

Peer Instruction



CDIO Region-of-the-Americas Meeting
Duke University
Durham, NC, 9 November 2009



My message

shift focus from "teaching" to helping students learn



Outline

- Education



Outline

- Education
- Peer Instruction



Outline

- Education
- Peer Instruction
- Results

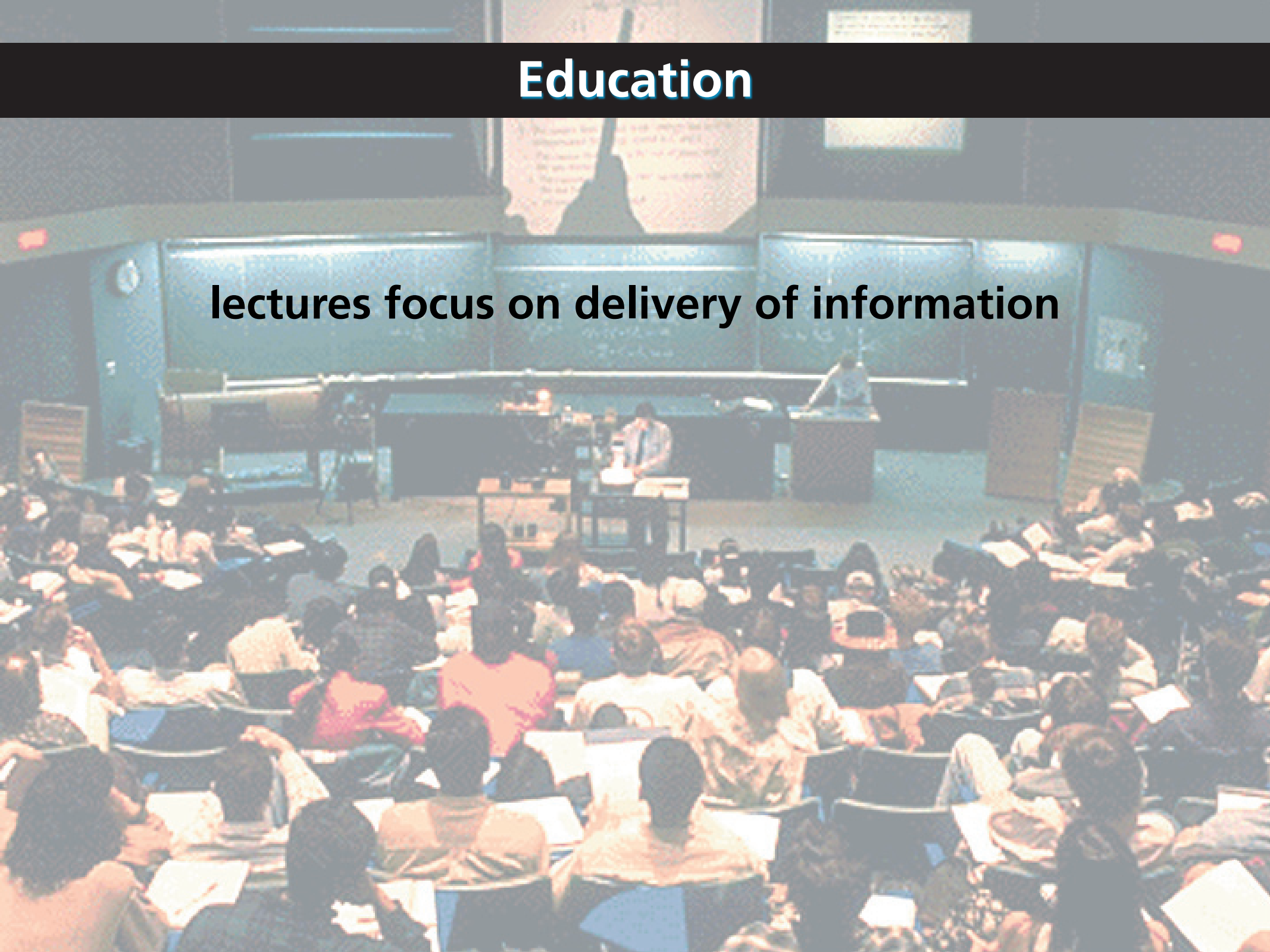


Education



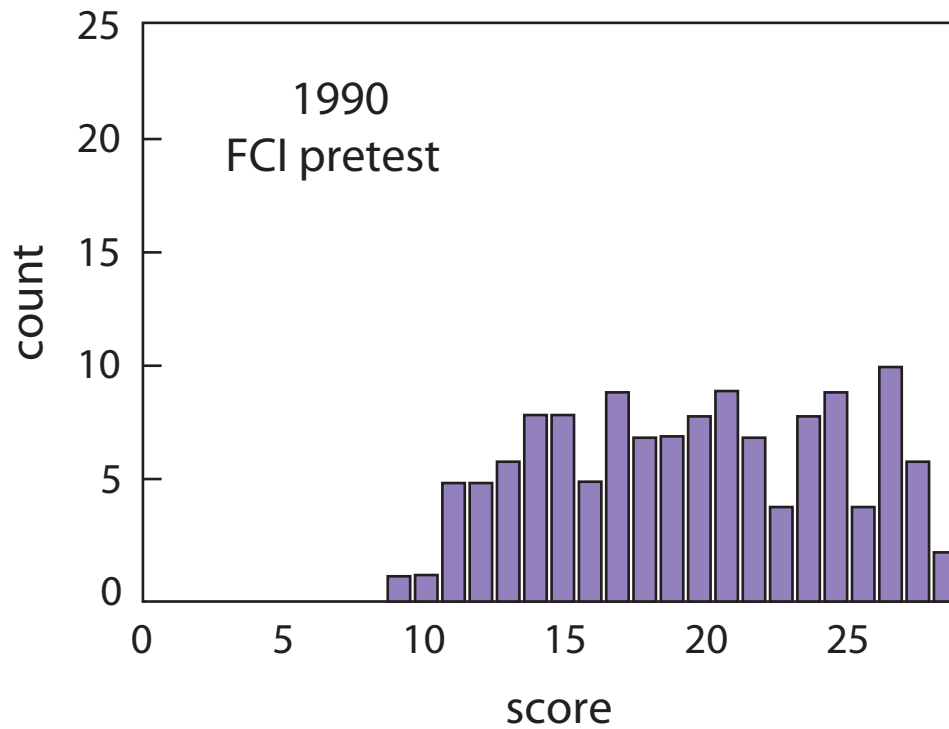
Education

lectures focus on delivery of information



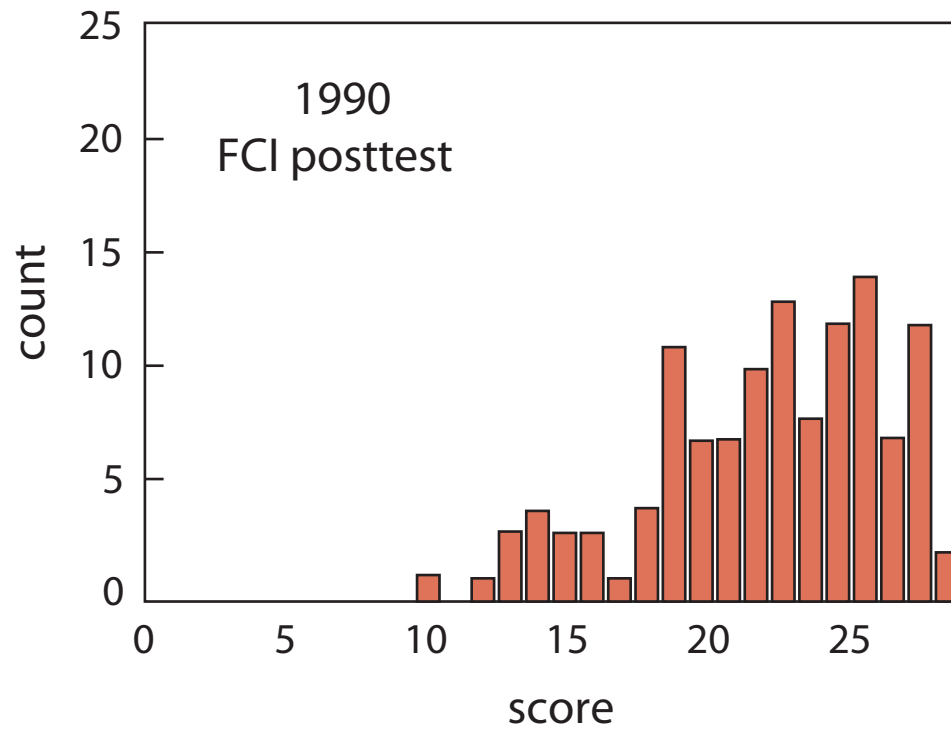
Education

education is not just information transfer



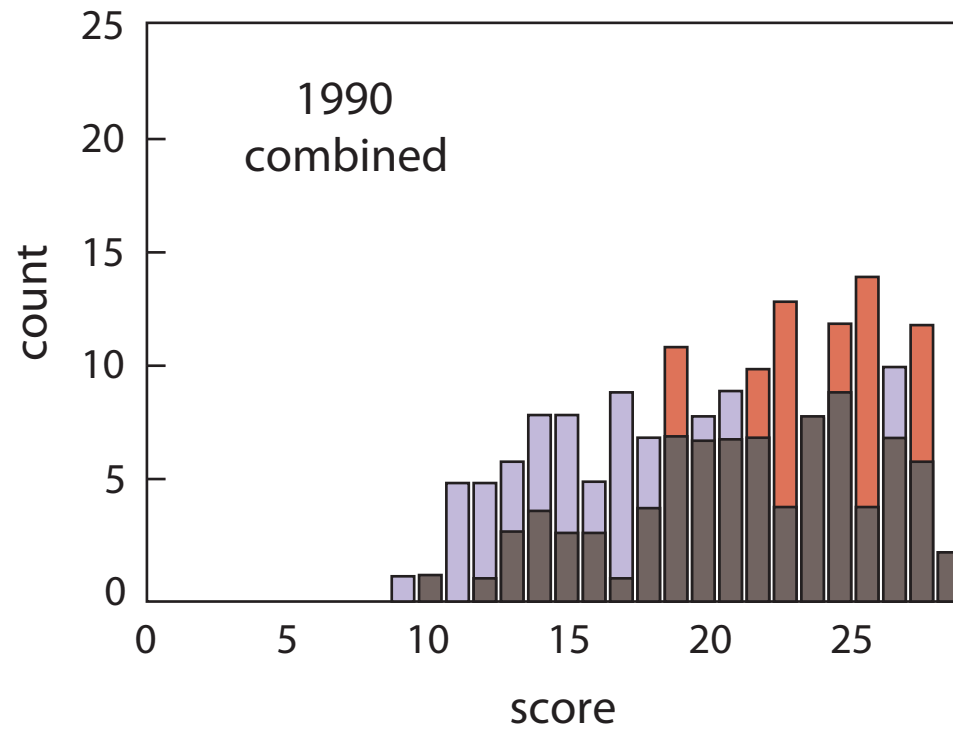
Education

education is not just information transfer

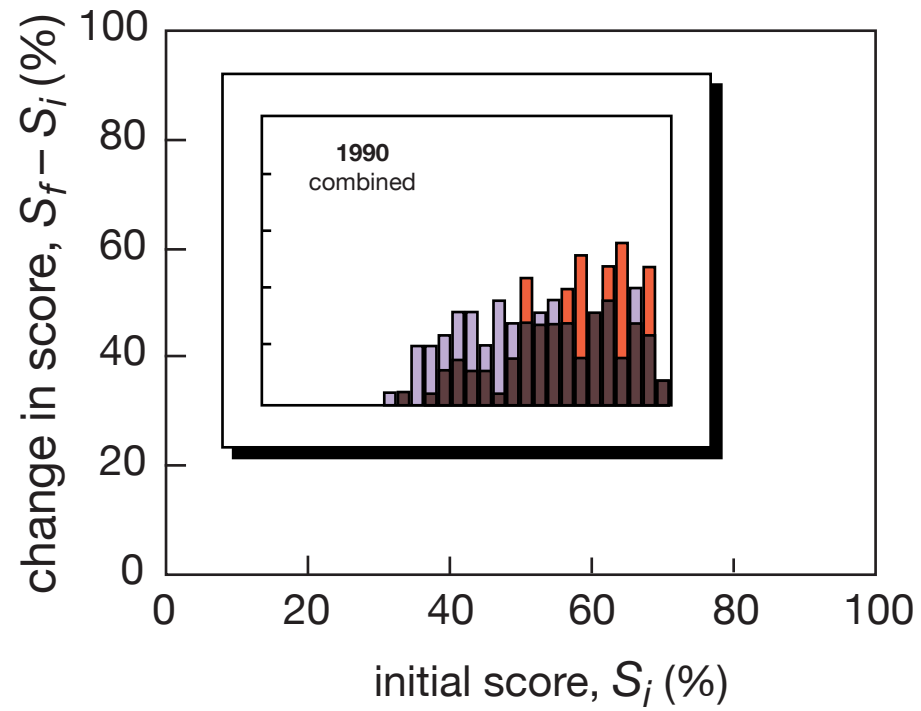


Education

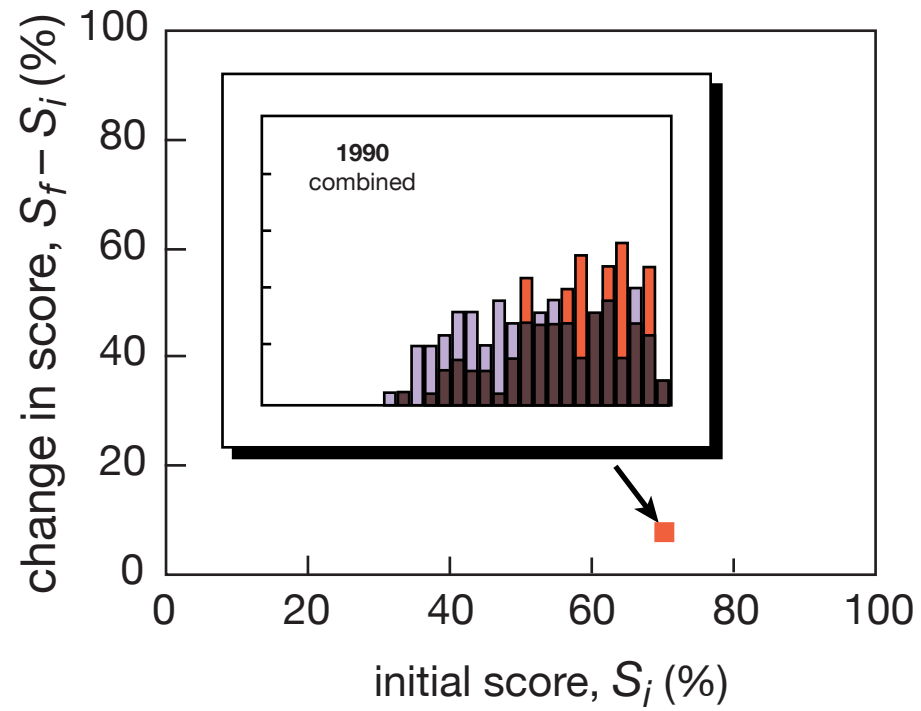
education is not just information transfer



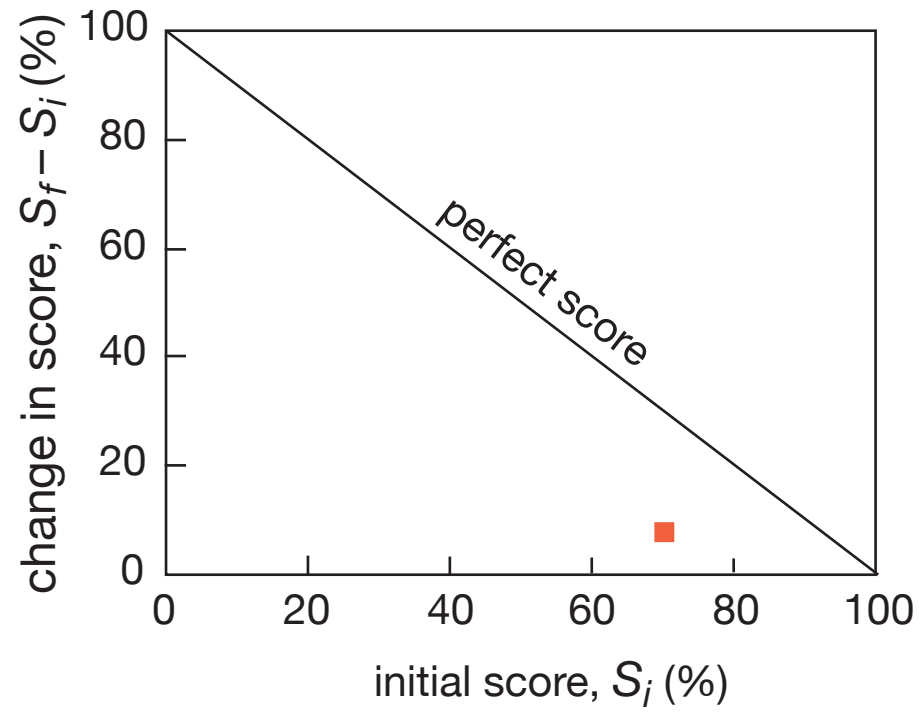
Education



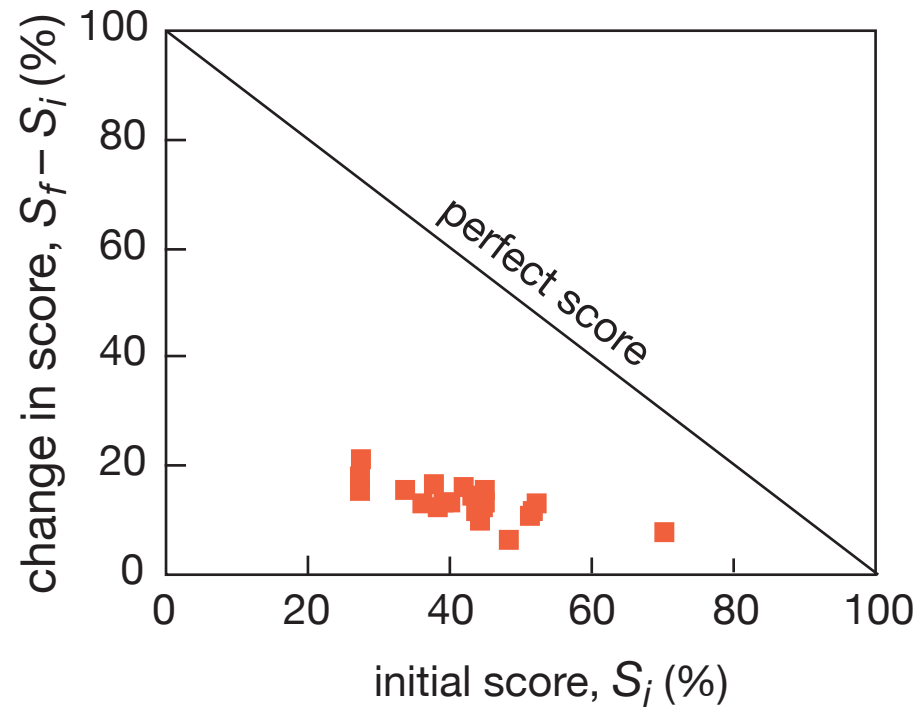
Education



Education

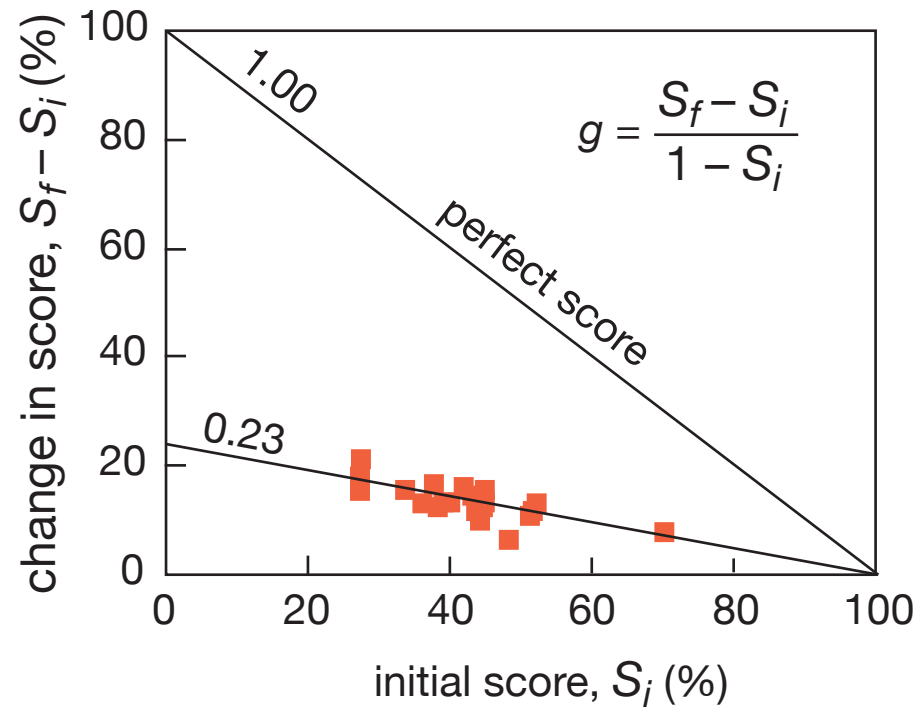


Education



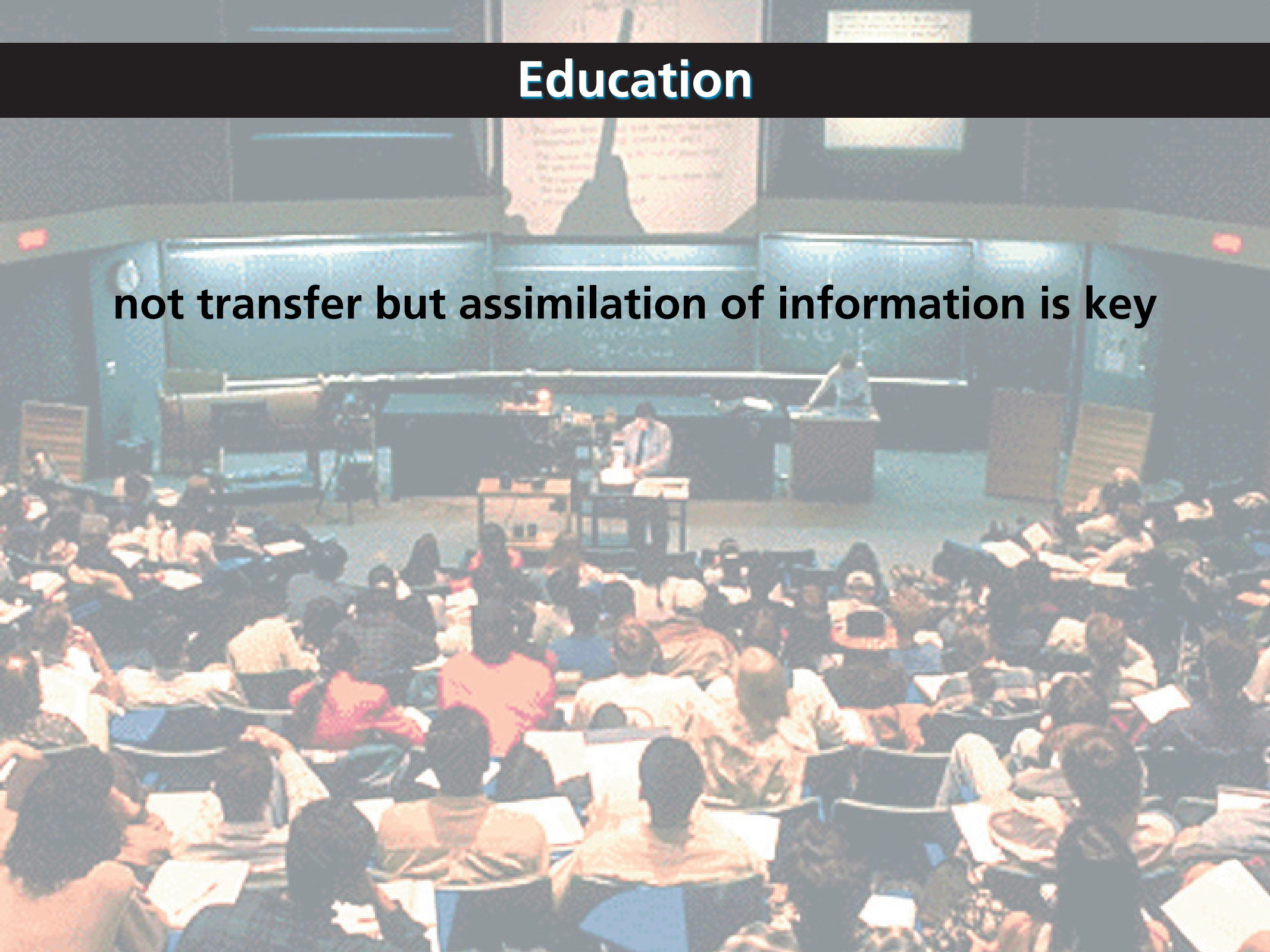
Education

only one quarter of maximum gain realized



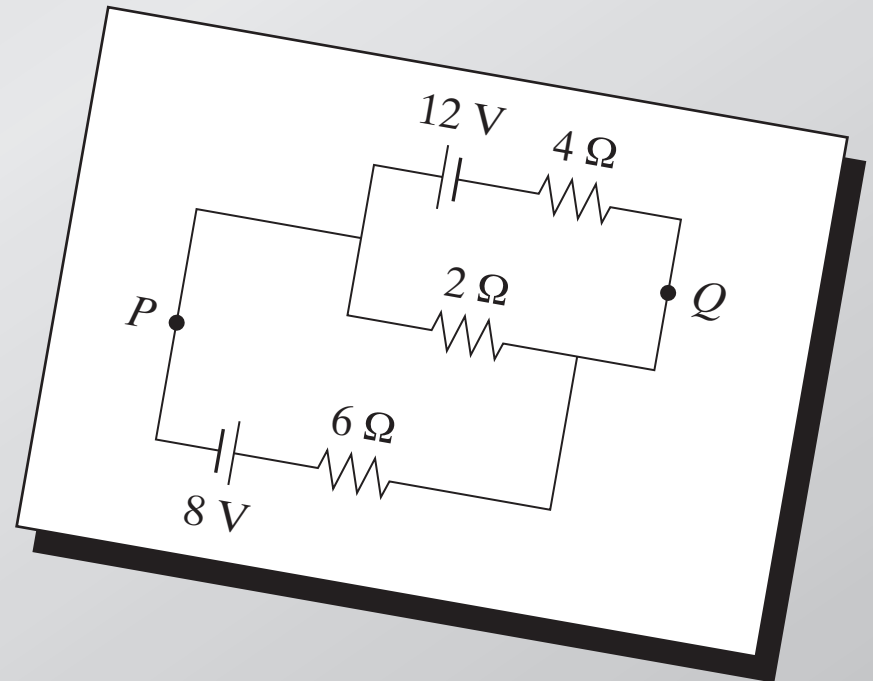
Education

not transfer but assimilation of information is key



Education

conventional problems misleading



Education

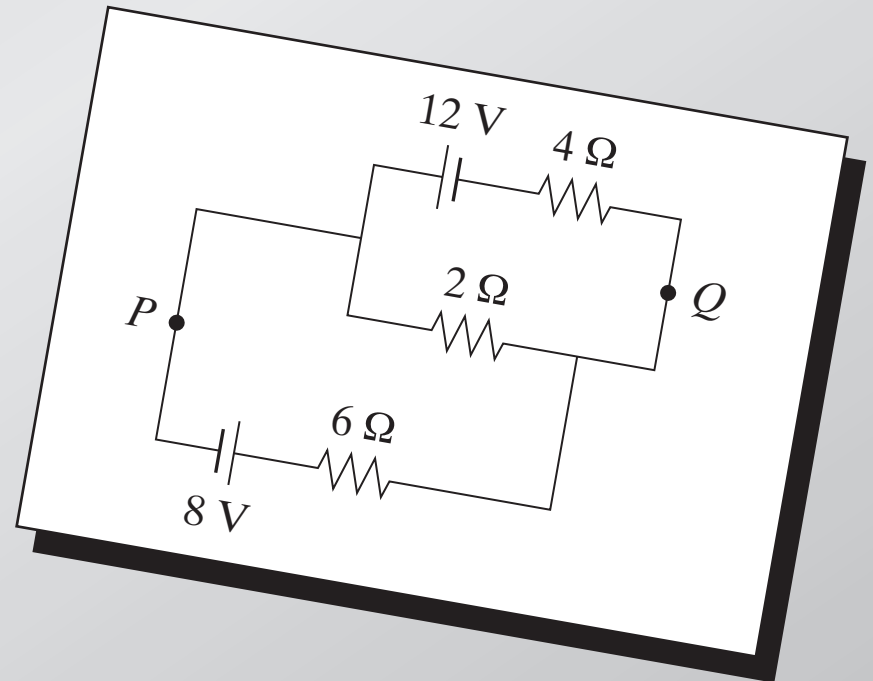
conventional problems misleading

Calculate:

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

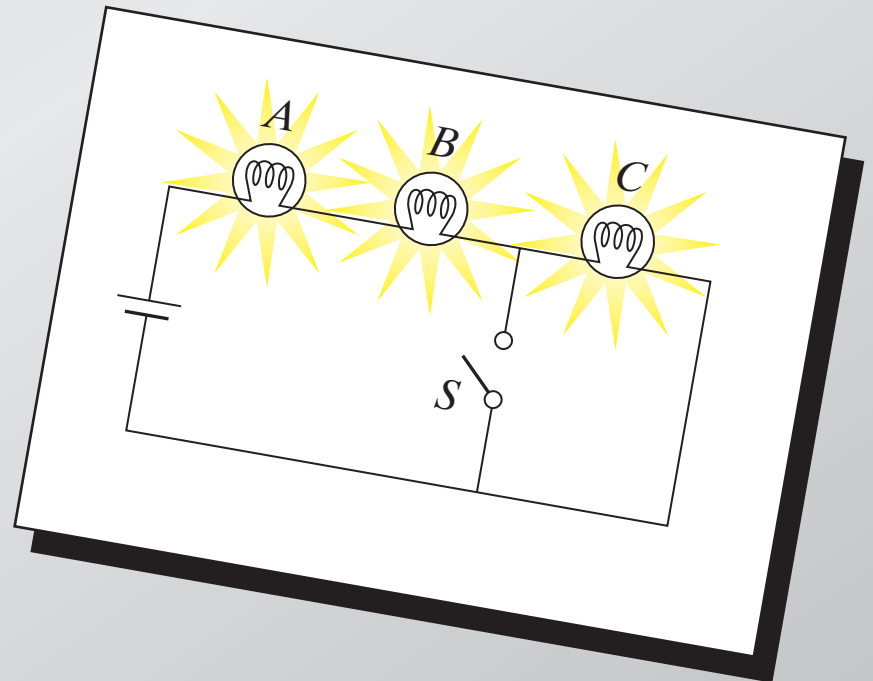
(b) potential difference

between P and Q



Education

are the basic principles understood?

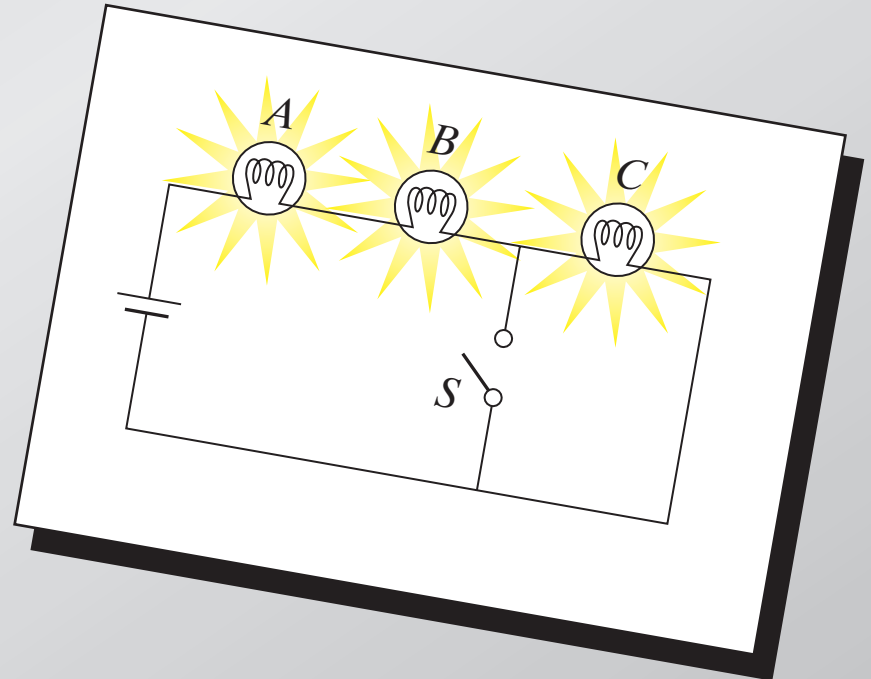


Education

are the basic principles understood?

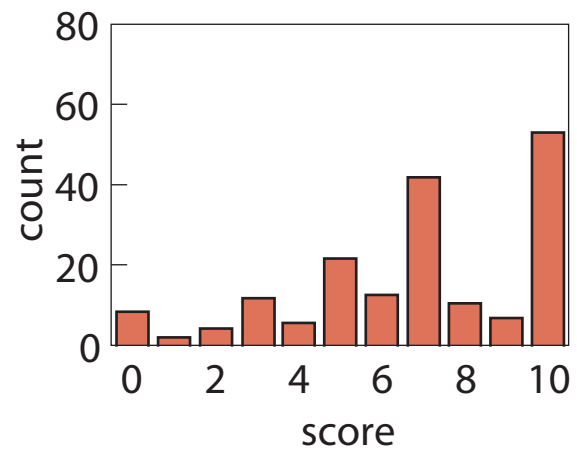
When S is closed, what happens to:

- (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?

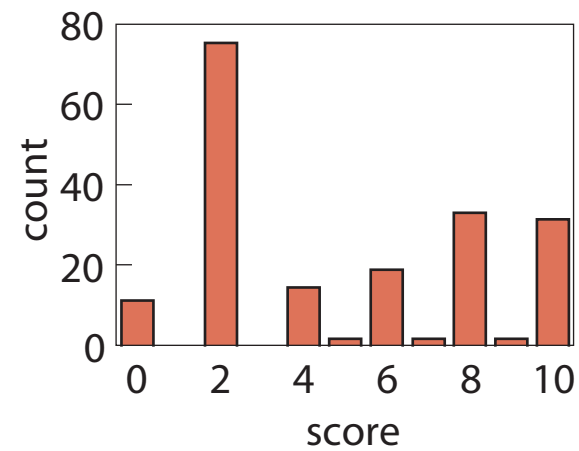


Education

conventional

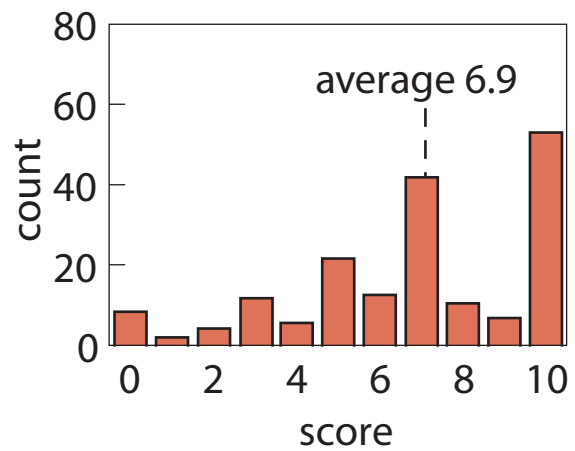


conceptual

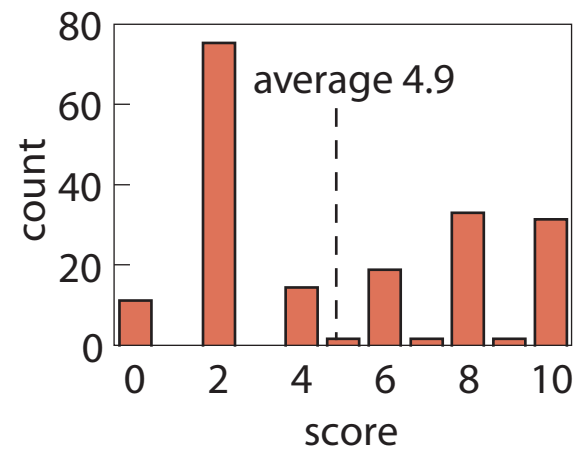


Education

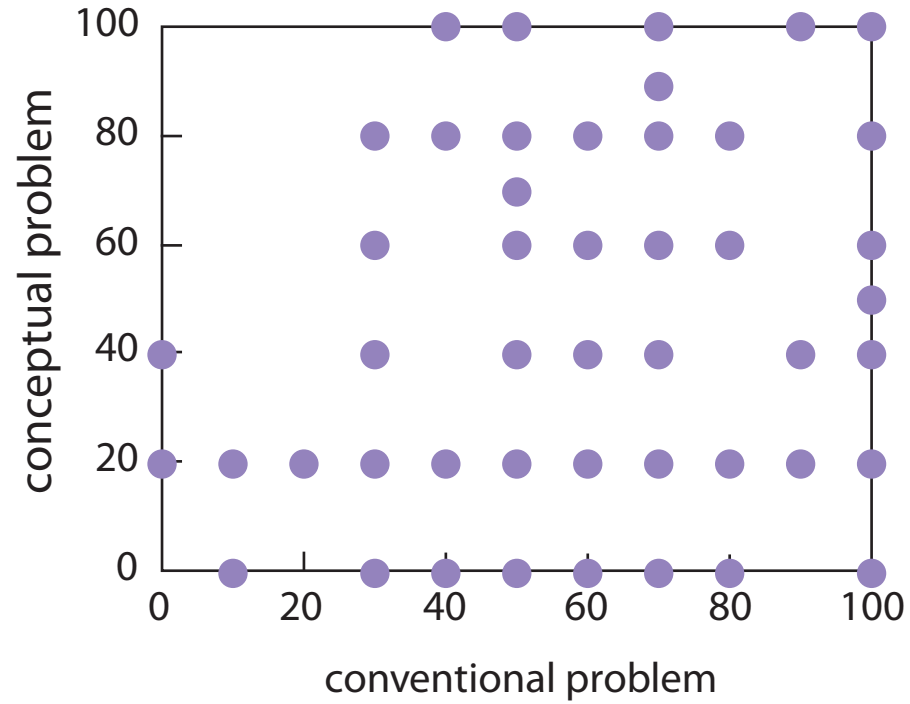
conventional



conceptual



Education



A large lecture hall with students seated at desks, facing a stage with a lecturer and a large screen displaying text. The text on the screen is partially legible and appears to be a list of items or a document. The room is dimly lit, with the stage area being the primary light source. The students are mostly seen from the back, looking towards the front of the room. The lecturer is standing at a podium on the stage, facing the audience. The overall atmosphere is that of a formal academic setting.

So what should we do?

Peer Instruction

Give students more responsibility for gathering information...

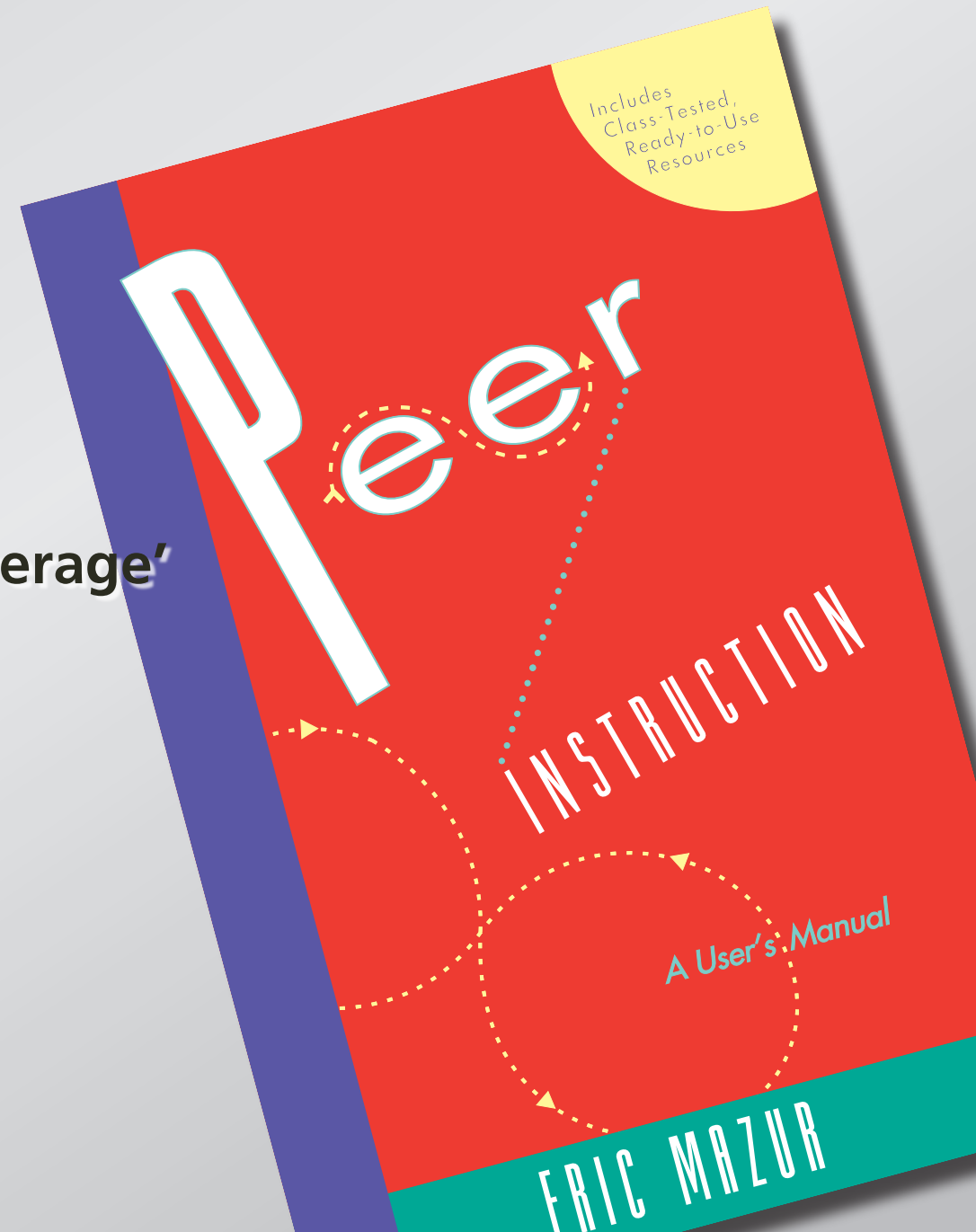
Peer Instruction

**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

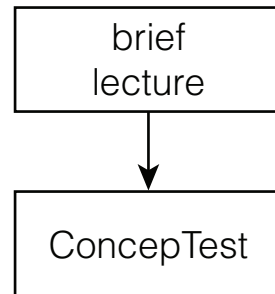
ConcepTest:

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

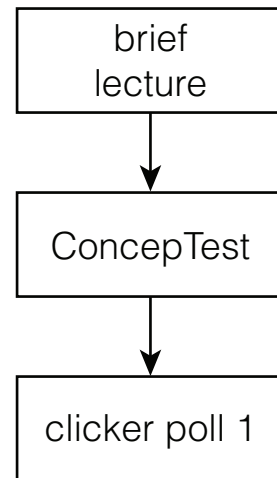
Peer Instruction

brief
lecture

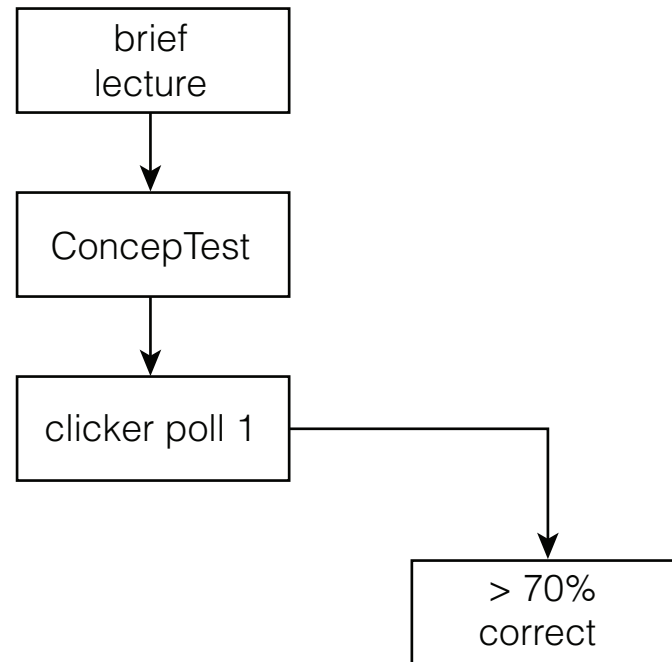
Peer Instruction



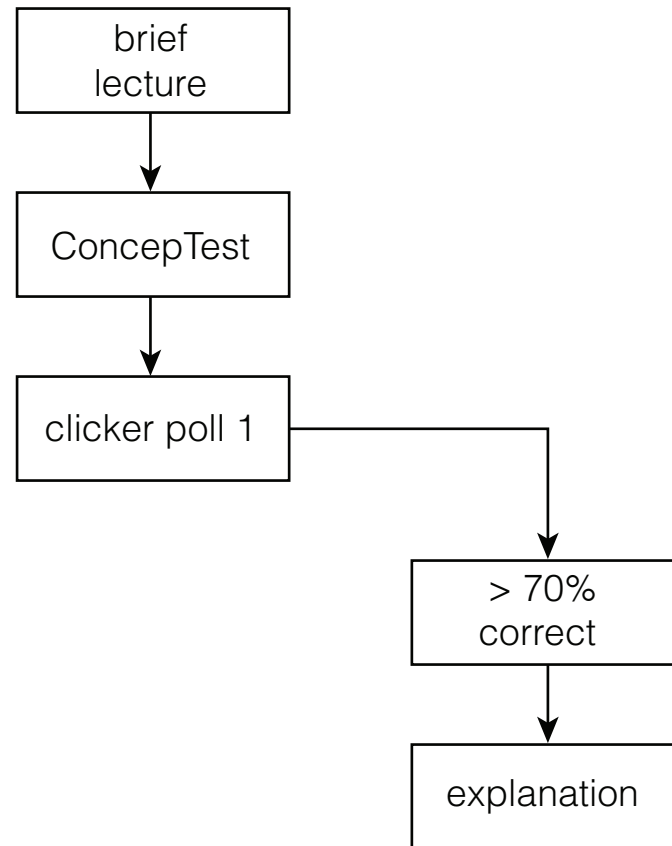
Peer Instruction



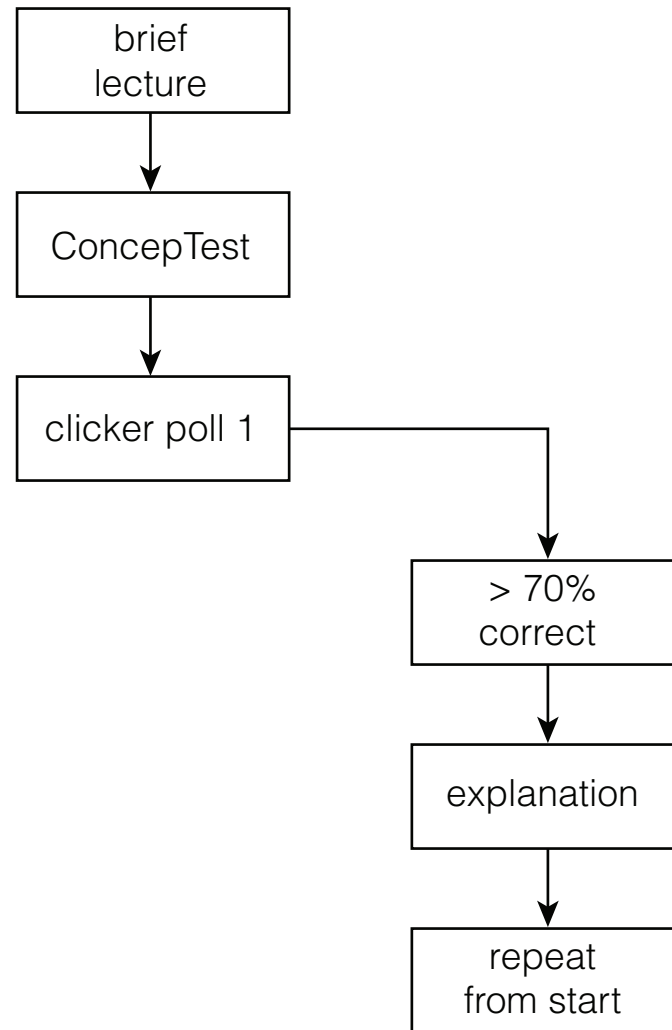
Peer Instruction



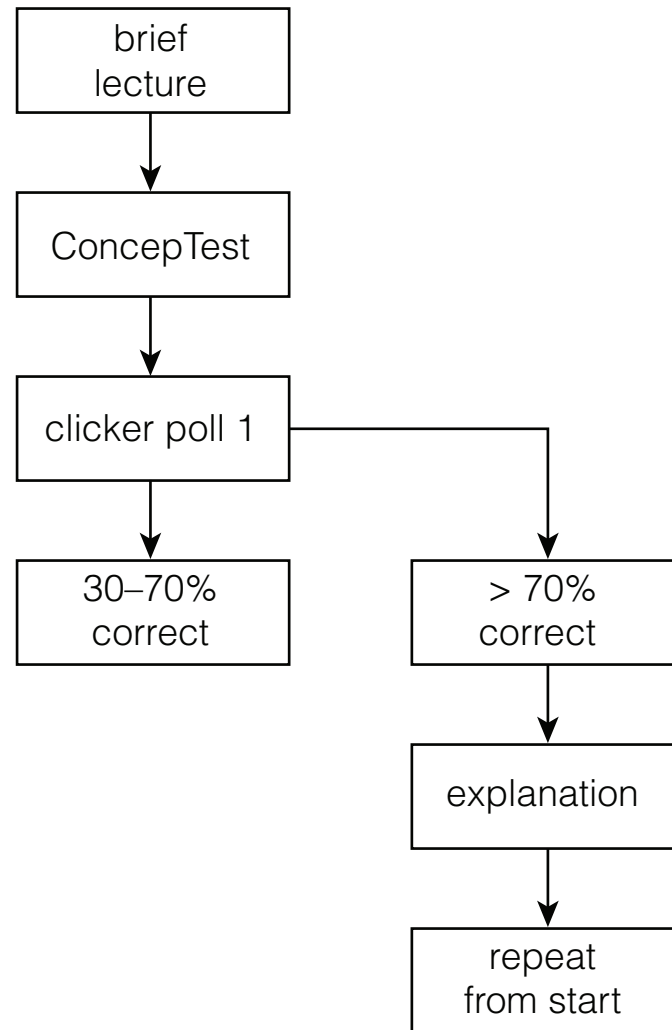
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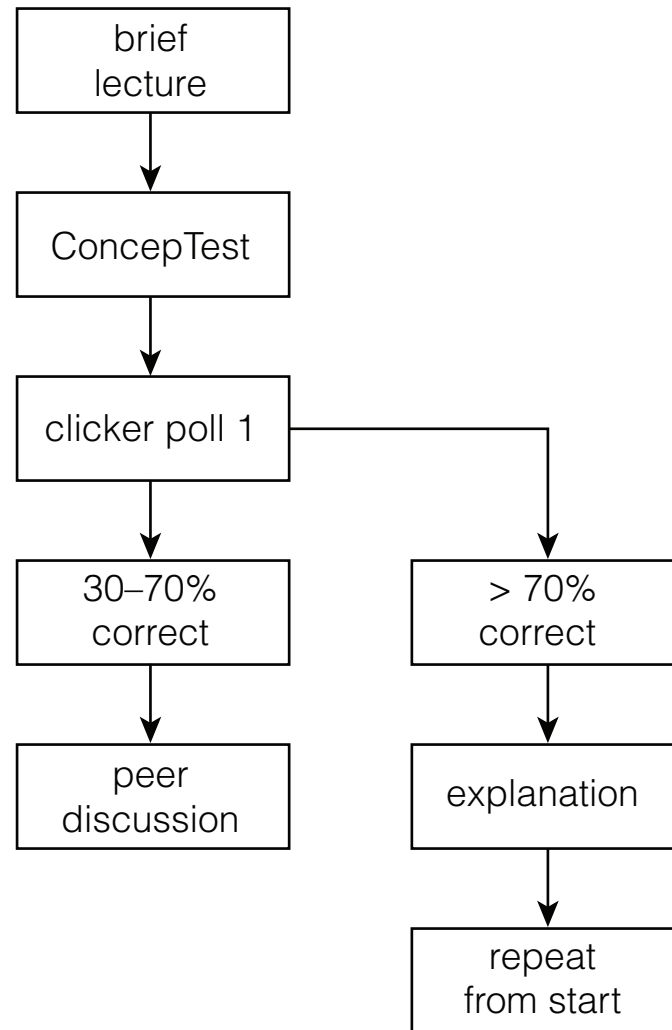
Peer Instruction



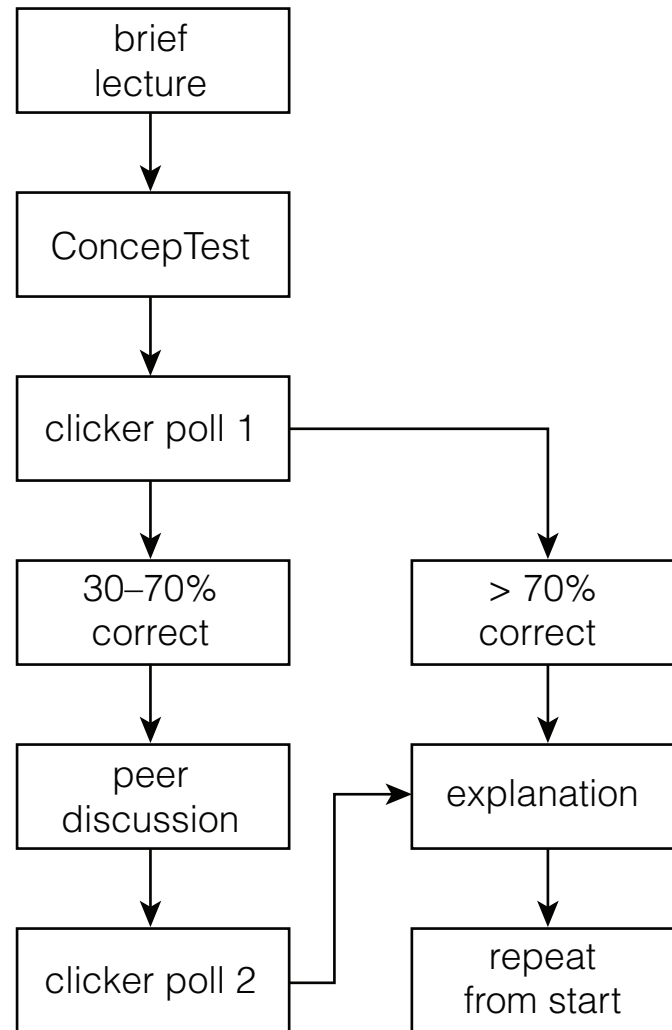
Peer Instruction



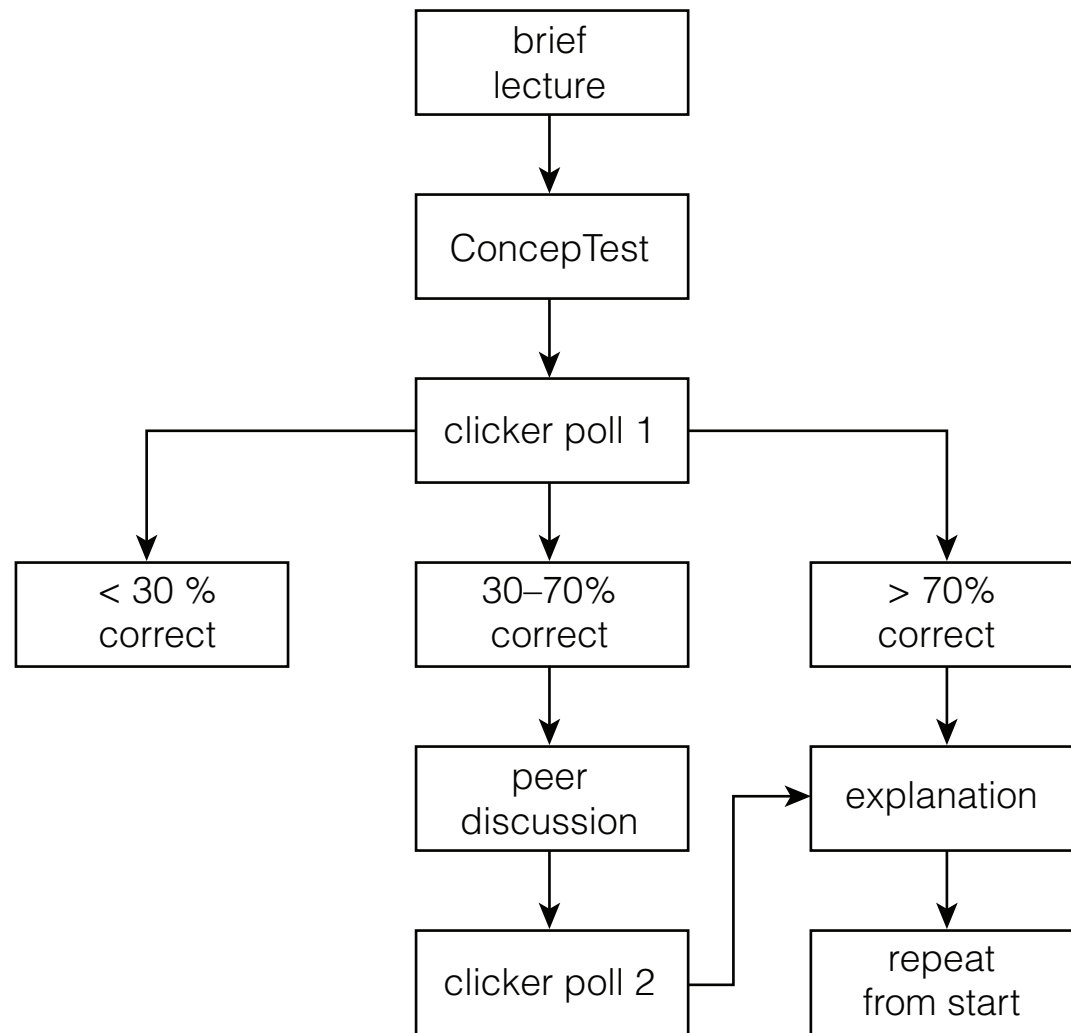
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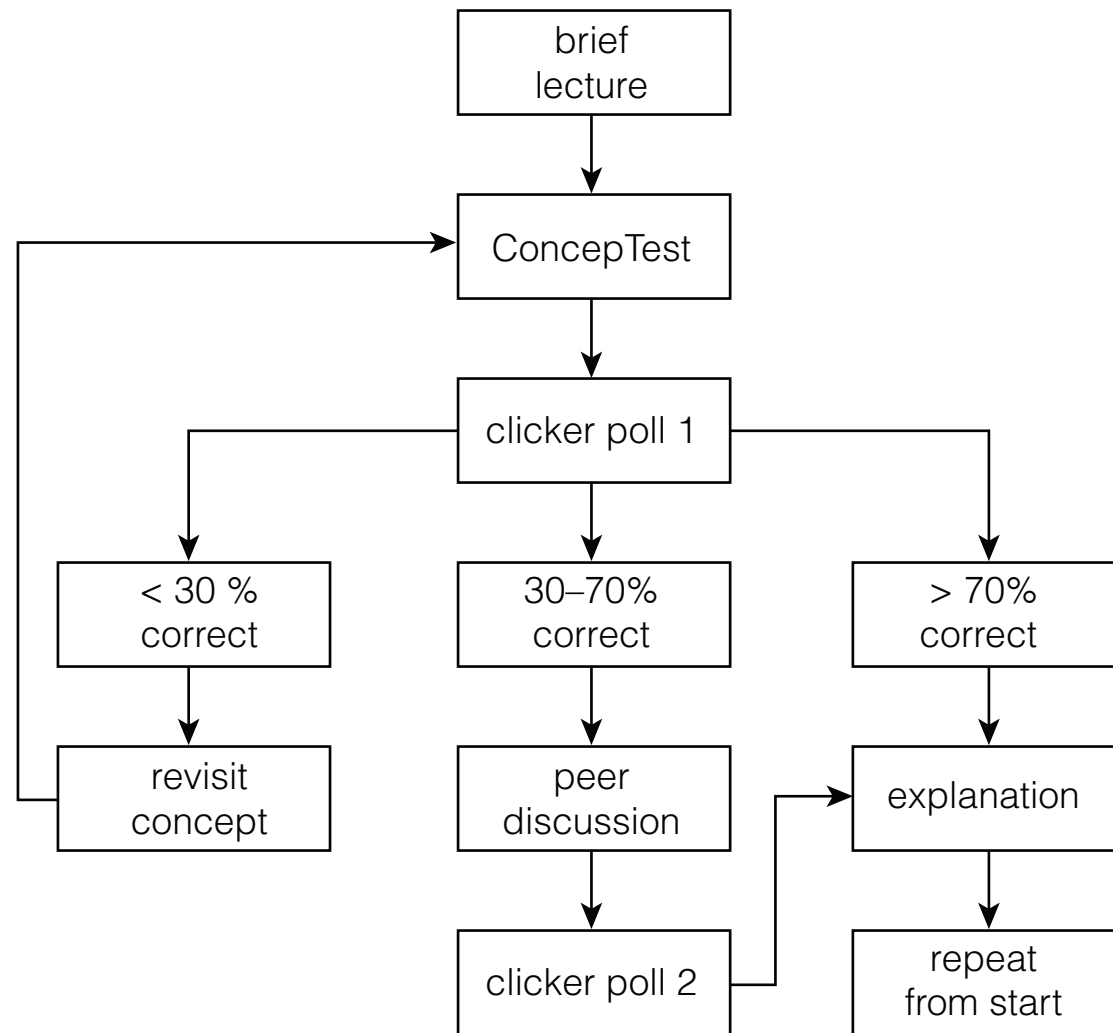
Peer Instruction



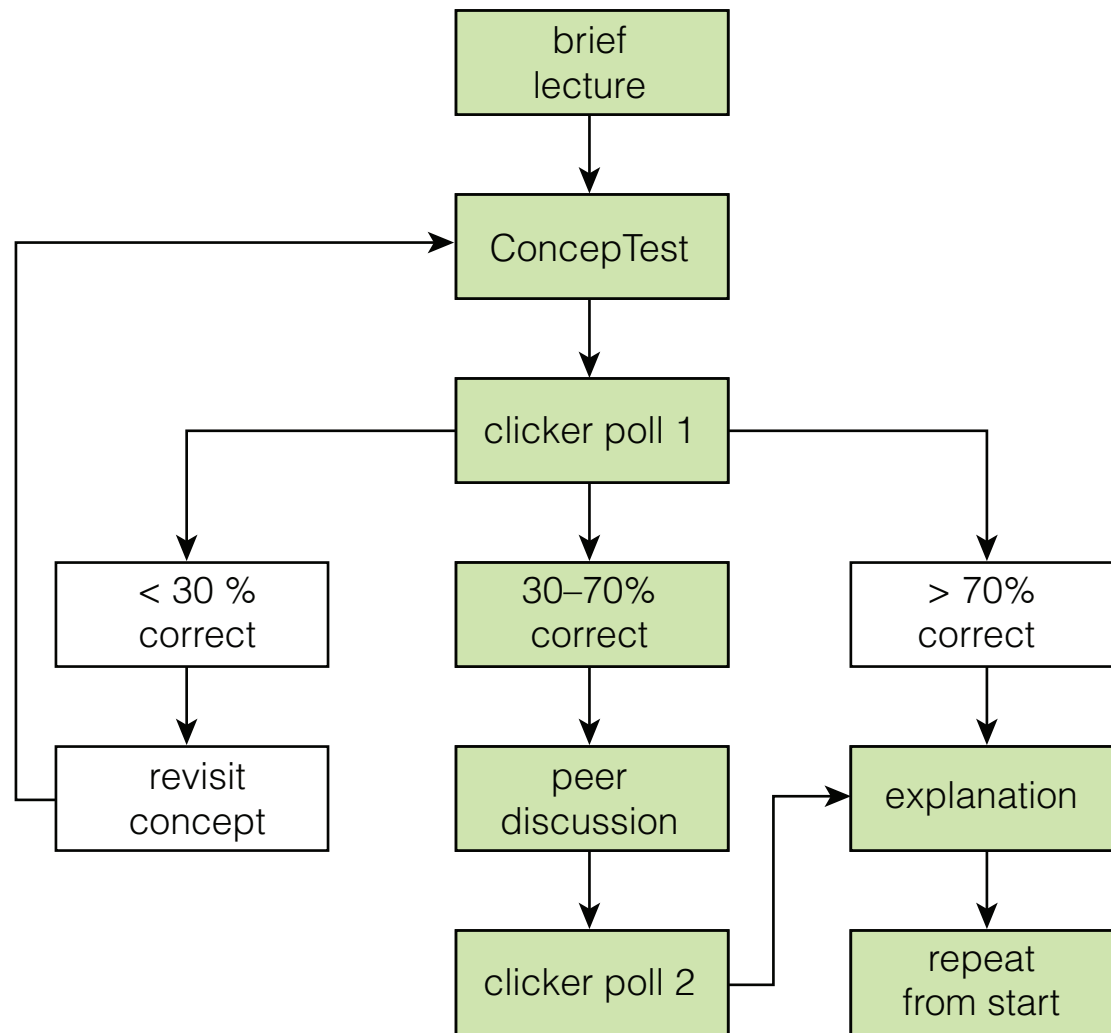
Peer Instruction



Peer Instruction

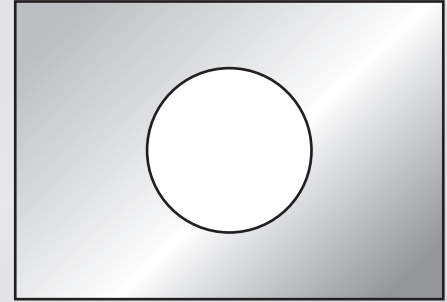


Peer Instruction



Let's try it!

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

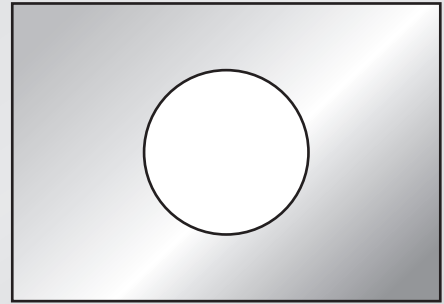


Let's try it!

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

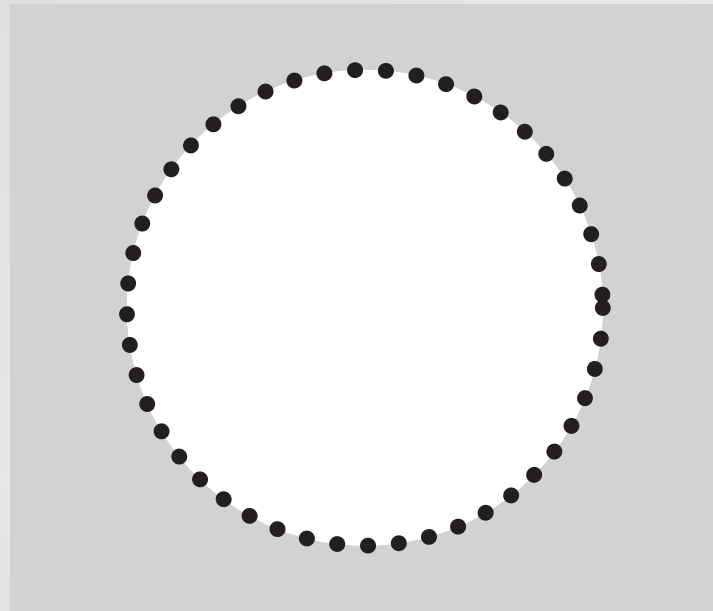
When the plate is uniformly heated, the diameter of the hole

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



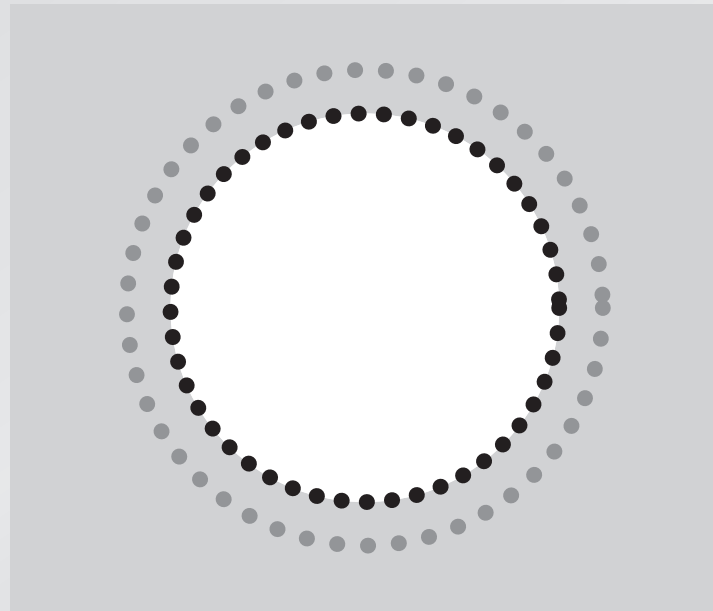
Let's try it!

consider the atoms at the rim of the hole



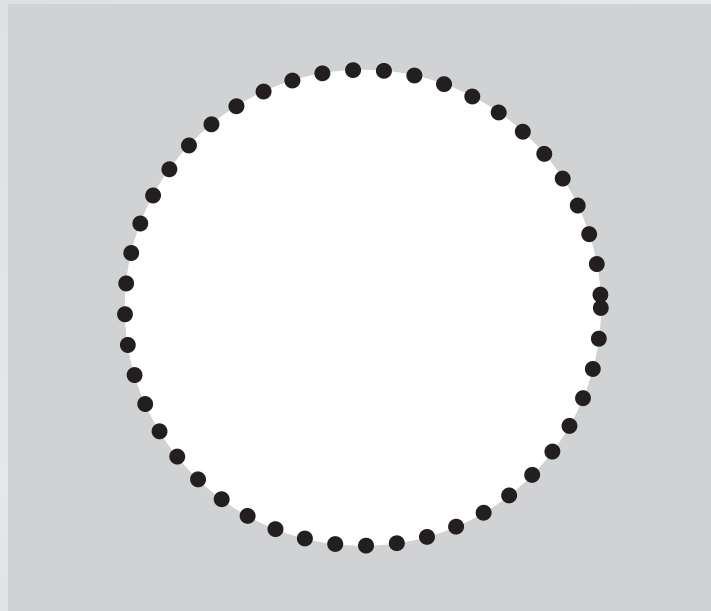
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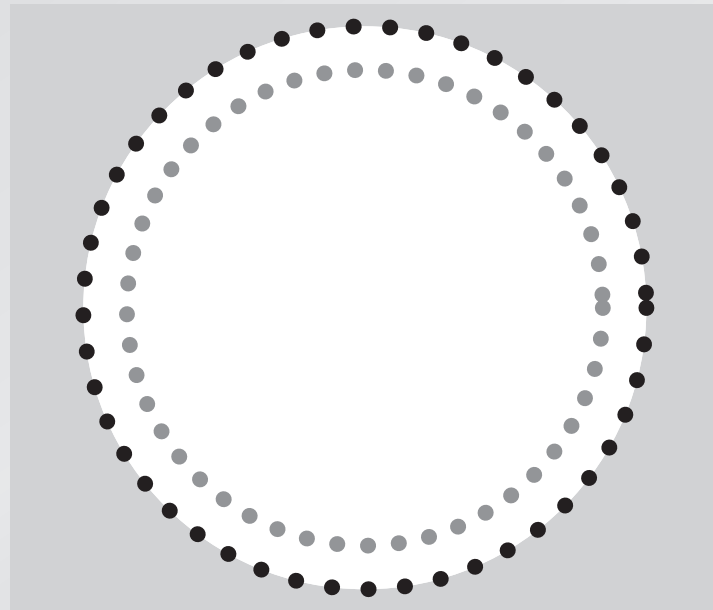
Let's try it!

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!

Imagine a rope that fits snugly along the equator.



Let's try it!

Imagine a rope that fits snugly along the equator.

Suppose the rope is cut and 1 m of rope is inserted between the cut ends. If the rope were to maintain a circular shape, how far off the surface of the Earth would it float?

1. the width of a few atoms
2. the width of a few hairs
3. the height of a curb
4. exactly 1 m
5. more than 1 m



Let's try it!

circumference at equator:

$$2\pi R_E$$

Let's try it!

circumference at equator:

$$2\pi R_E$$

new circumference:

$$2\pi R_E + 1 \text{ m}$$

Let's try it!

circumference at equator:

$$2\pi R_E$$

new circumference:

$$2\pi R_E + 1 \text{ m}$$

radius of circle with new circumference:

$$2\pi R = 2\pi R_E + 1 \text{ m}, \quad \text{and so} \quad R = R_E + \frac{1 \text{ m}}{2\pi}.$$

Let's try it!

It's easy to fire up the audience!

Let's try it!

Which of the following airlines tries to save fuel by suggesting that its passengers use the bathroom before boarding?

1. Delta Airlines
2. Lufthansa
3. All Nippon Airways
4. British Midland Airways
5. Air France
6. JAL
7. Aboriginal Air Services
8. Aeroflot
9. Are you kidding me? None of the above.

Let's try it!

Which of the following airlines tries to save fuel by suggesting that its passengers use the bathroom before boarding?

1. Delta Airlines
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Let's try it!

hole in plate

model

circumference

model

airline

fact

Let's try it!

hole in plate

model

circumference

model

airline

fact

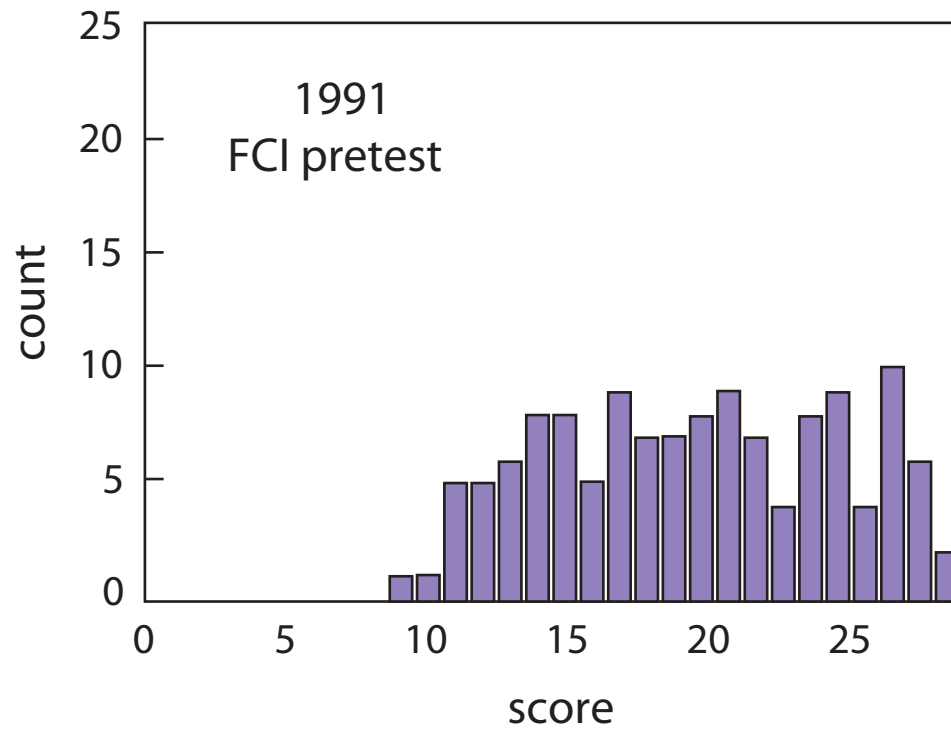
need to test mental model!

Results

is it any good?

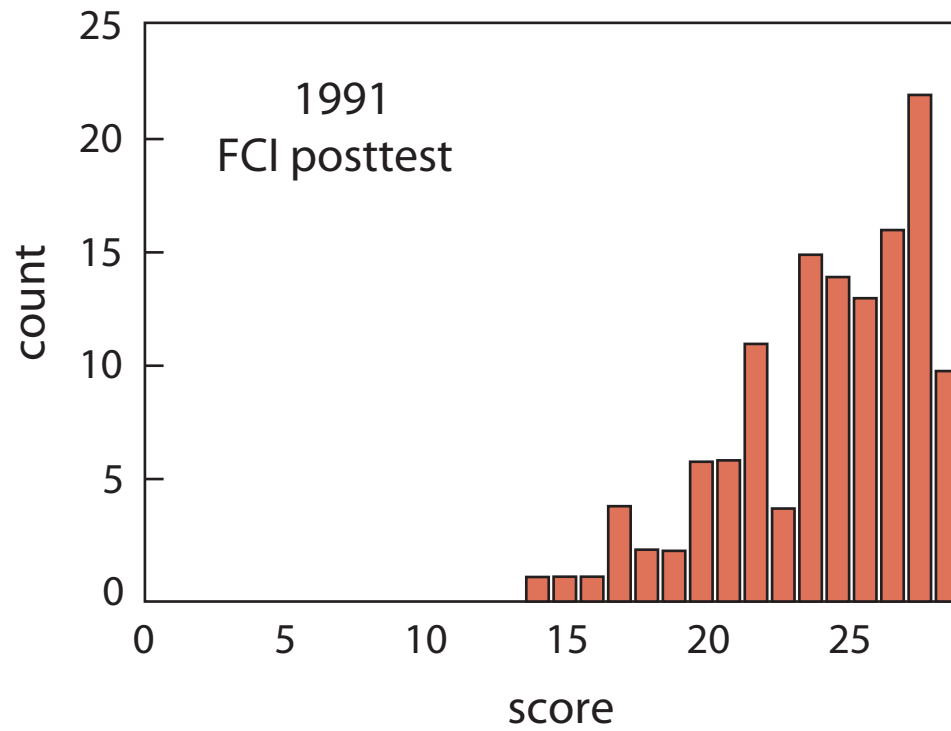
Results

first year of implementing PI



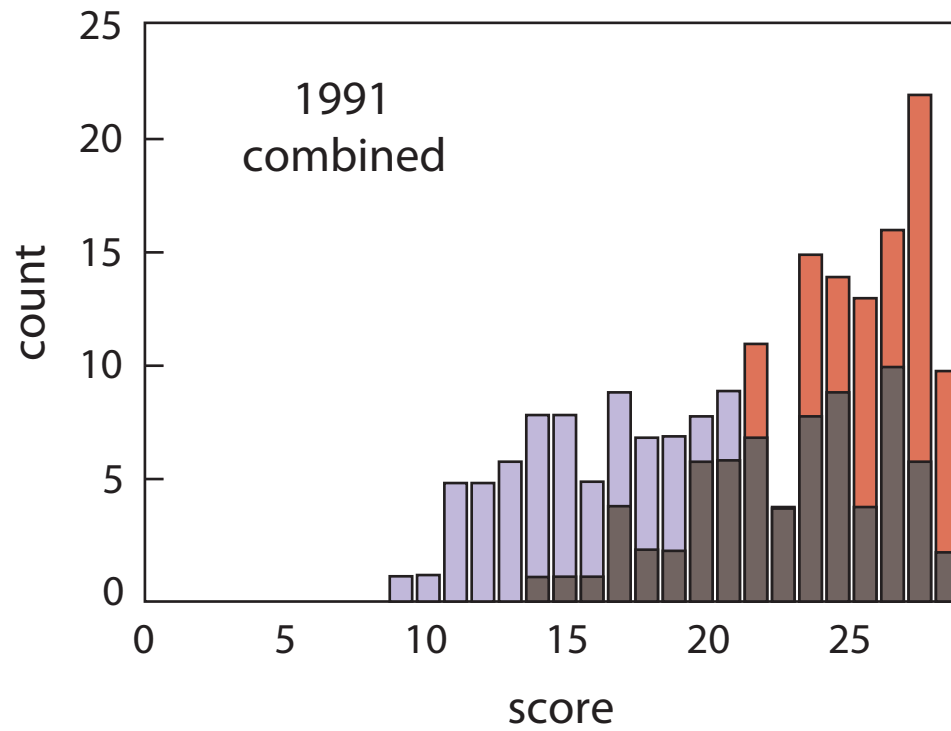
Results

first year of implementing PI

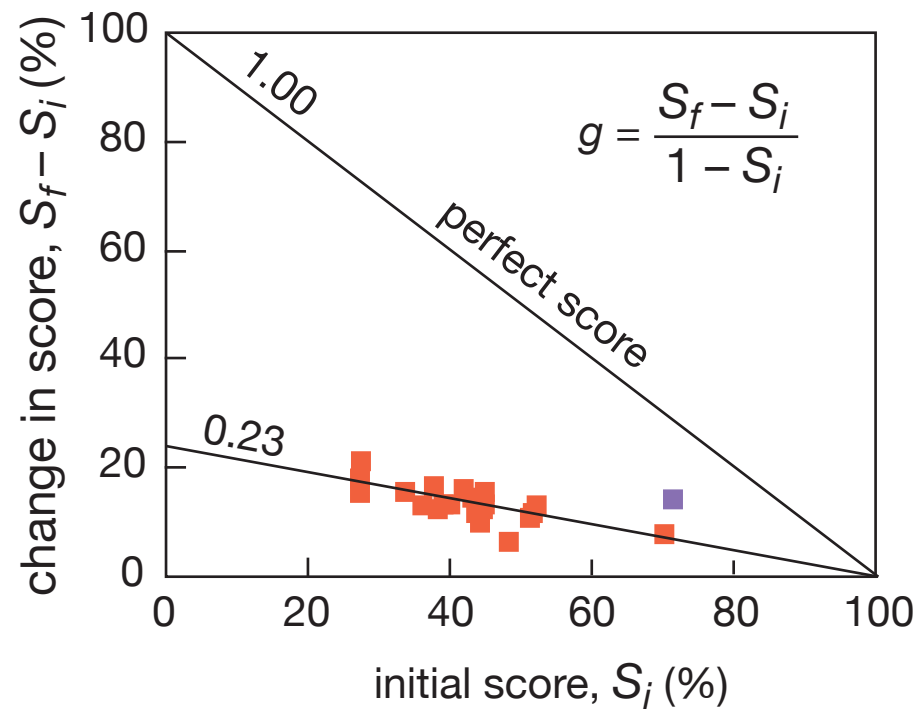


Results

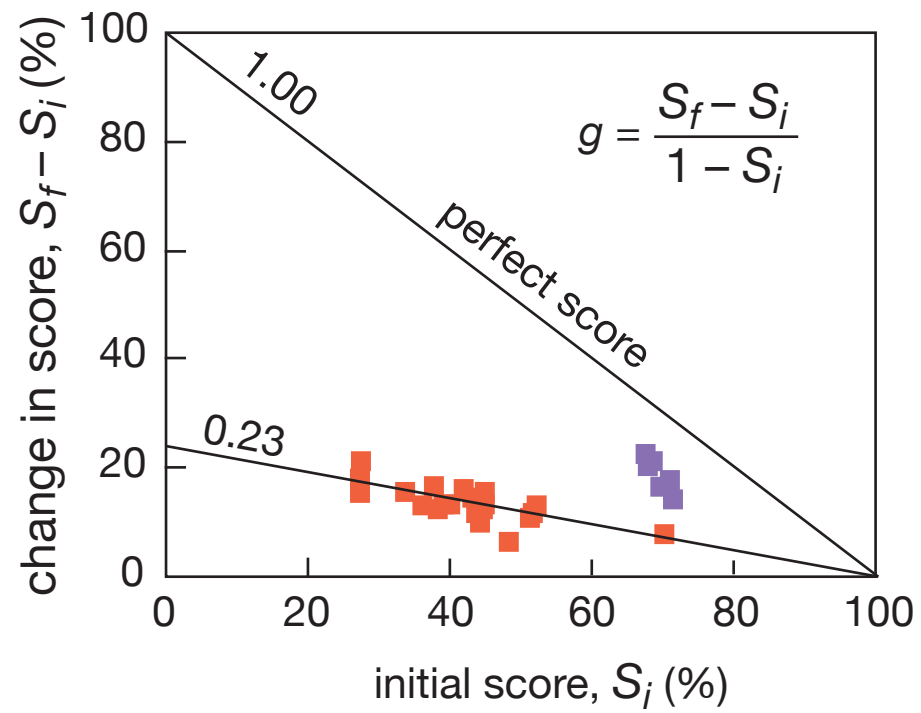
first year of implementing PI



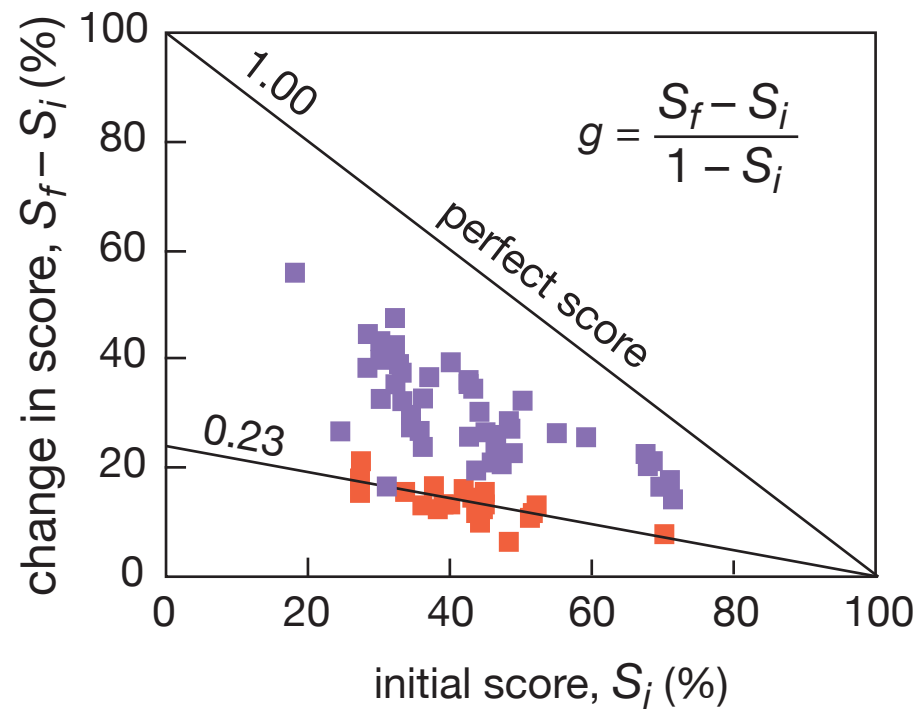
Results



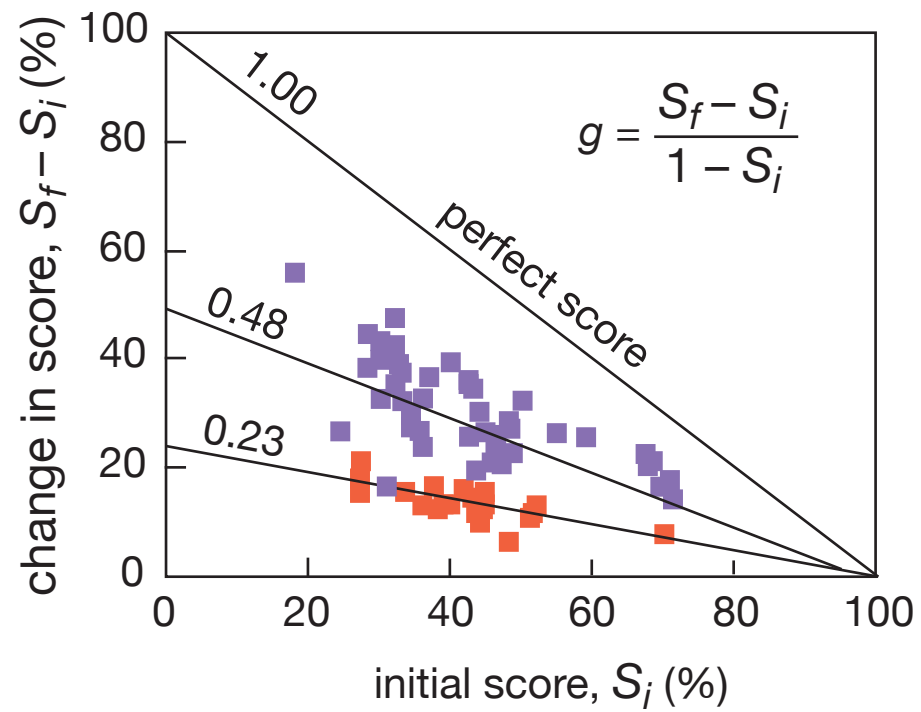
Results



Results



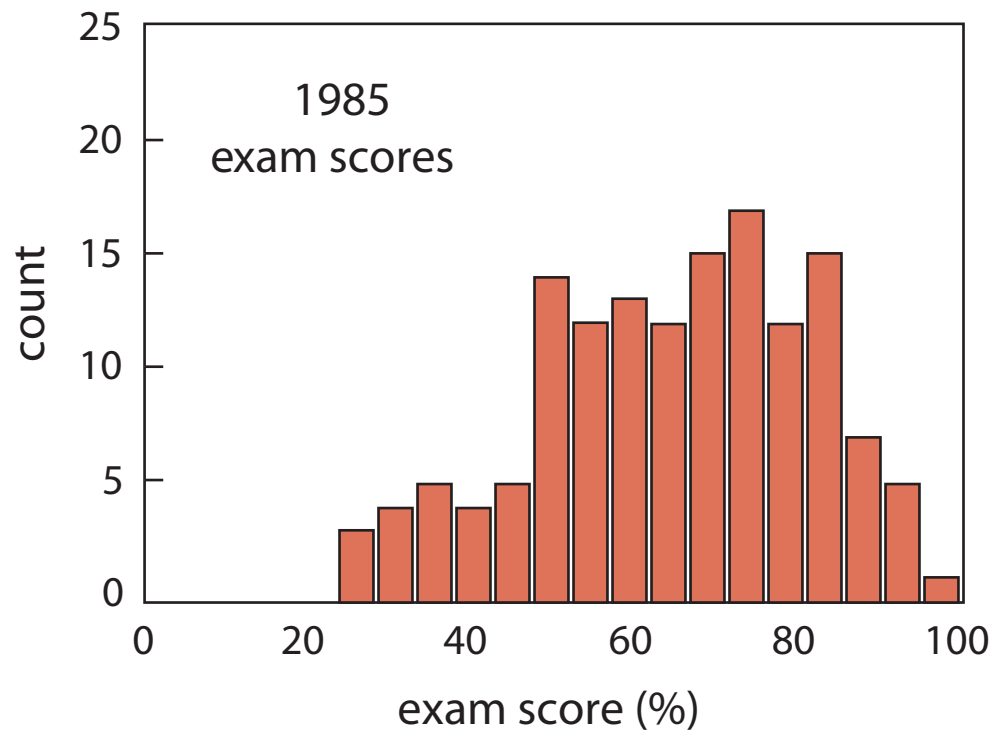
Results



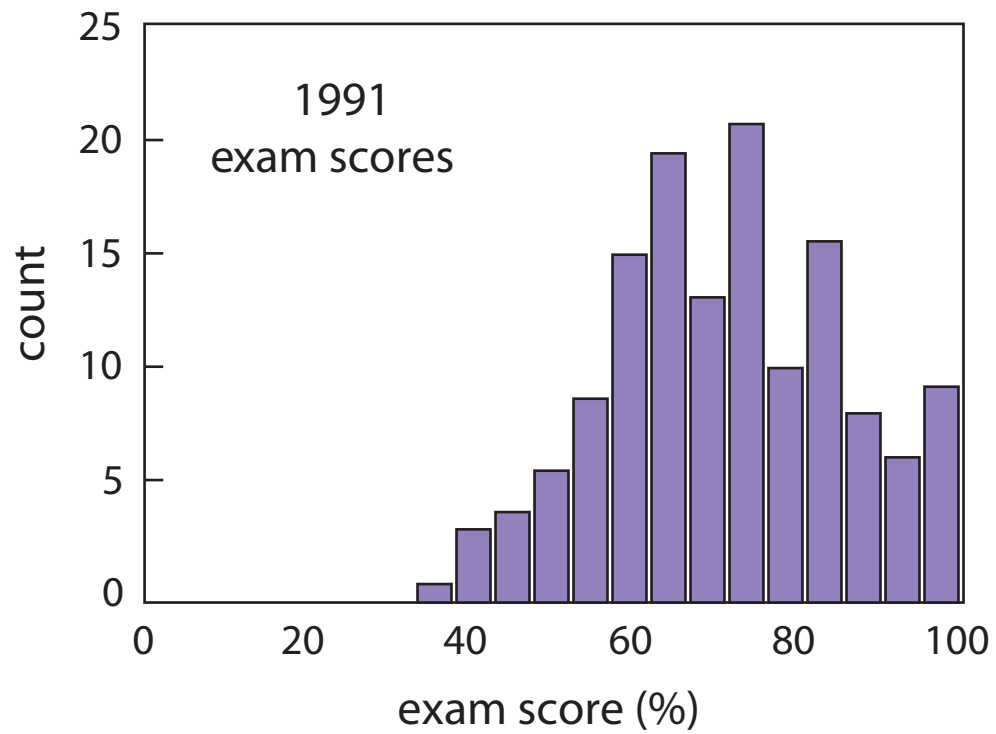
Results

what about problem solving?

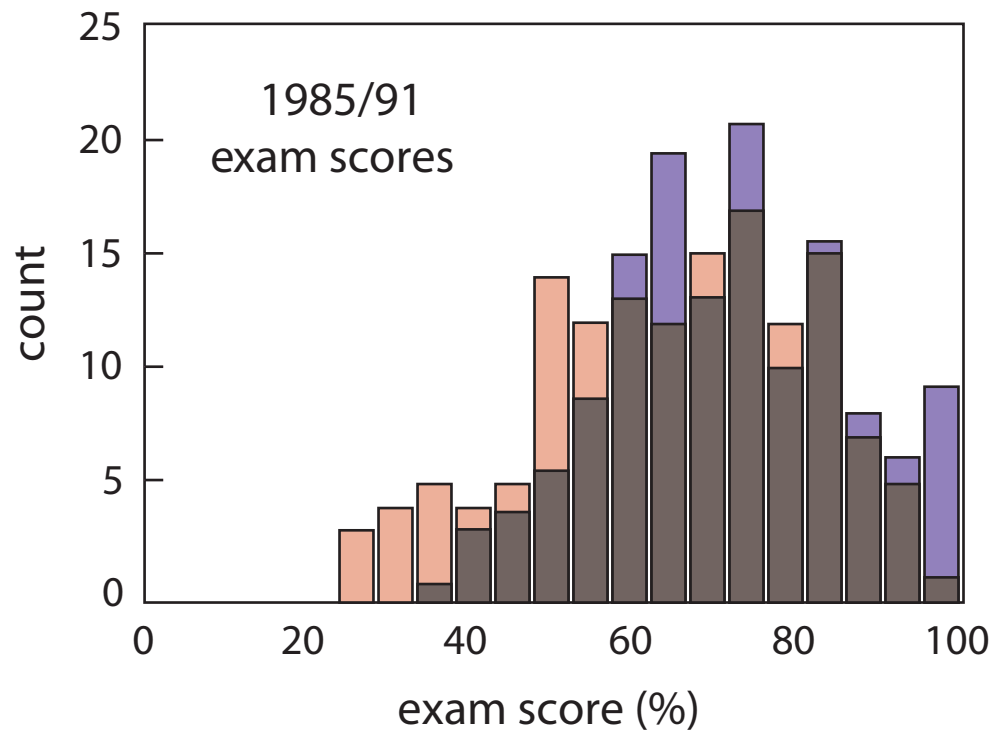
Results



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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