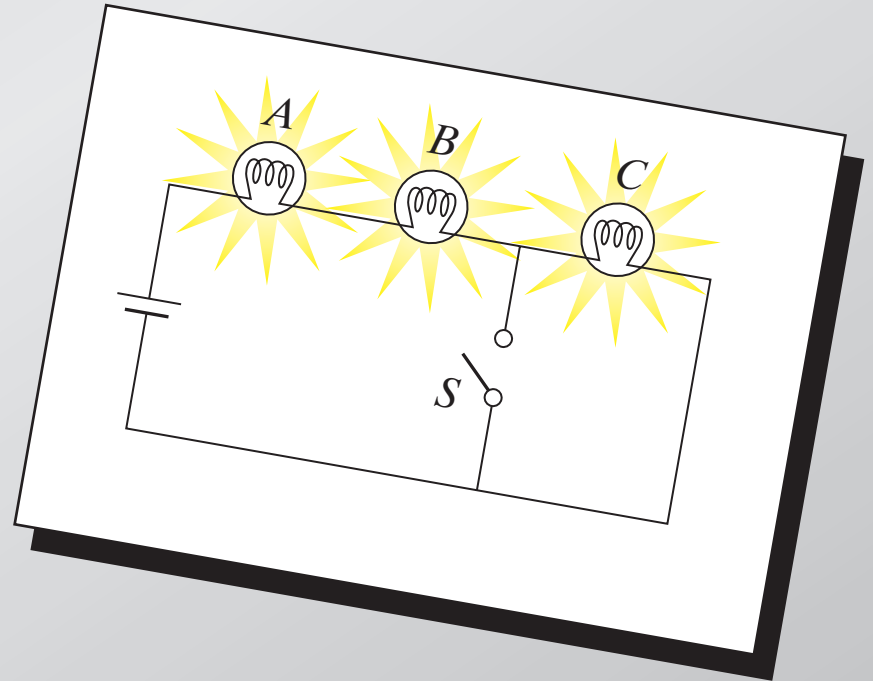
(a) current in $2\text{-}\Omega$ resistor

(b) potential difference
between P and Q



Education

are the basic principles understood?

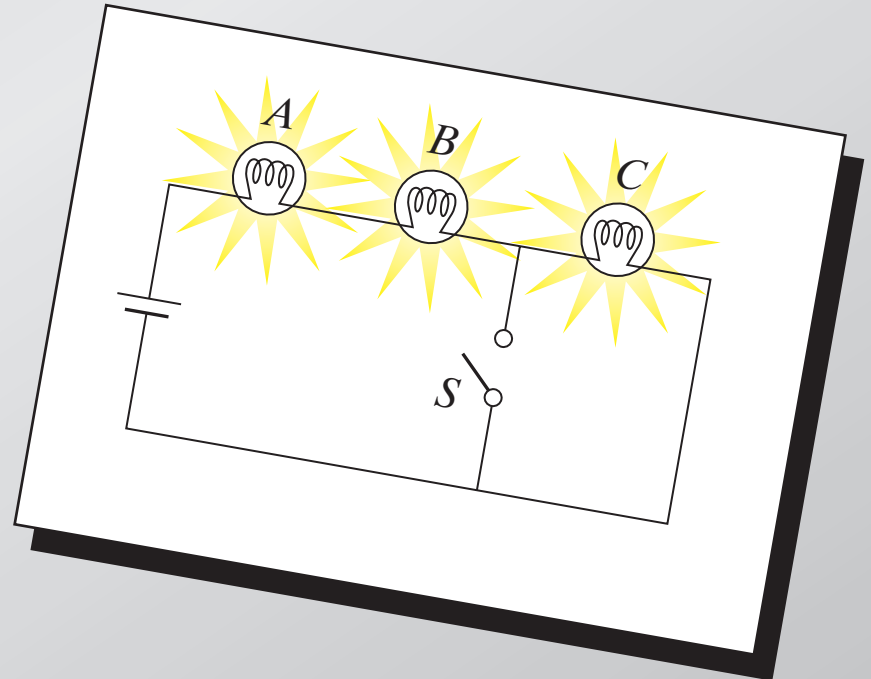


Education

are the basic principles understood?

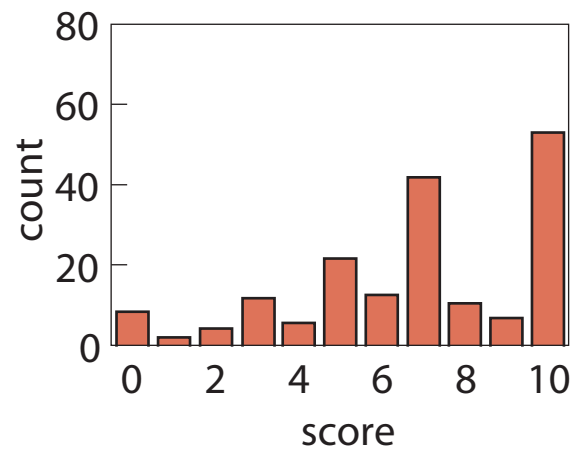
When S is closed, what happens to:

- (a) intensities of A and B ?
- (b) intensity of C ?
- (c) current through battery?
- (d) potential difference across
 A , B , and C ?
- (e) the total power dissipated?

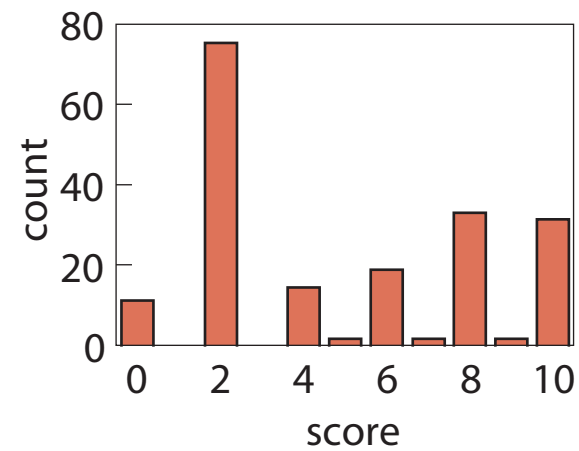


Education

conventional

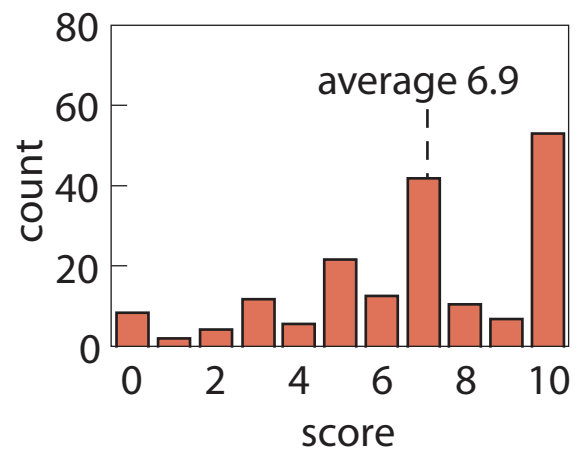


conceptual

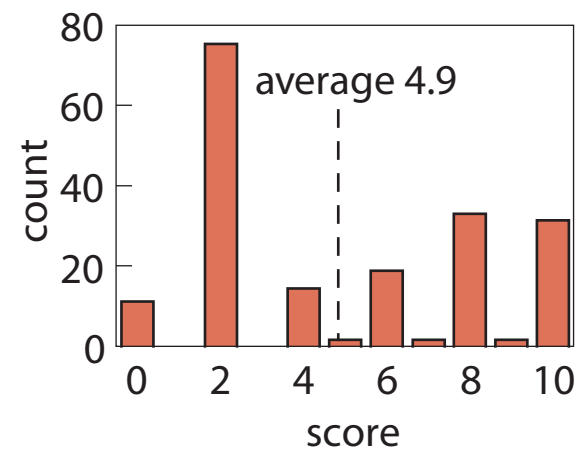


Education

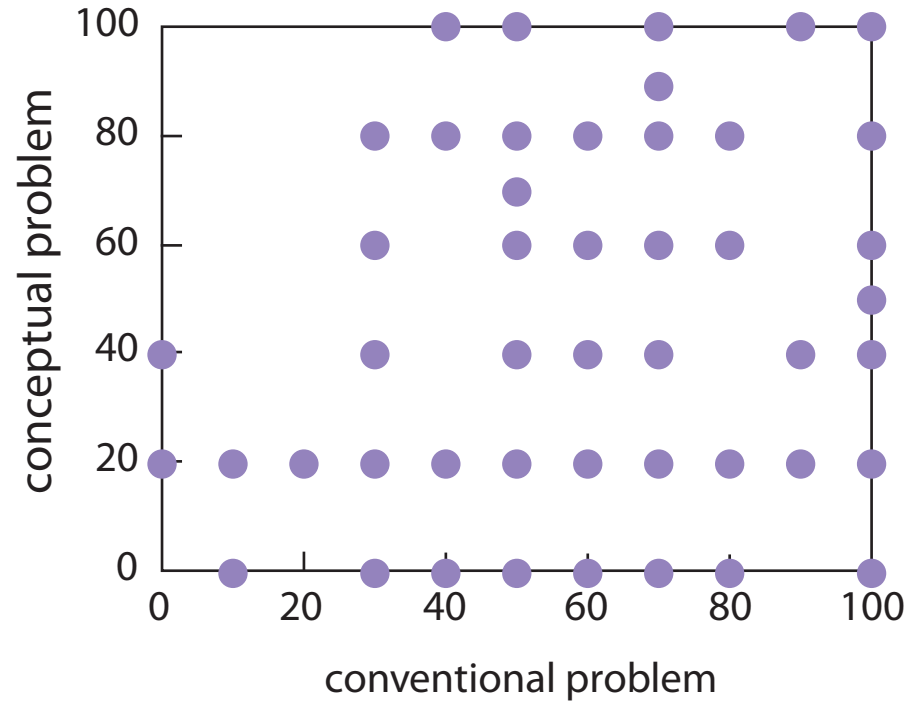
conventional



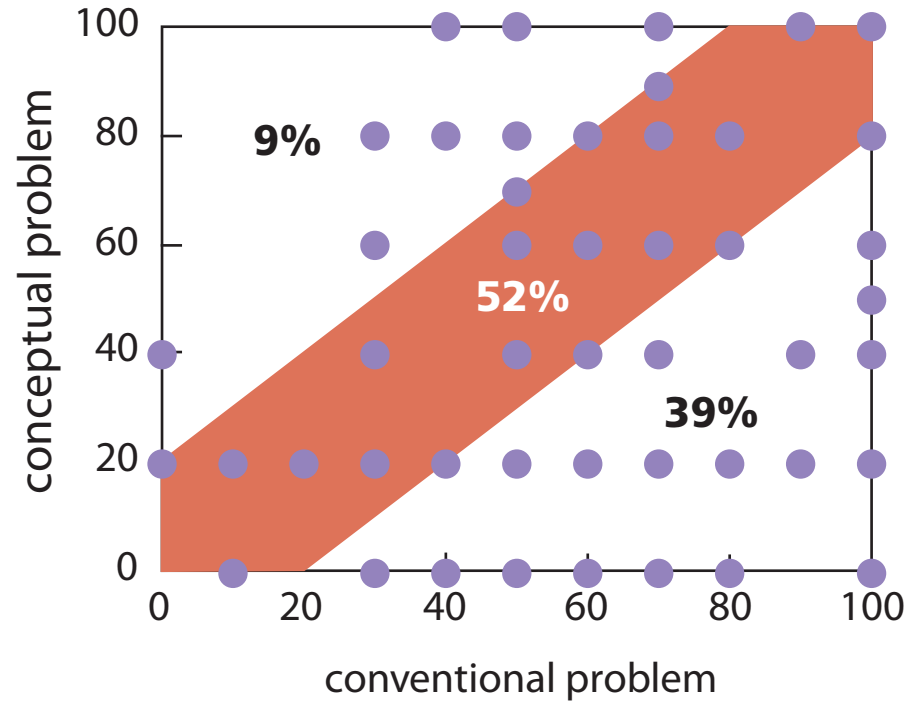
conceptual



Education



Education





The image shows a large lecture hall from the perspective of the back of the room. Students are seated at long desks, facing a stage. A lecturer is standing at a podium on the stage, facing the audience. A large screen is visible on the stage, displaying a presentation. The text "So what should we do?" is overlaid on the image.

So what should we do?

Peer Instruction

Give students more responsibility for gathering information...

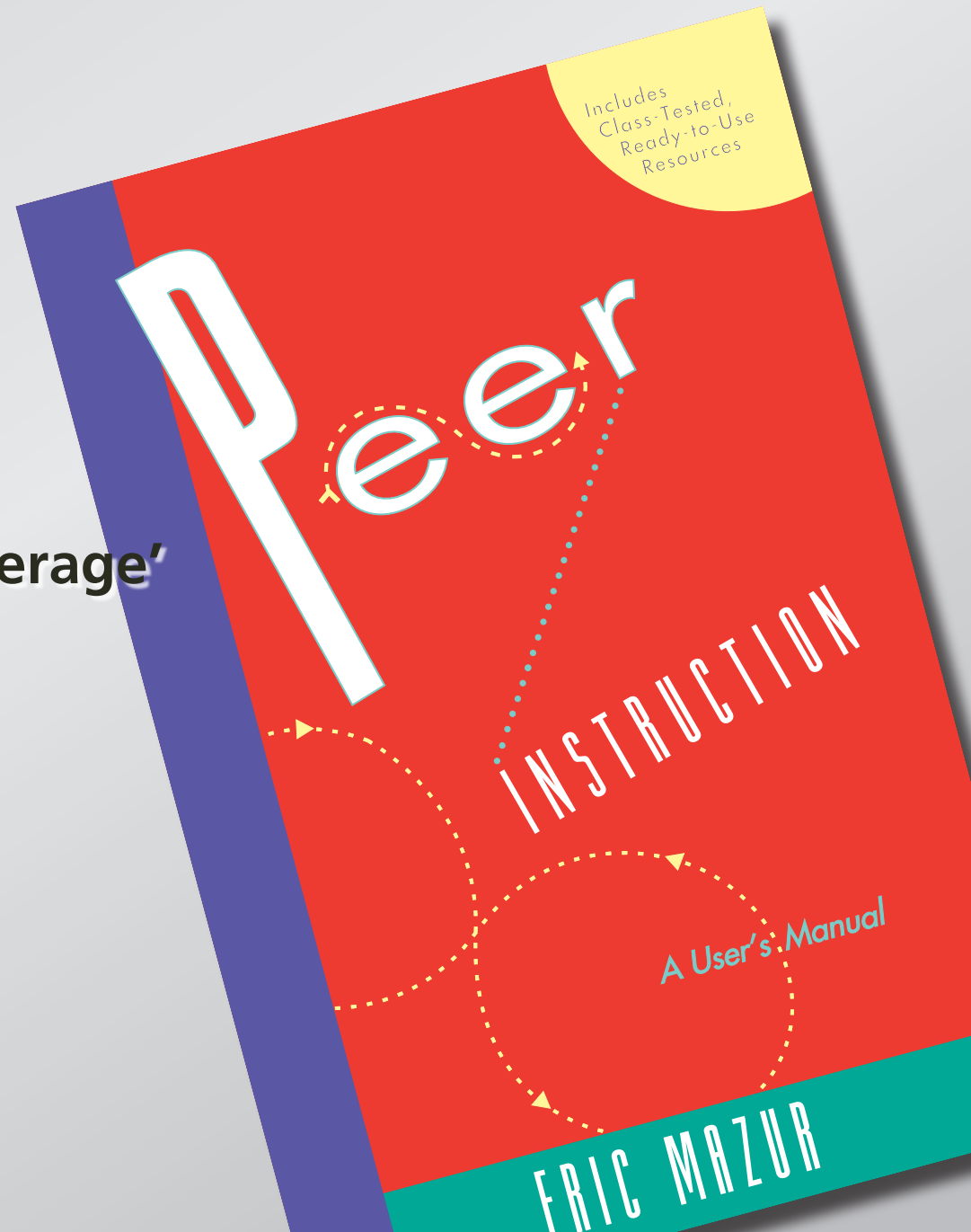
Peer Instruction

**Give students more responsibility for gathering information...
so we can better help them assimilate it.**

Peer Instruction

Main features:

- pre-class reading
- in-class: depth, not 'coverage'
- ConcepTests



Peer Instruction

ConcepTest:

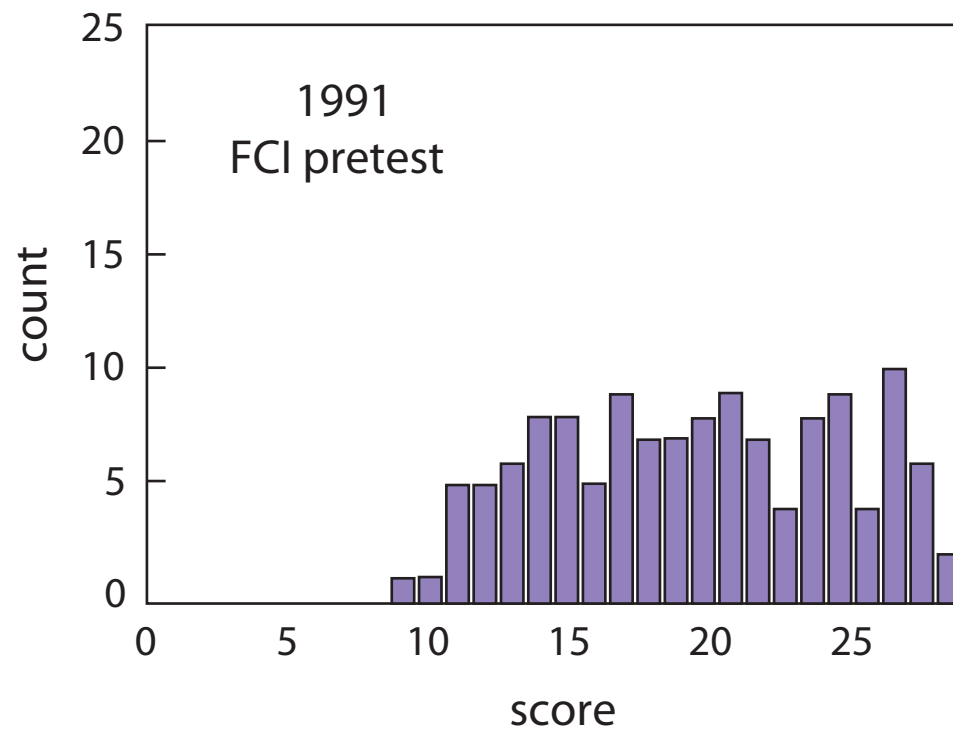
- 1. Question**
- 2. Thinking**
- 3. Individual answer**
- 4. Peer discussion**
- 5. Revised/Group answer**
- 6. Explanation**

Results

is it any good?

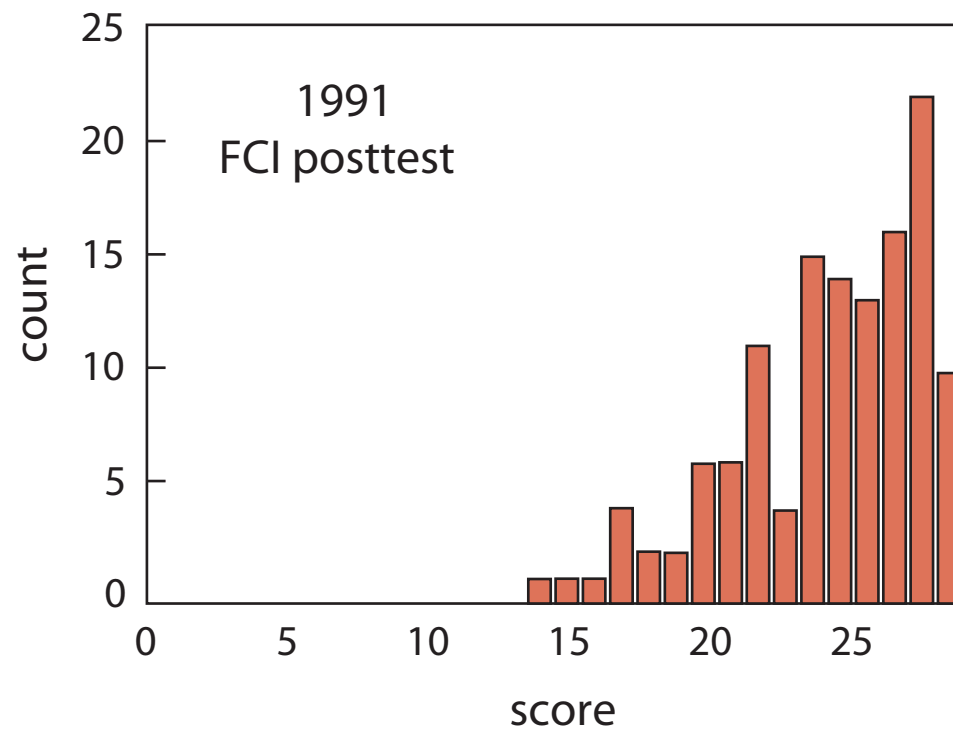
Results

first year of implementing PI



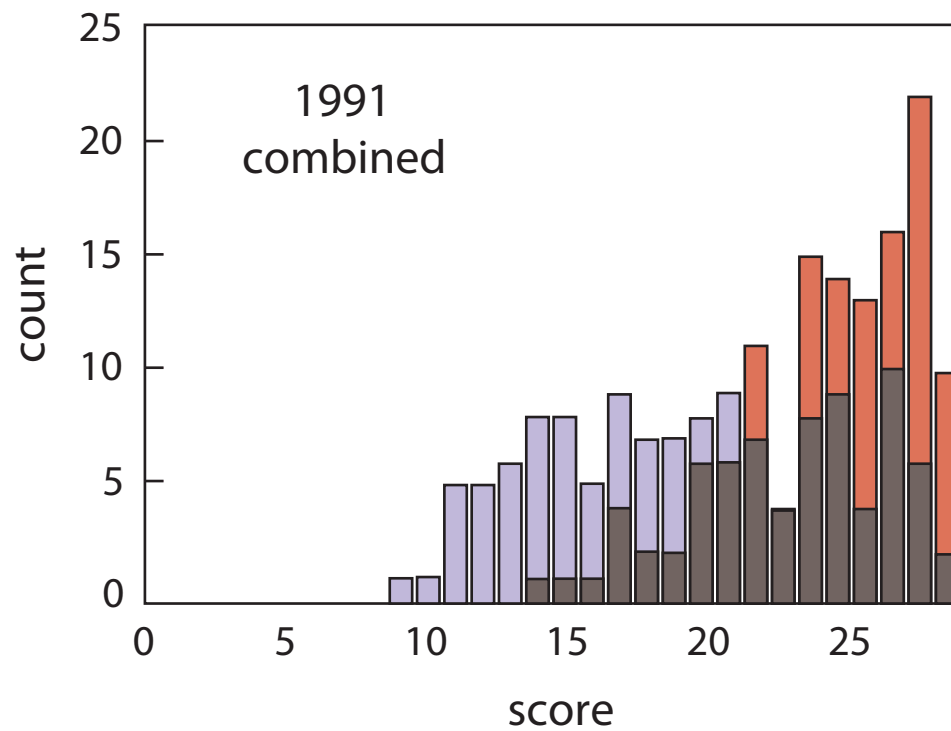
Results

first year of implementing PI

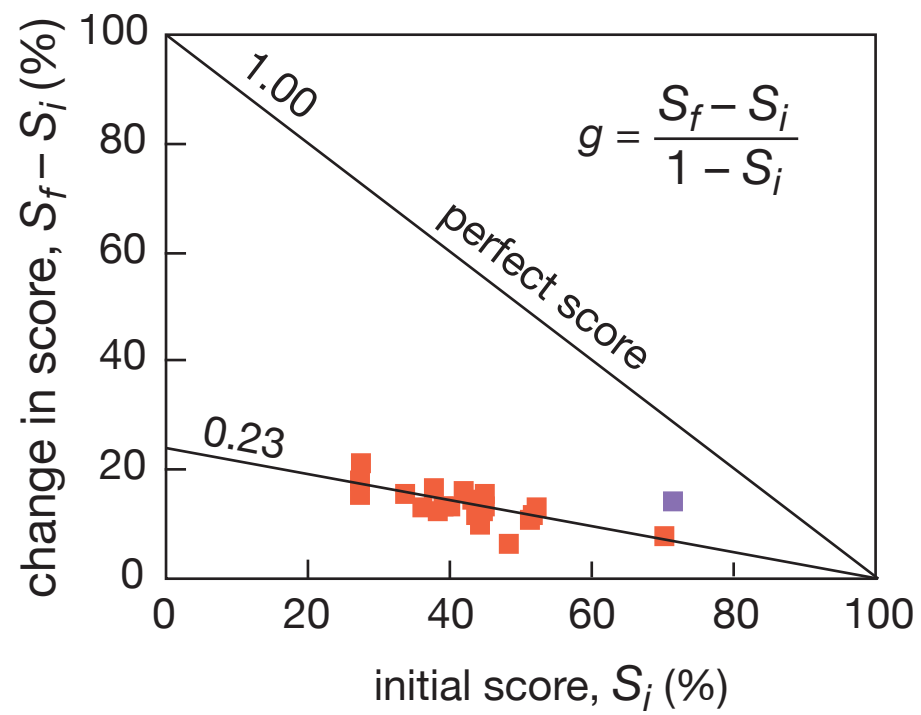


Results

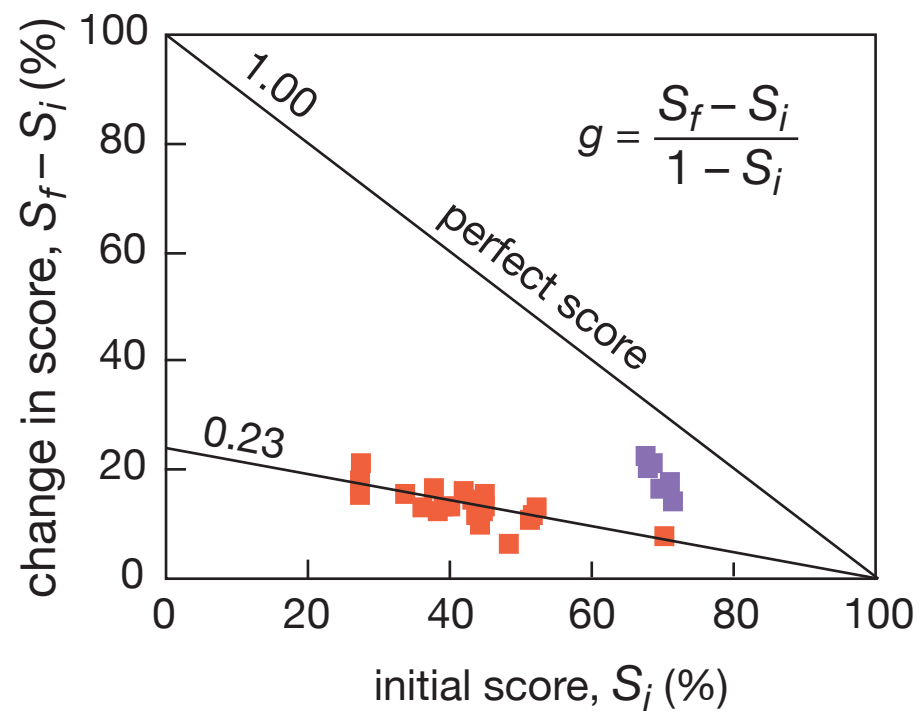
first year of implementing PI



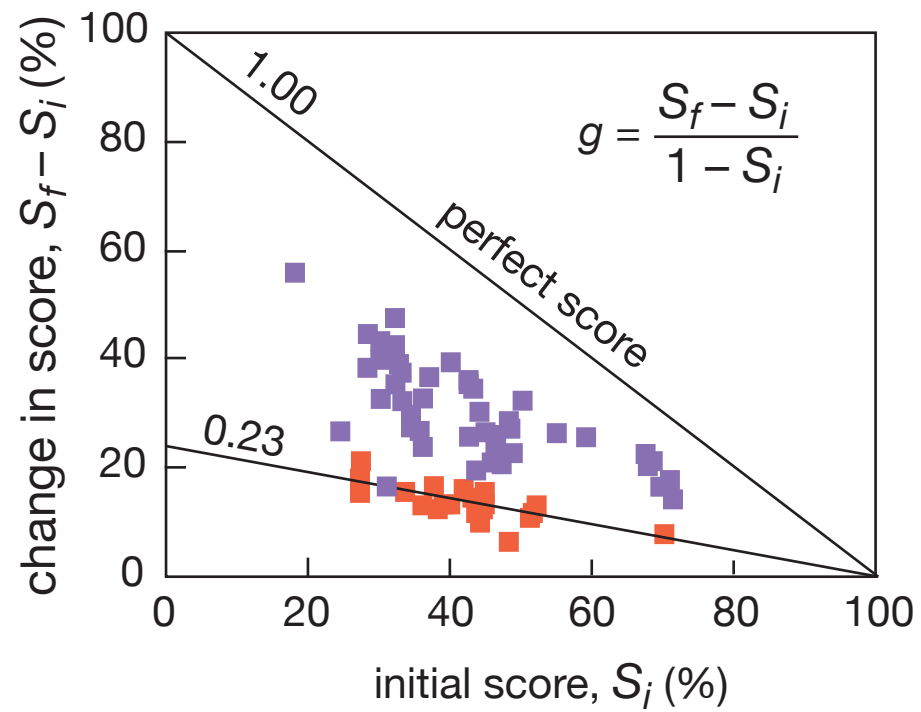
Results



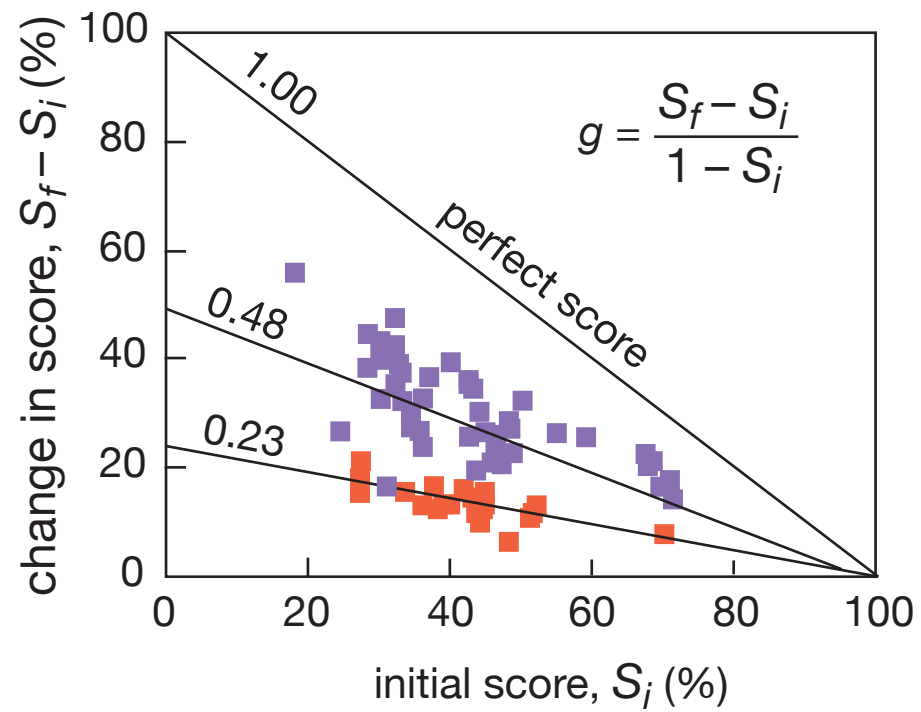
Results



Results



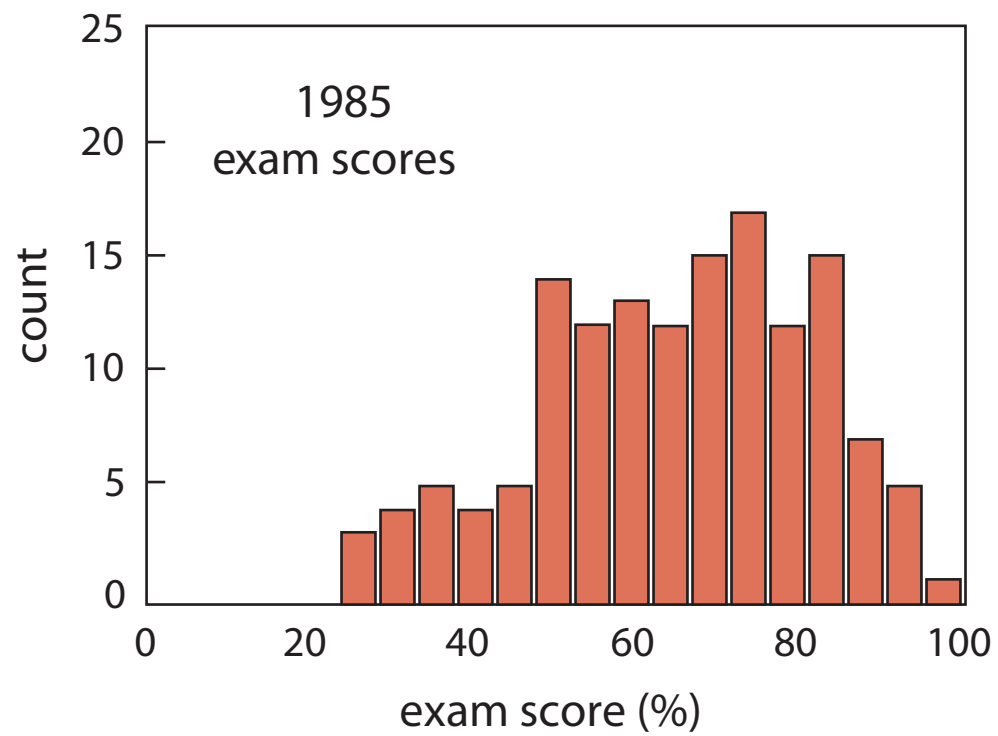
Results



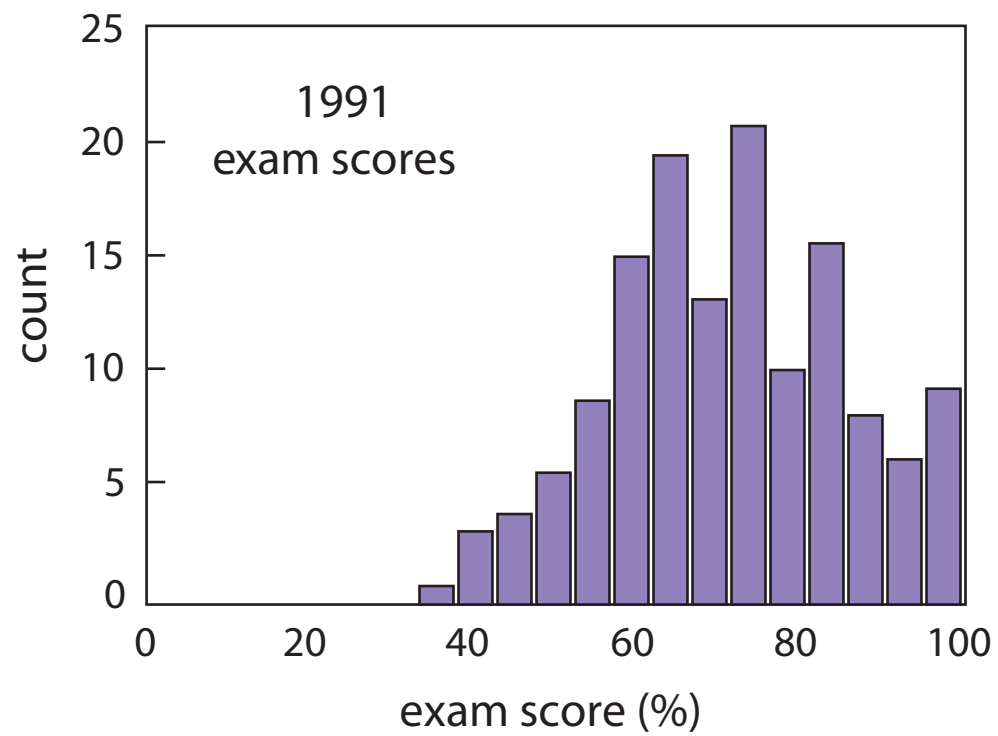
Results

what about problem solving?

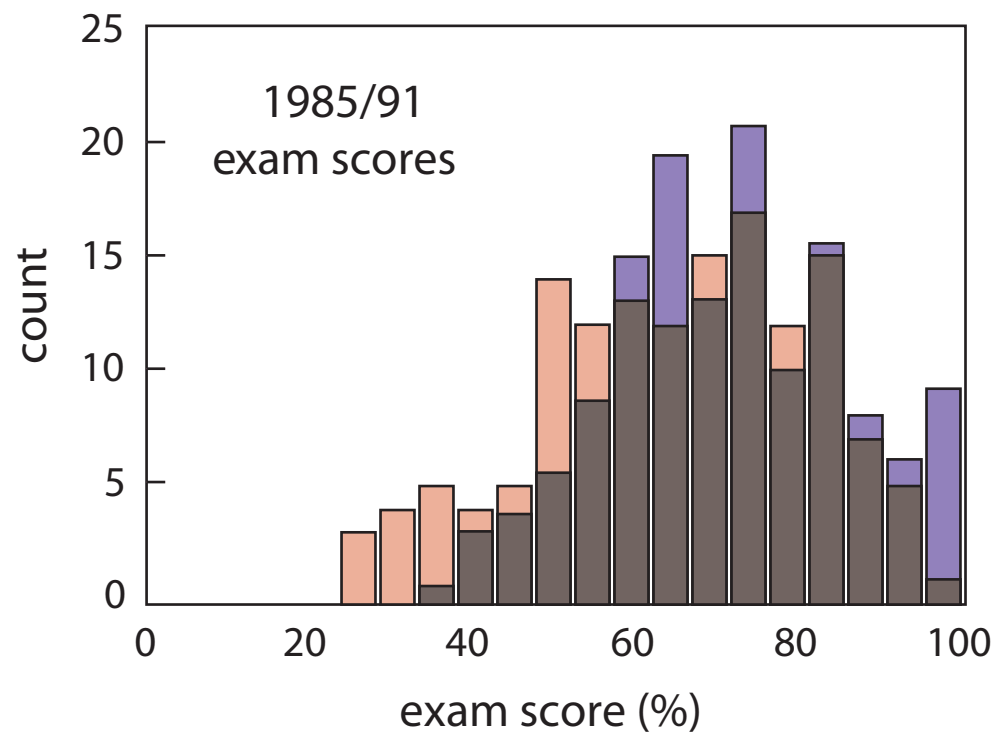
Results



Results



Results



Summary

**So better understanding leads to better
problem solving!**

Summary

So better understanding leads to better problem solving!

(but “good” problem solving doesn’t always indicate understanding!)

Funding:

National Science Foundation

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eric_mazor

Summary

Traditional indicators of success misleading

Summary

Traditional indicators of success misleading

Education is no longer about information

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Google Search

I'm Feeling Lucky

Google™



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Google Search

I'm Feeling Lucky

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Peer Instruction: a hands-on workshop



Physics and Astronomy New Faculty Workshop
Greenbelt, MD 26 June 2010

Get your clickers ready!

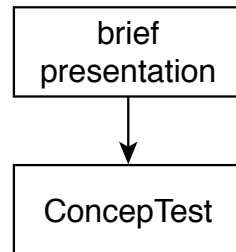


- no ON/OFF button
- only last “click” counts
- display shows recorded answer

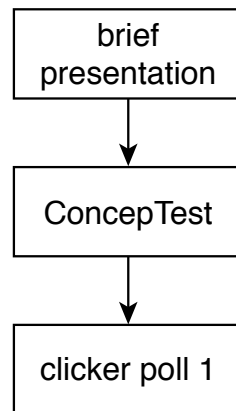
Peer Instruction: a primer

brief
presentation

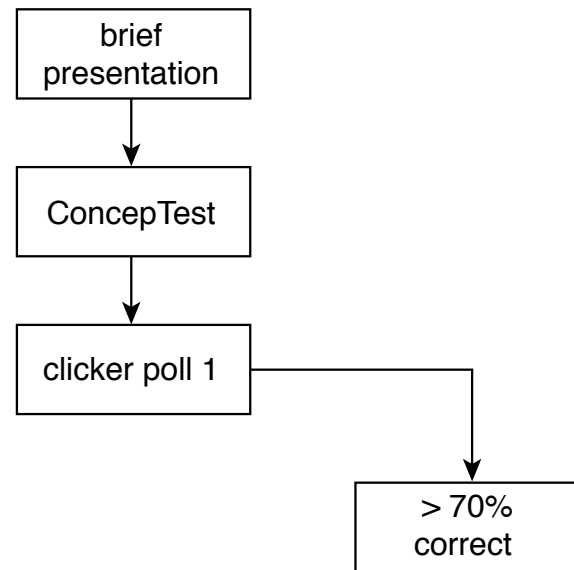
Peer Instruction: a primer



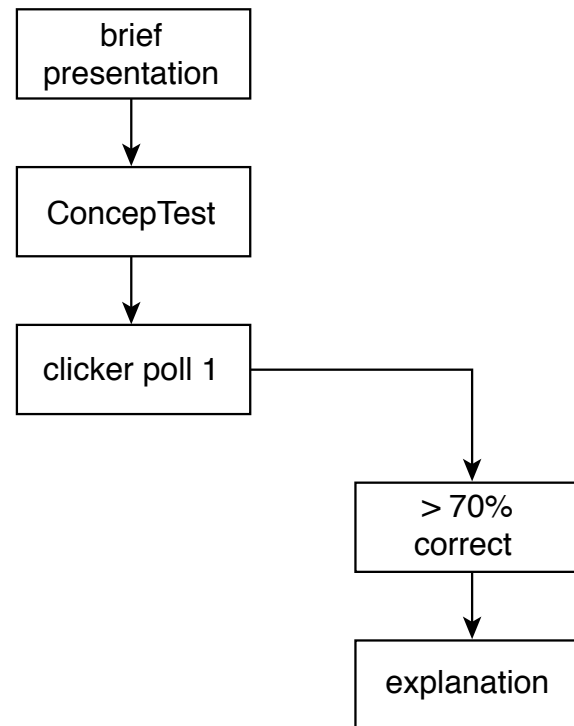
Peer Instruction: a primer



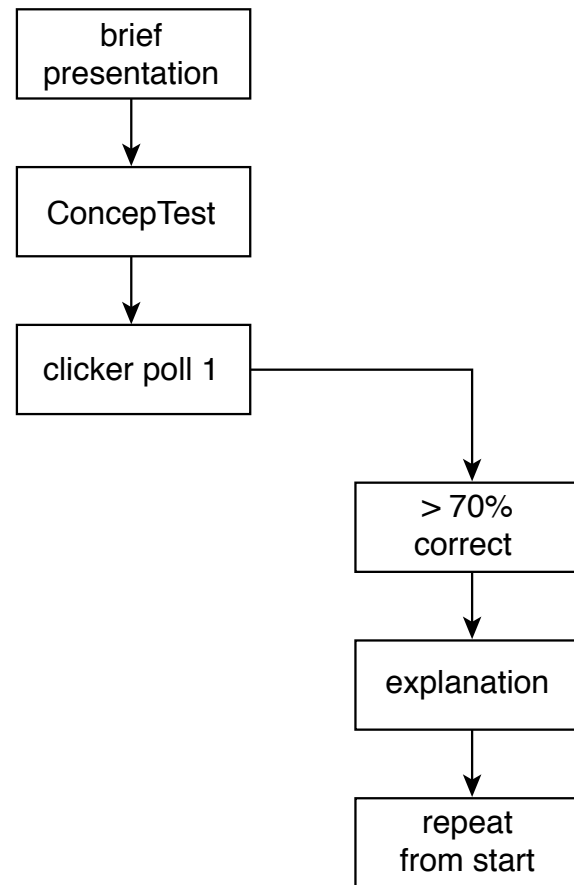
Peer Instruction: a primer



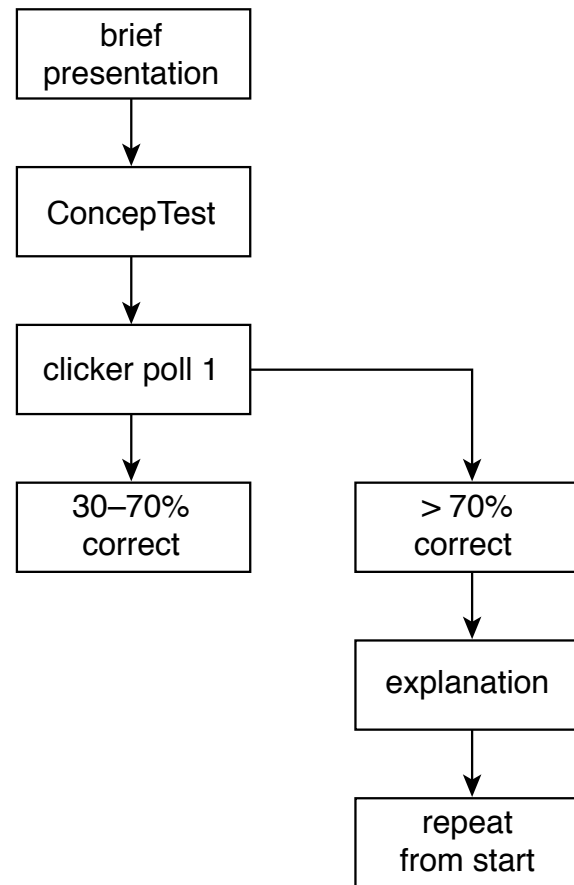
Peer Instruction: a primer



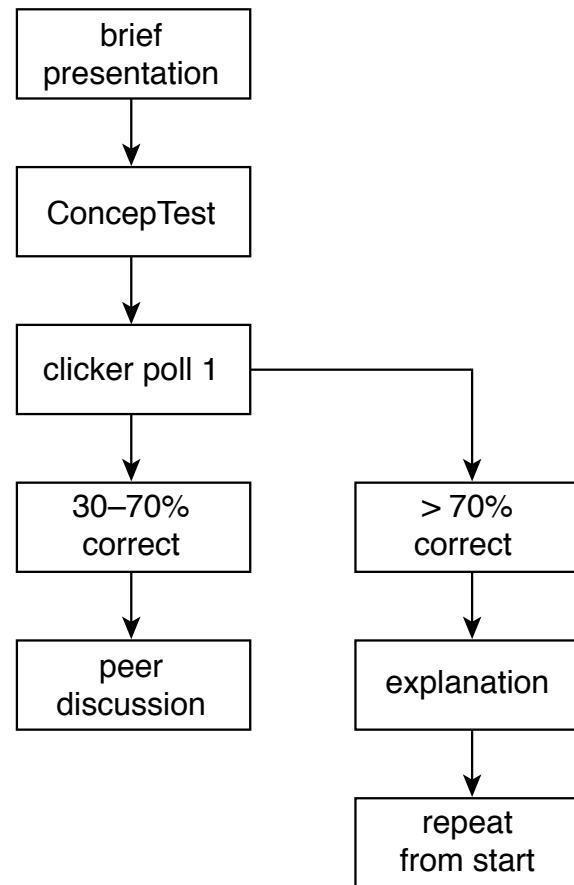
Peer Instruction: a primer



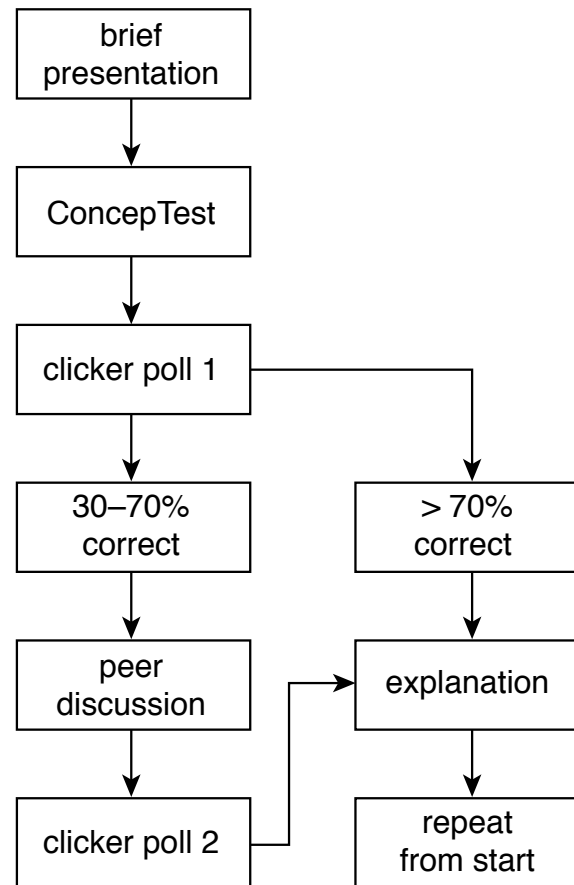
Peer Instruction: a primer



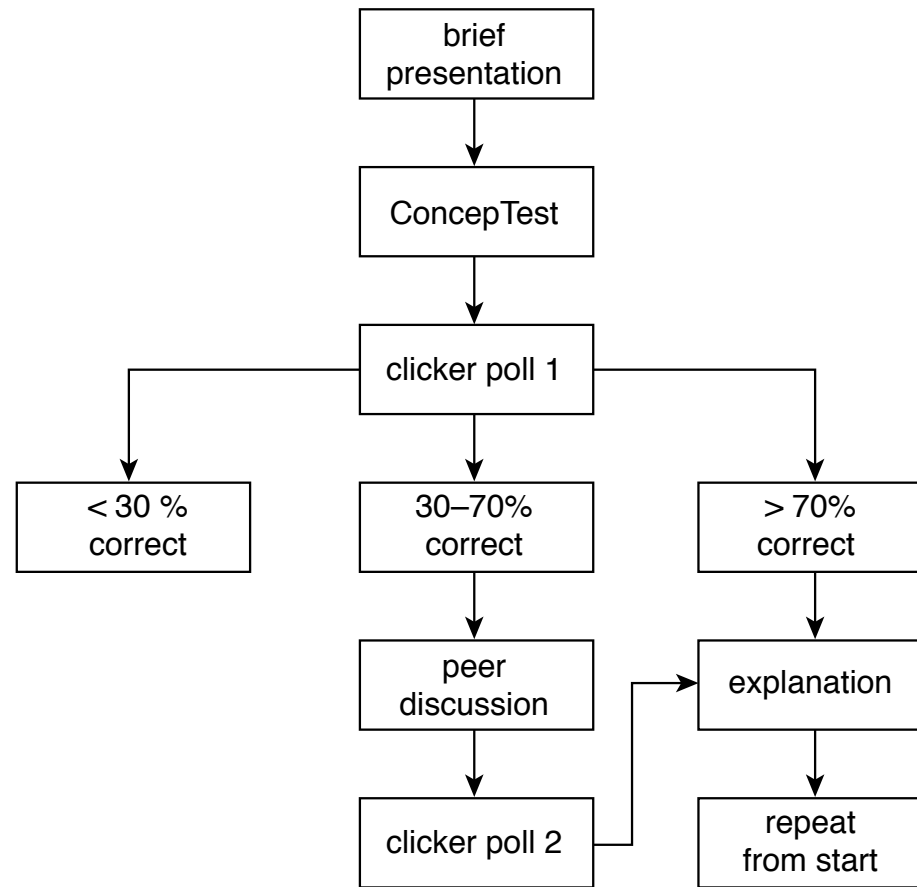
Peer Instruction: a primer



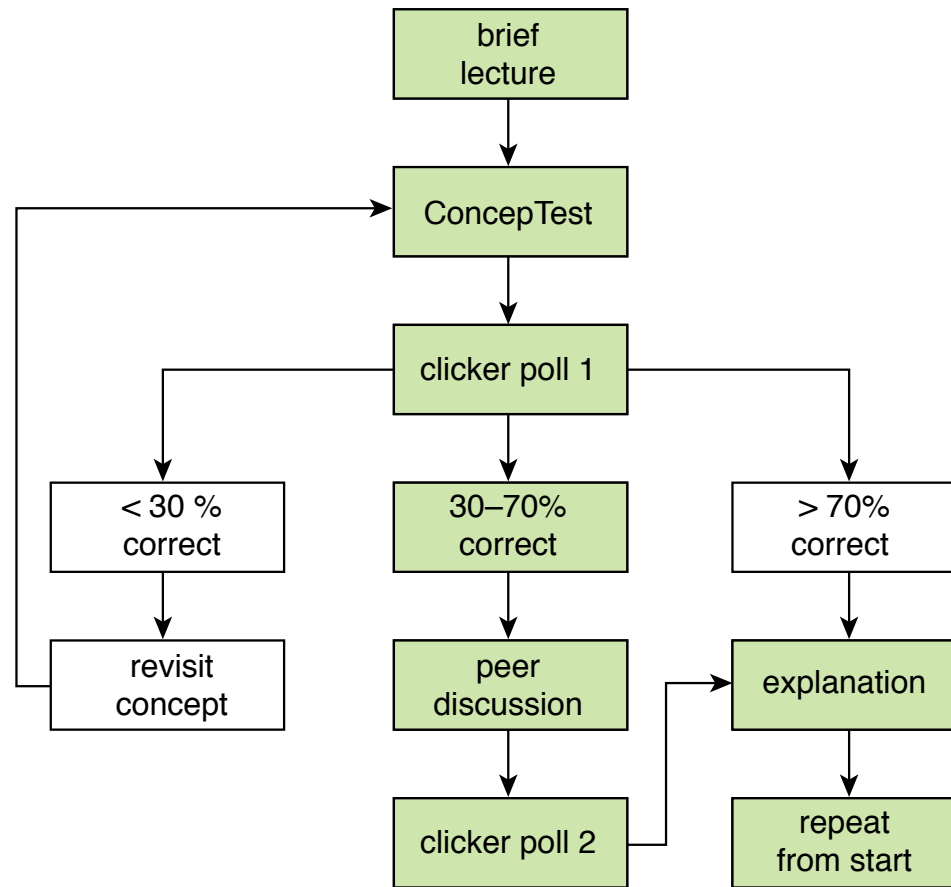
Peer Instruction: a primer



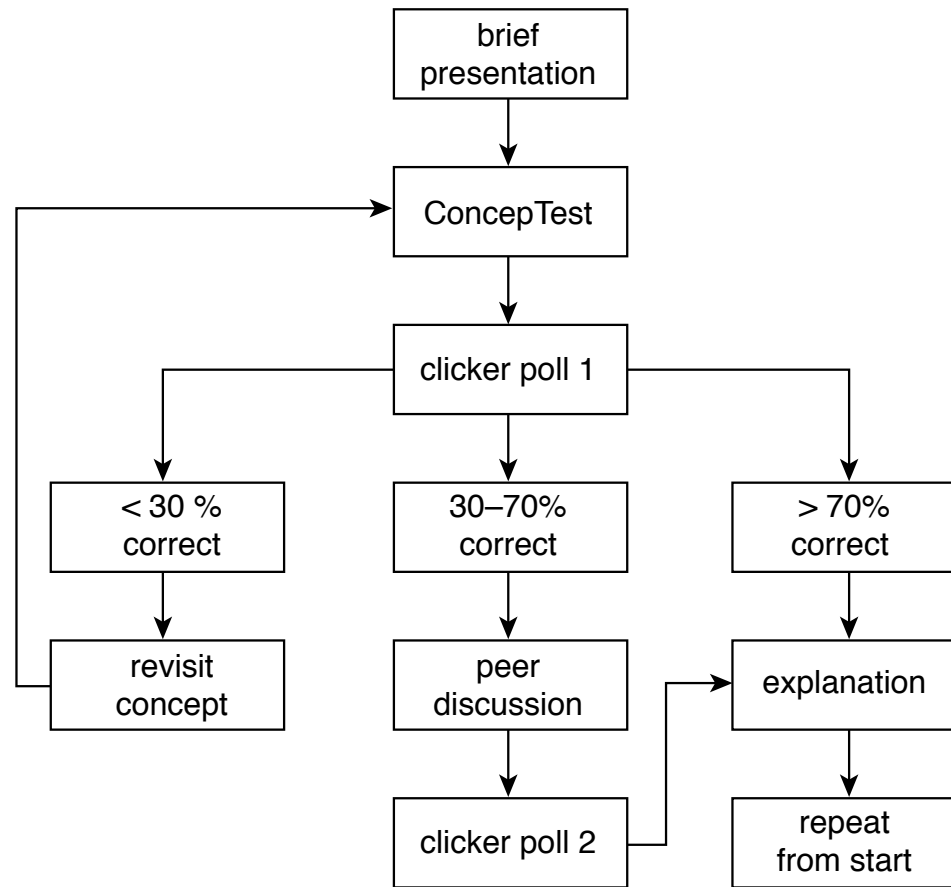
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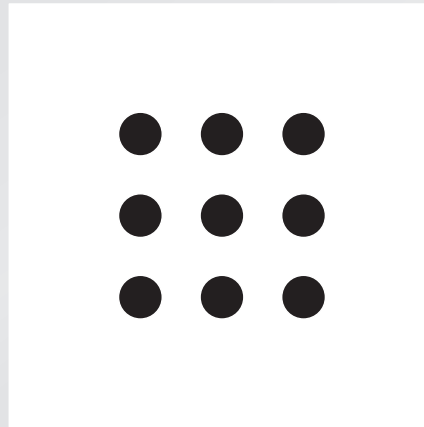


Peer Instruction: a primer



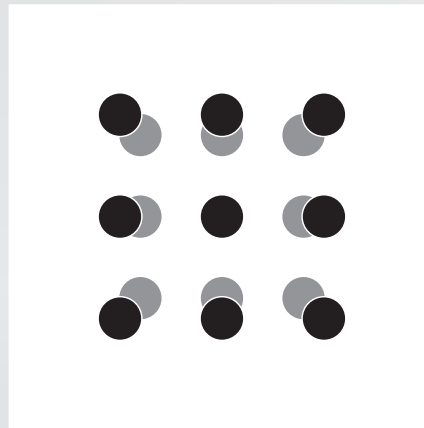
Let's try it!

When metals heat up, they expand because all atoms get farther away from each other.



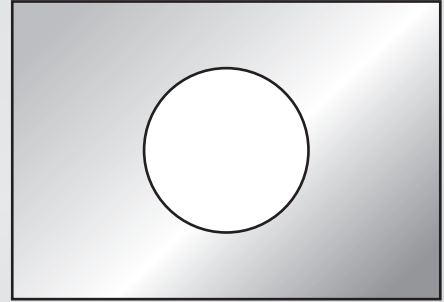
Let's try it!

When metals heat up, they expand because all atoms get farther away from each other.



Let's try it!

Consider a rectangular metal plate with a circular hole in it.

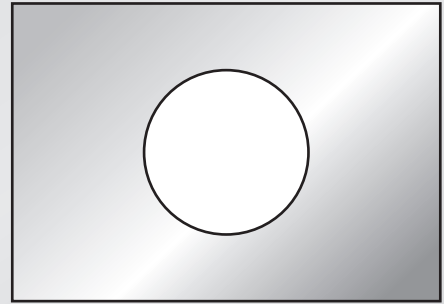


Let's try it!

Consider a rectangular metal plate with a circular hole in it.

When the plate is uniformly heated, the diameter of the hole

1. increases.
2. stays the same.
3. decreases.

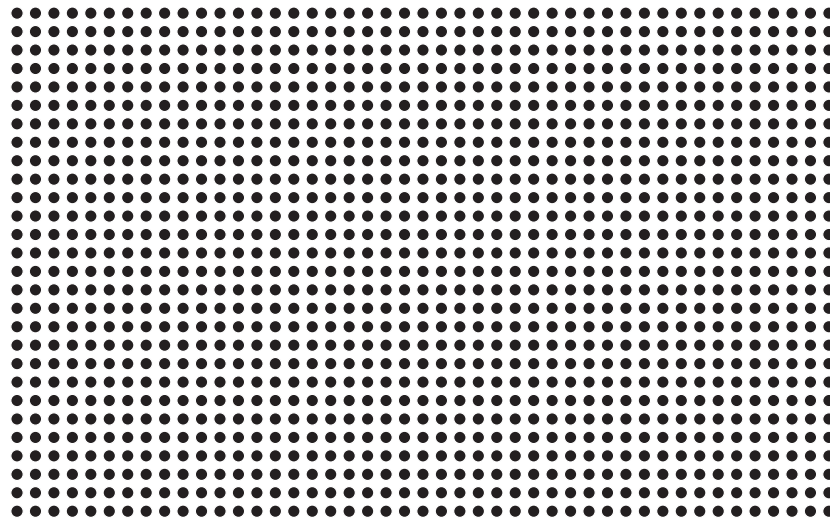


Let's try it!

It's easy to fire up the audience!

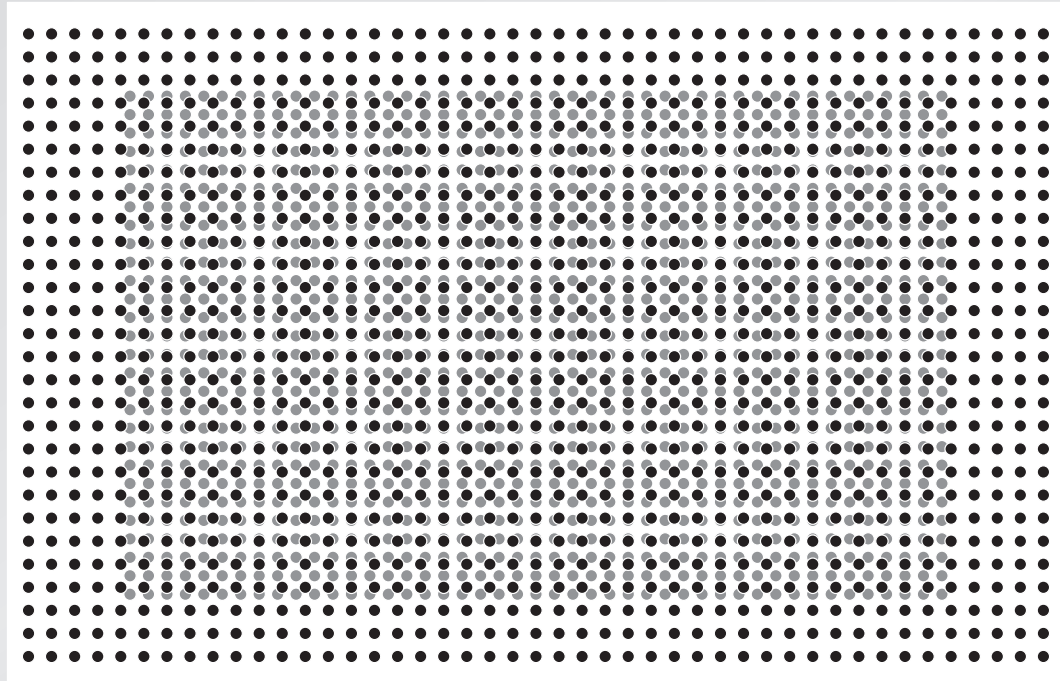
Let's try it!

remember: all atoms must get farther away from each other!



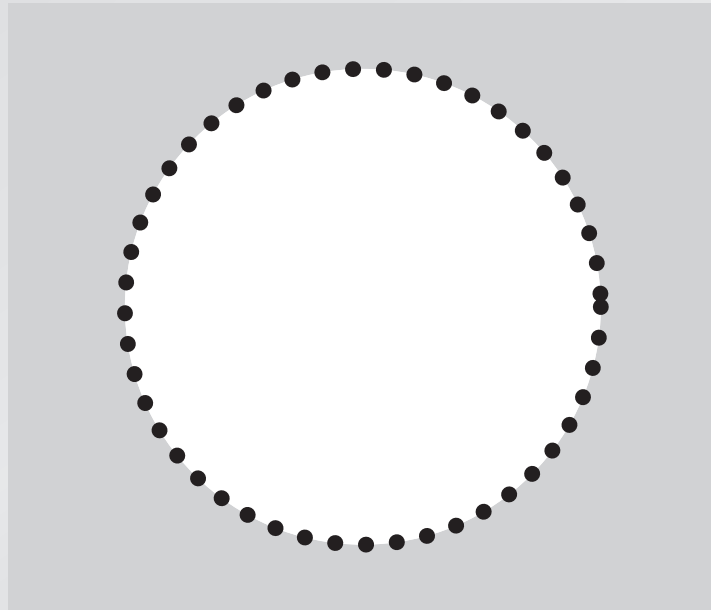
Let's try it!

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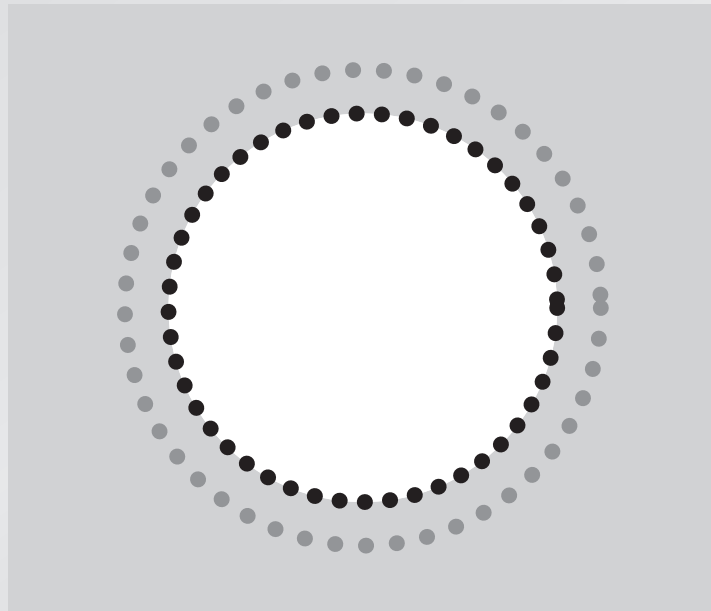
Let's try it!

consider the atoms at the rim of the hole



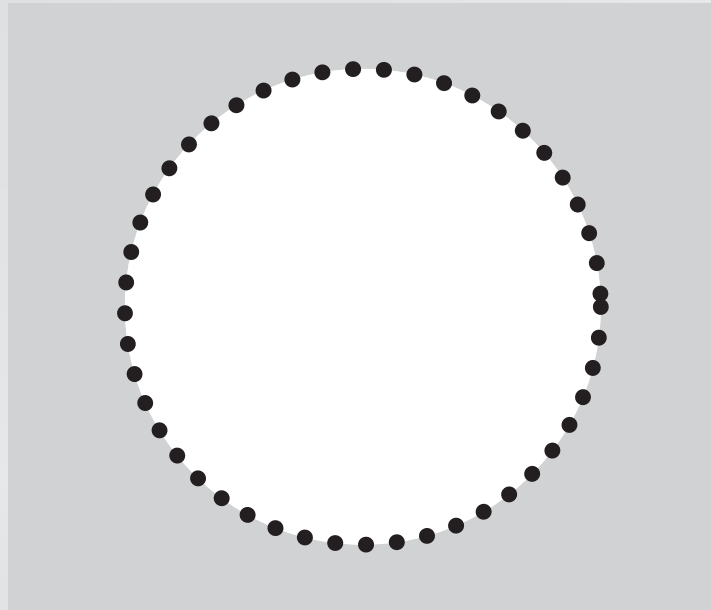
Let's try it!

consider the atoms at the rim of the hole



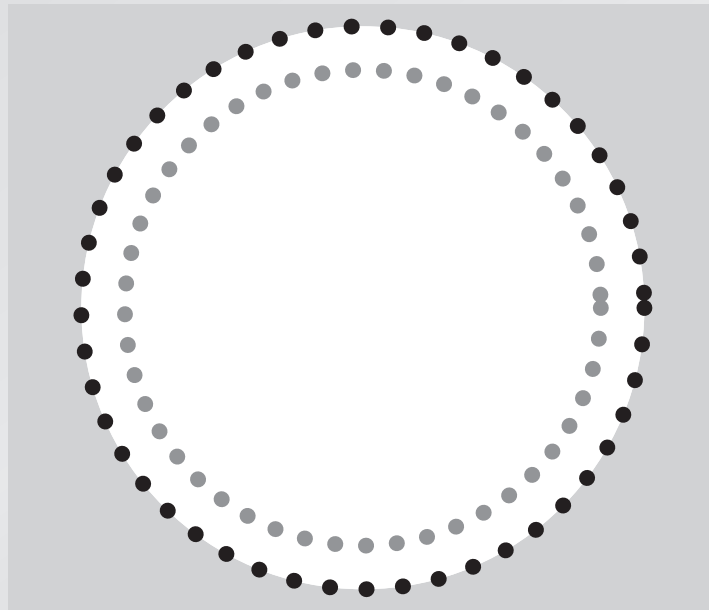
Let's try it!

consider the atoms at the rim of the hole



Let's try it!

consider the atoms at the rim of the hole



Setting the stage

What constitutes a good problem?

Setting the stage

On a Saturday afternoon, you pull into a parking lot with unmeasured spaces near a shopping area. You circle around, but there are no empty spots. You decide to wait at one end of the lot, where you can see (and command) about 20 spaces.

Setting the stage

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How long do you have to wait before someone frees up a space?

Setting the stage

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How long do you have to wait before someone frees up a space?

Requires:

Assumptions

Developing a model

Applying that model

Setting the stage

On a Saturday afternoon, you pull into a parking lot with unmeasured spaces near a shopping area. You circle around, but there are no empty spots. You decide to wait at one end of the lot, where you can see (and command) about 20 spaces. **On average people shop for 2 hours.**

How long do you have to wait before someone frees up a space?

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Applying that model

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Assuming people leave at regularly-spaced intervals, how long do you have to wait before someone frees up a space?

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Assuming people leave at regularly-spaced intervals, how long do you have to wait before someone frees up a space?

Requires:

Applying a (new) model

Setting the stage

On a Saturday afternoon, you pull into a parking lot with unmeted spaces near a shopping area, where people are known to shop, on average, for 2 hours. You circle around, but there are no empty spots. You decide to wait at one end of the lot, where you can see (and command) about 20 spaces.

How long do you have to wait before someone frees up a space?

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How long do you have to wait before someone frees up a space?

$$t_{wait} = \frac{T_{shop}}{N_{spaces}}$$

Setting the stage

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How long do you have to wait before someone frees up a space?

Requires:

Using a calculator

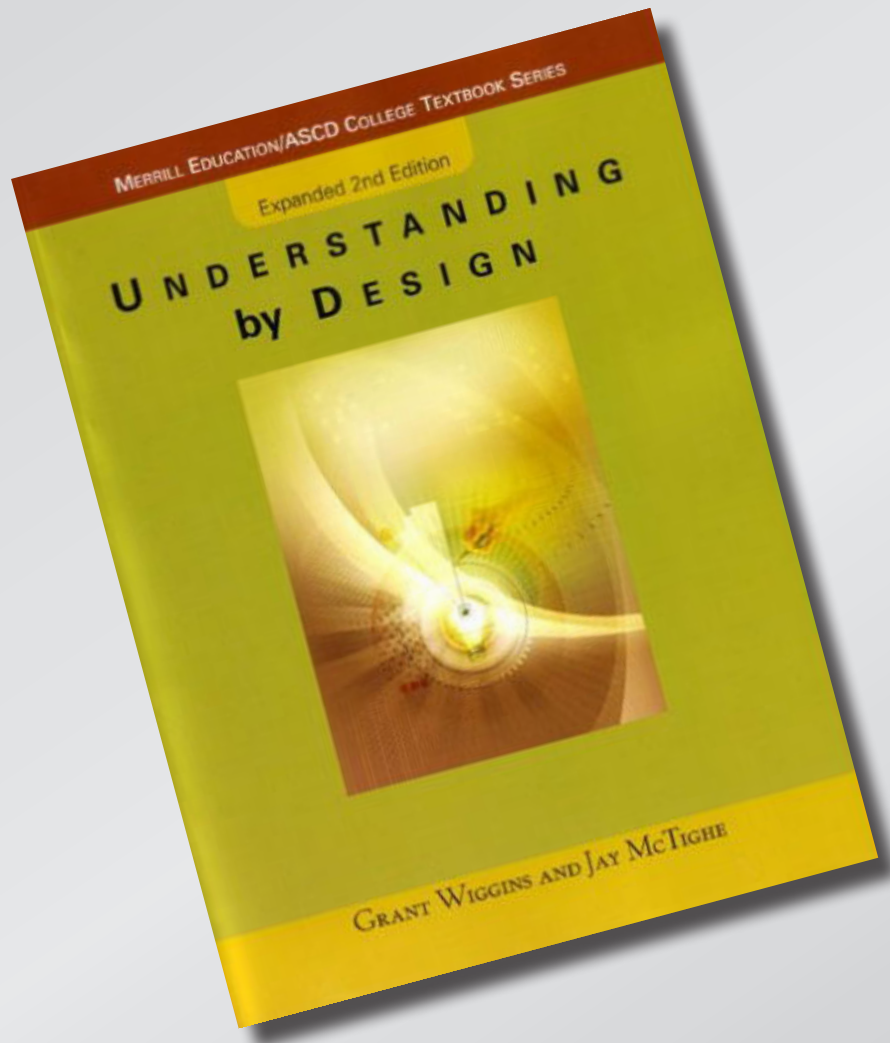
$$t_{wait} = \frac{T_{shop}}{N_{spaces}}$$

Setting the stage

Need to test meaningful skills!

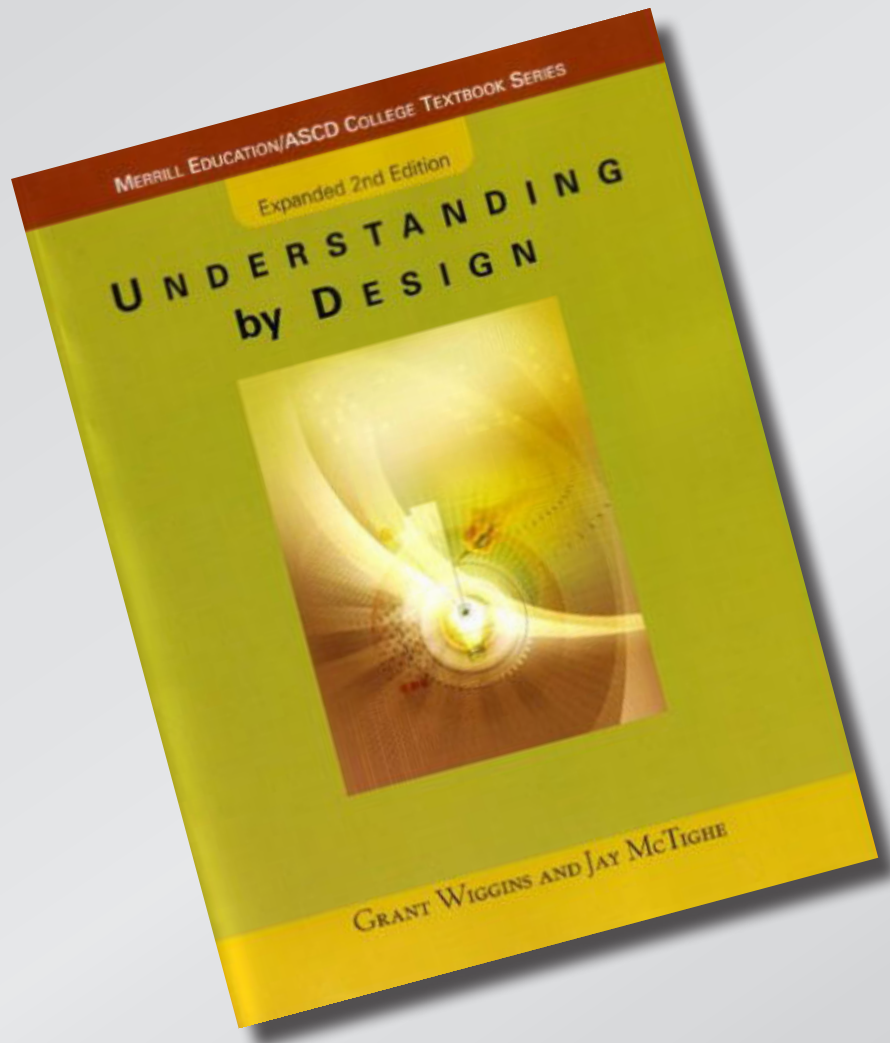
Setting the stage

Setting learning goals



Setting the stage

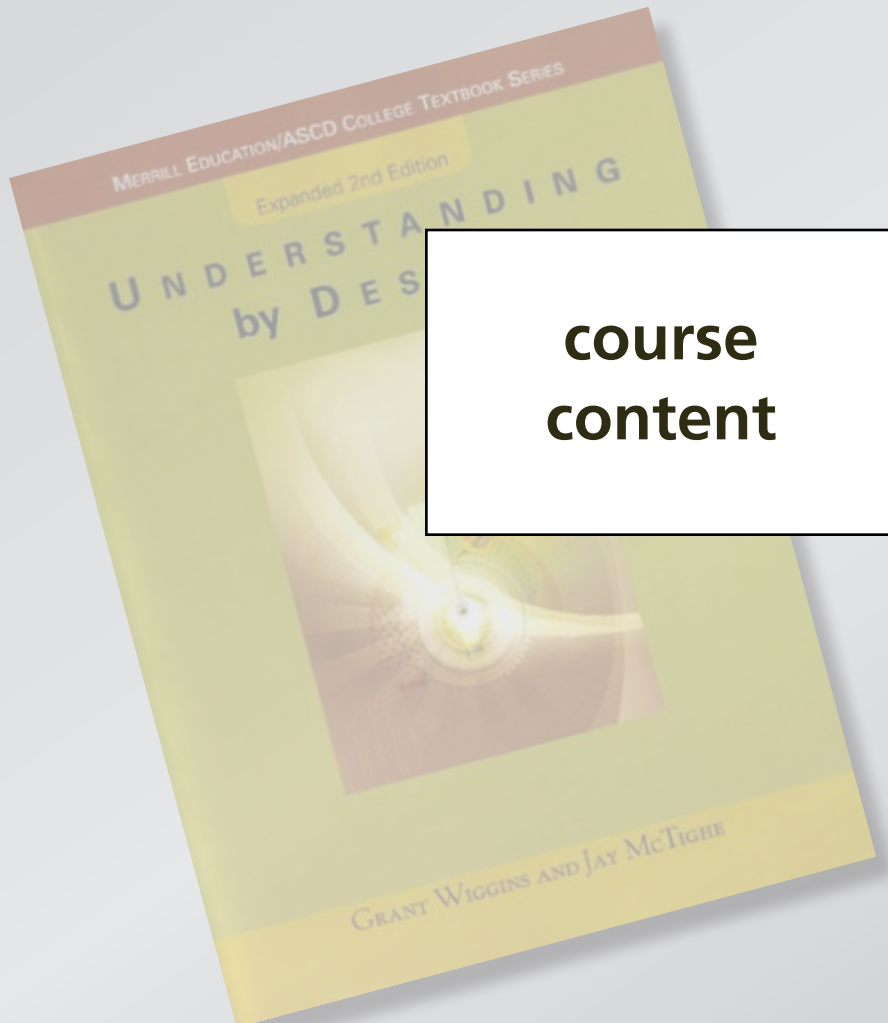
Setting learning goals



- approach, not content
- focus on understanding
- backward design

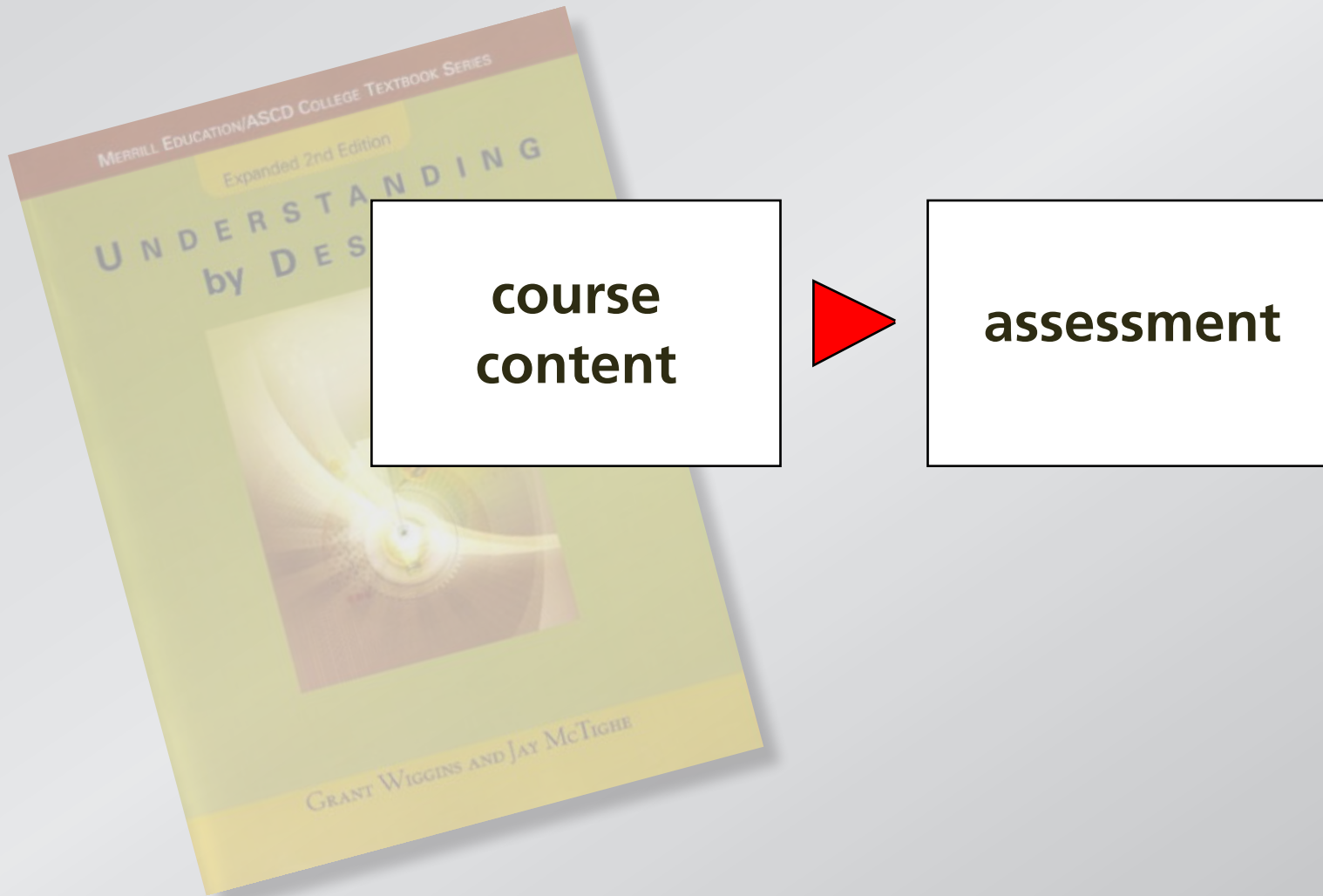
Setting the stage

Traditional approach to course planning



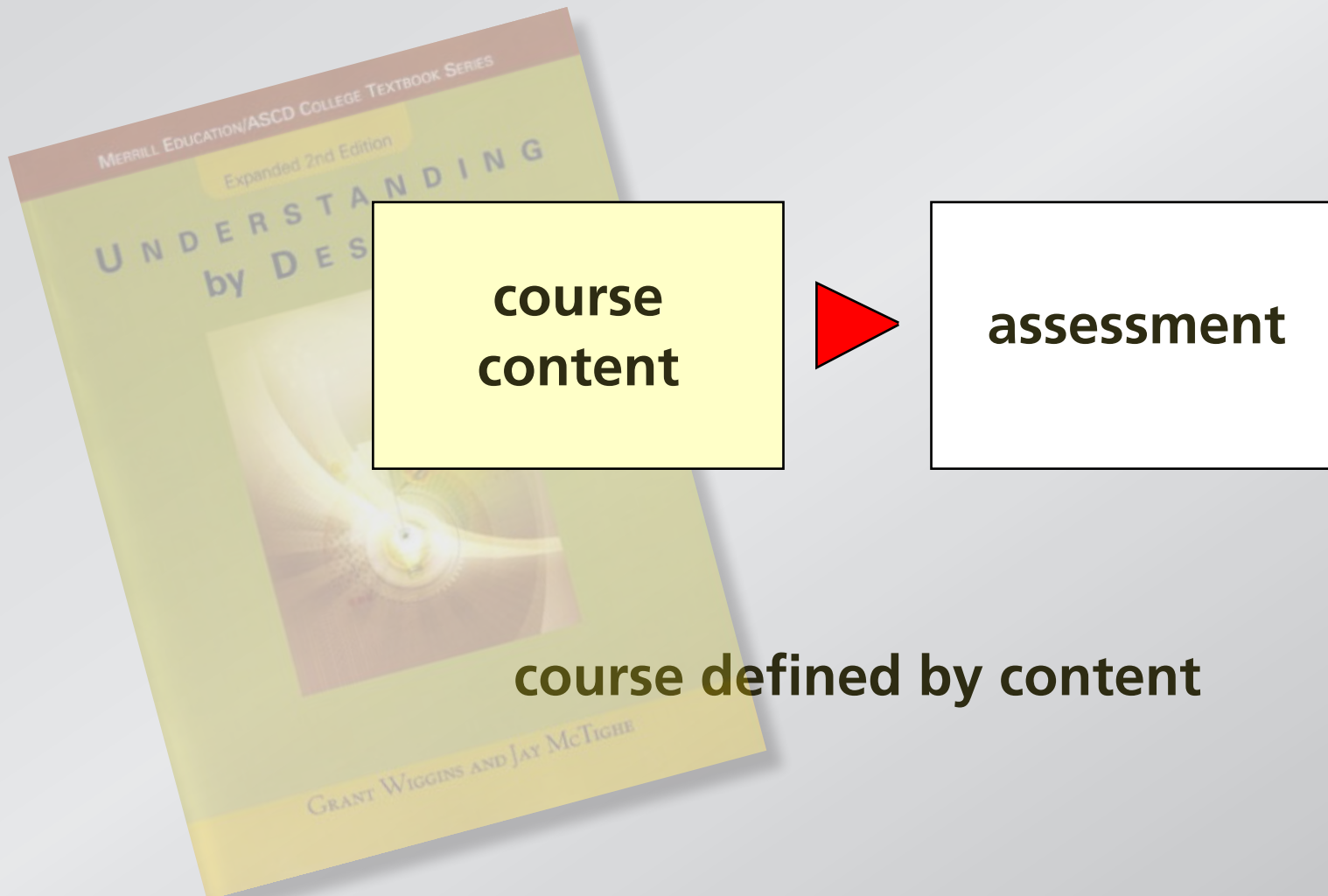
Setting the stage

Traditional approach to course planning



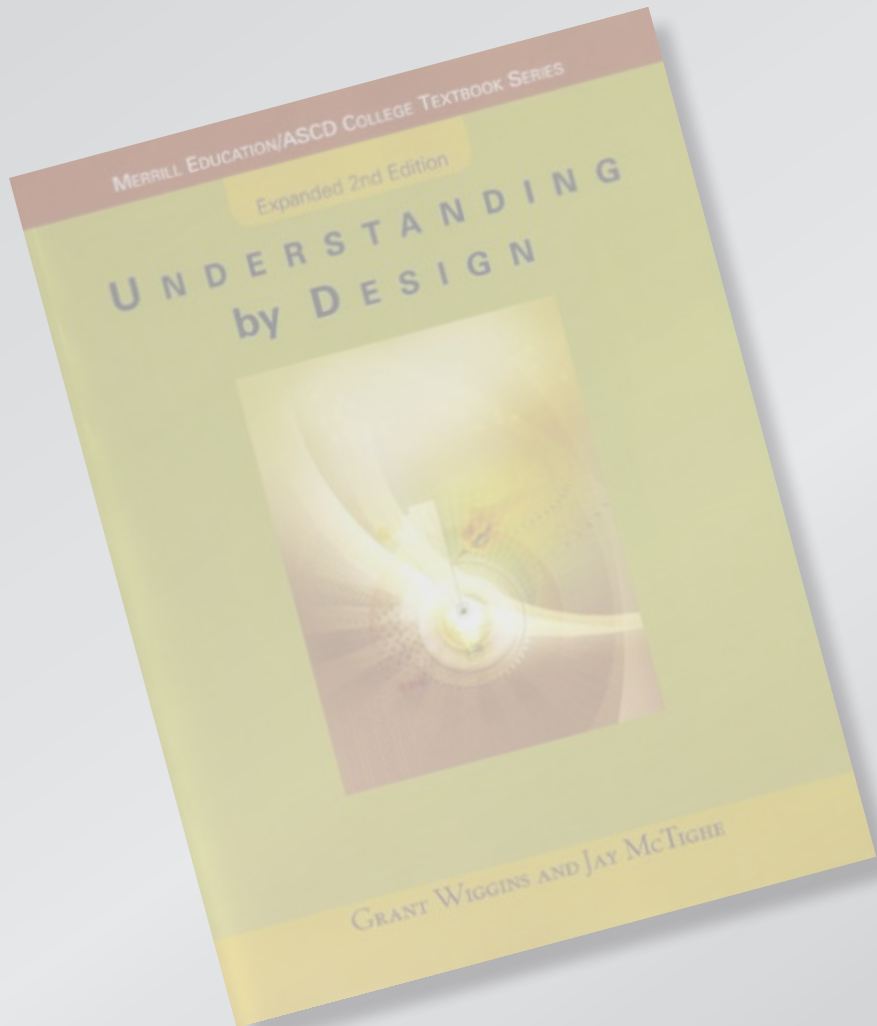
Setting the stage

Traditional approach to course planning



Setting the stage

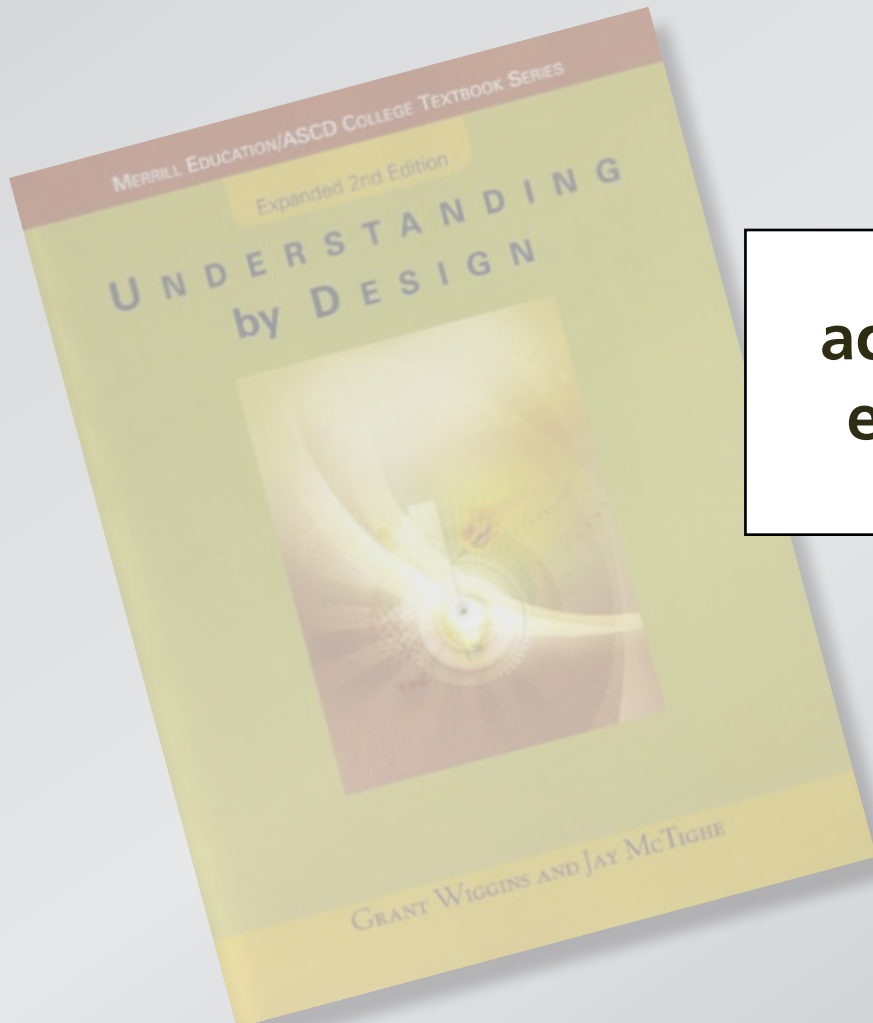
Backward design



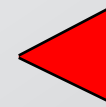
**desired
outcomes**

Setting the stage

Backward design



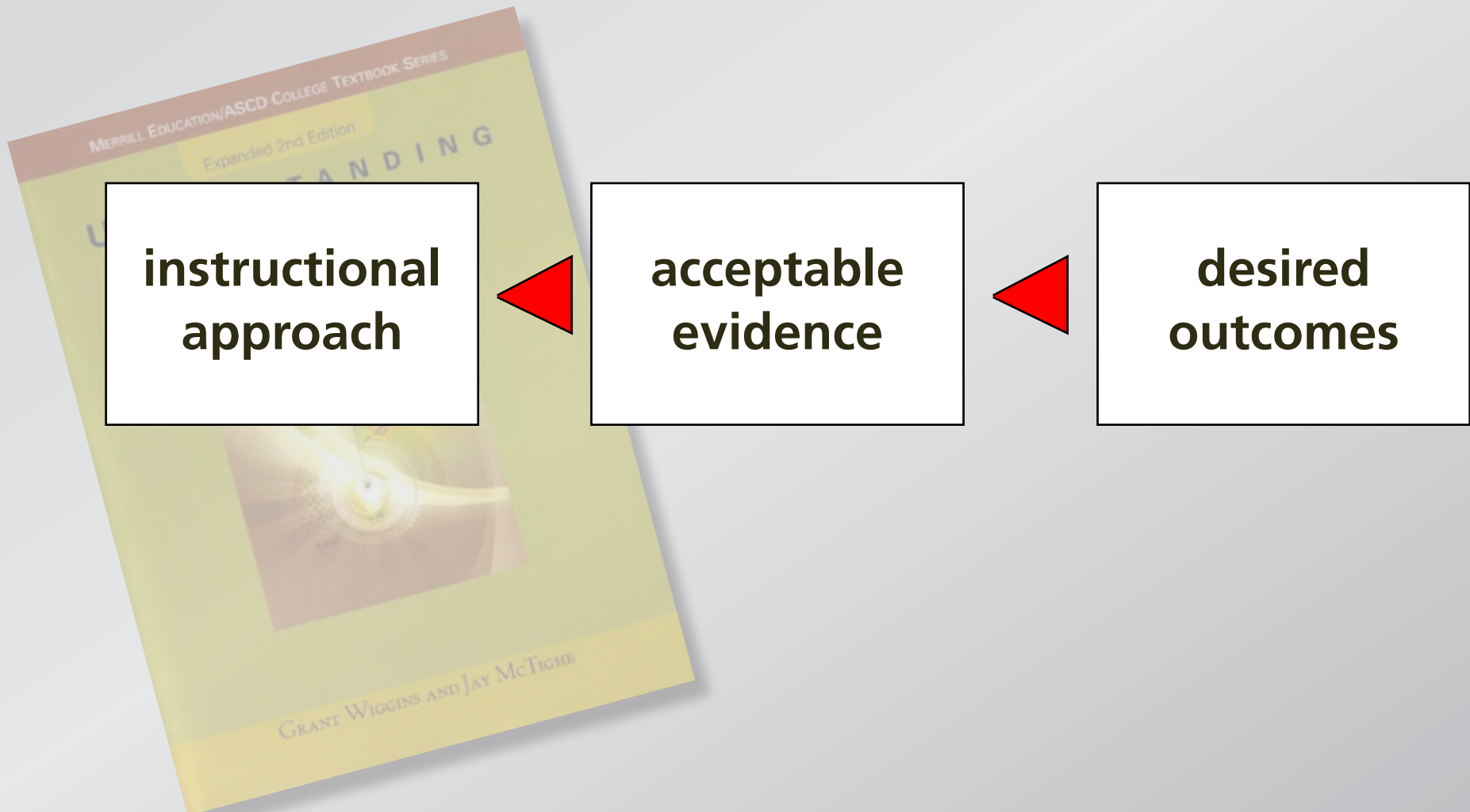
**acceptable
evidence**



**desired
outcomes**

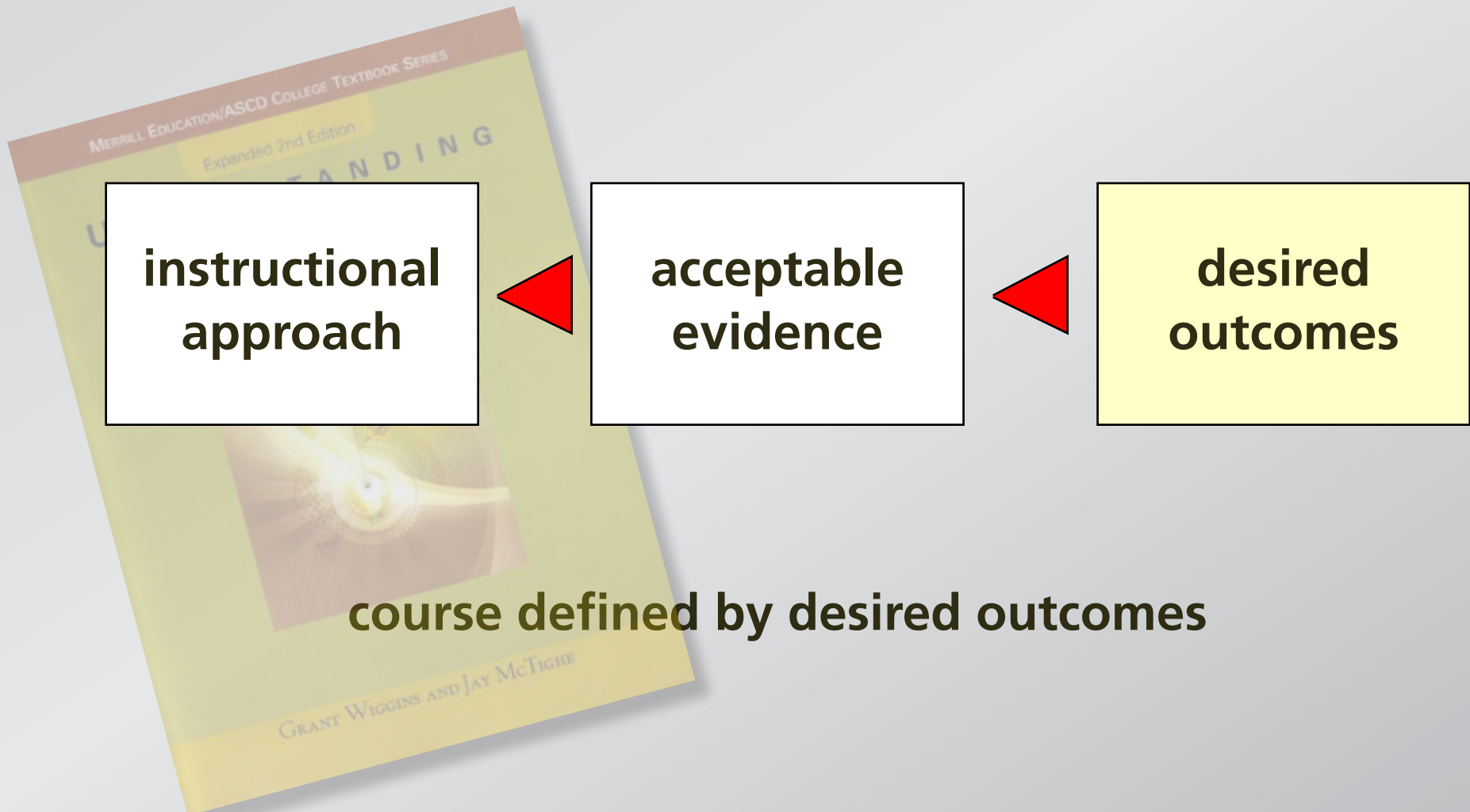
Setting the stage

Backward design



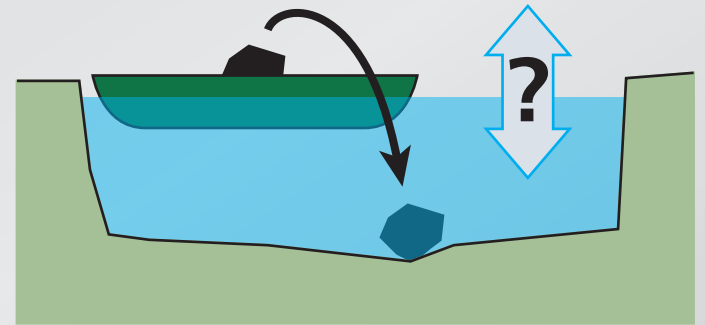
Setting the stage

Backward design



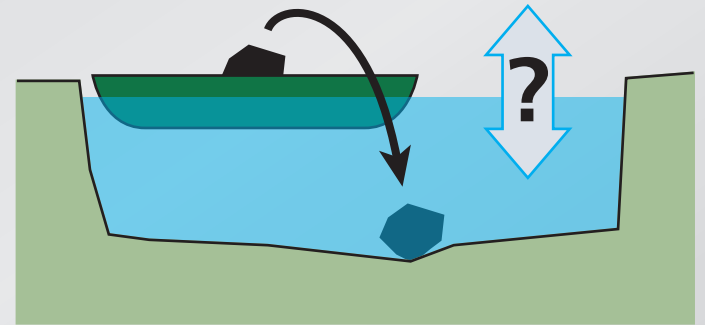
Let's try it!

A boat carrying a large boulder is floating on a small pond. The boulder is thrown overboard and sinks to the bottom of the pond.



Let's try it!

A boat carrying a large boulder is floating on a small pond. The boulder is thrown overboard and sinks to the bottom of the pond.



After the boulder sinks to the bottom of the pond, the level of the water in the pond is

1. higher than
2. the same as
3. lower than

it was when the boulder was in the boat.

Let's try it!

We all make mistakes!

Research Funding:

Pew Charitable Trust, Pearson/Prentice Hall, Davis Foundation, Engineering Information Foundation, Derek Bok Center for Teaching and Learning, National Science Foundation

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