

# Confessions of a converted lecturer

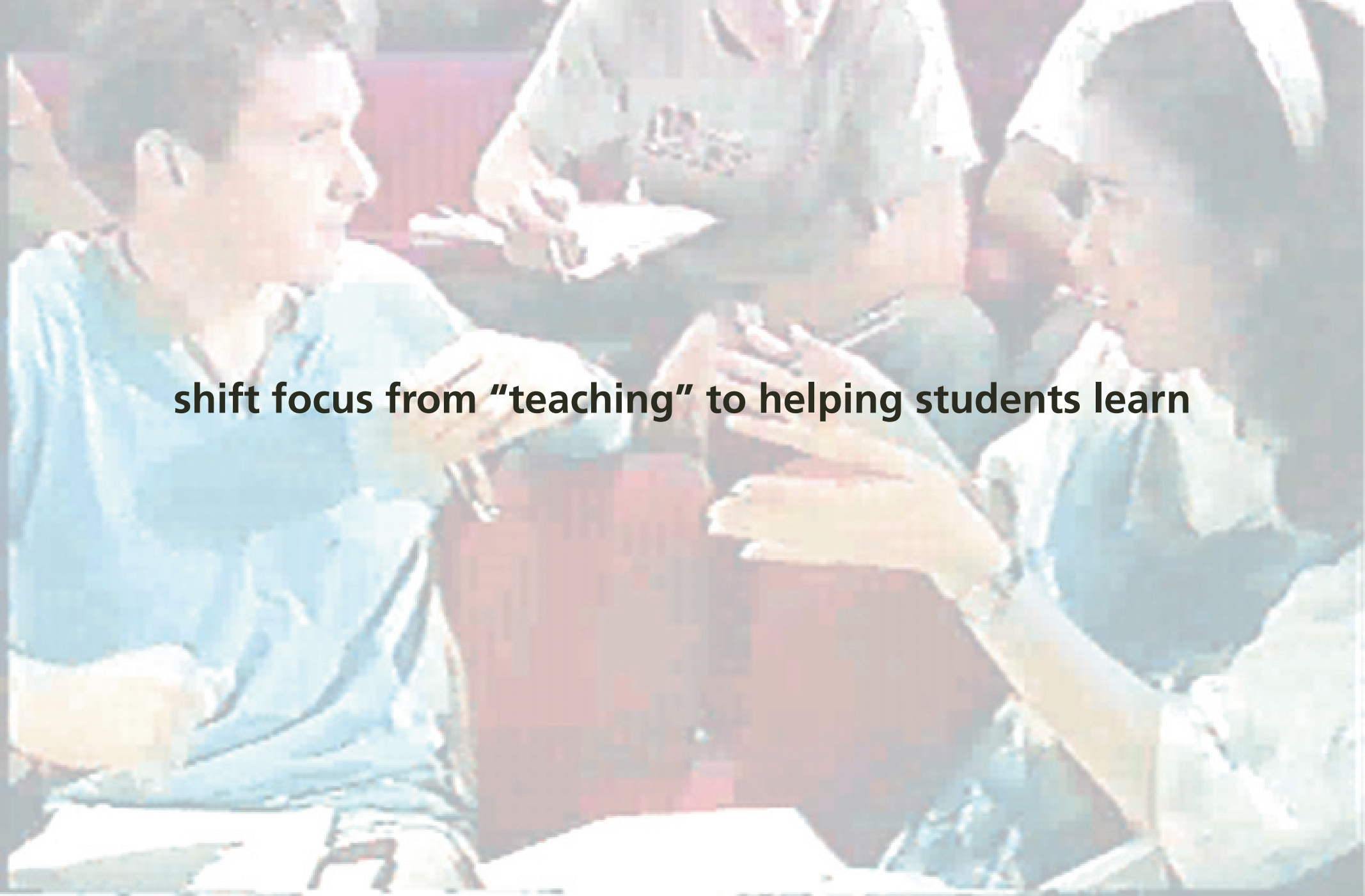


2nd Annual DTI Spring Conference  
Community College of Denver  
Denver, CO, 2 April 2010



# My message

shift focus from "teaching" to helping students learn



# Outline

- Education



# Outline

- Education
- Peer Instruction



# Outline

- Education
- Peer Instruction
- Results

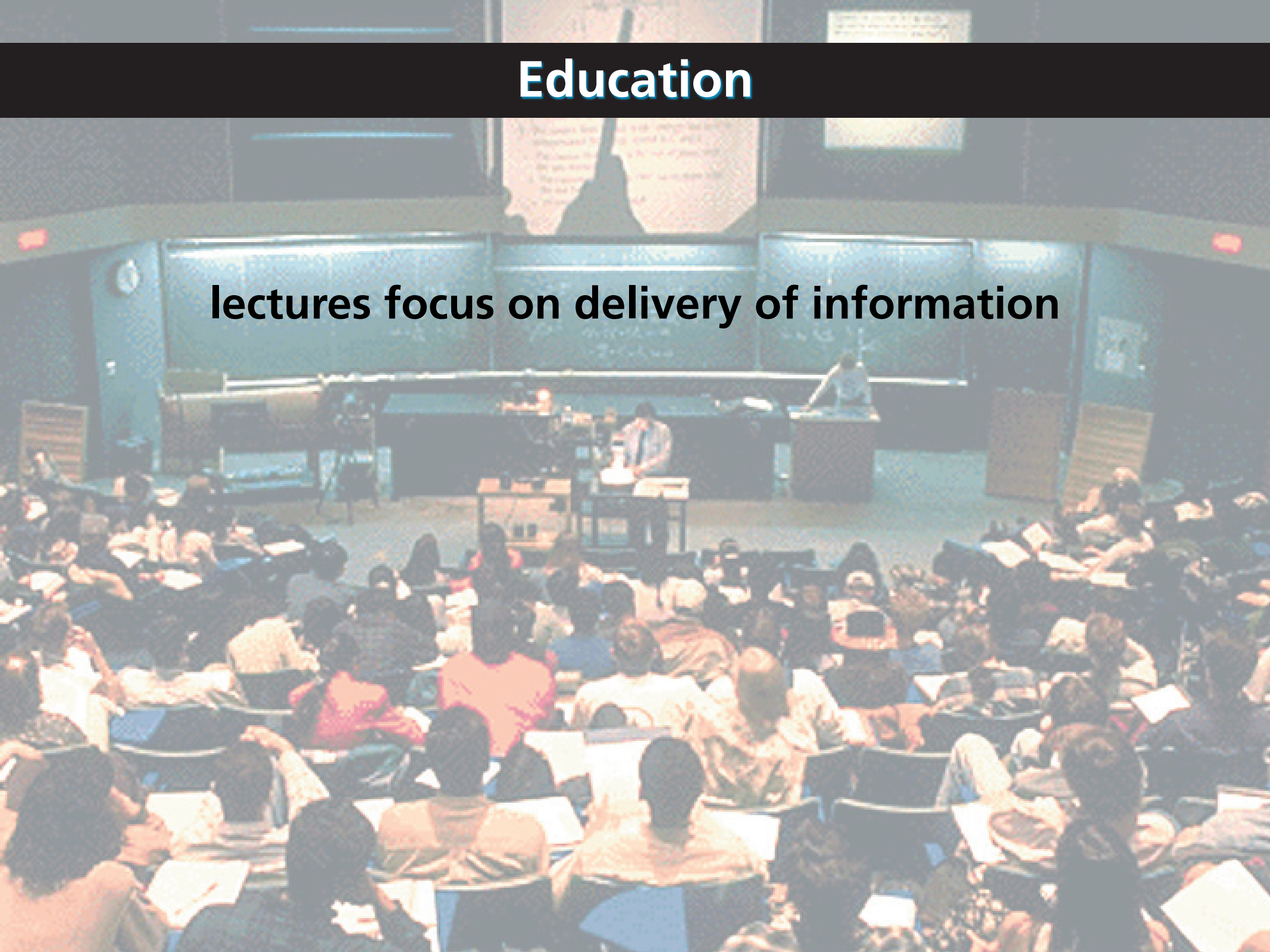


# Education



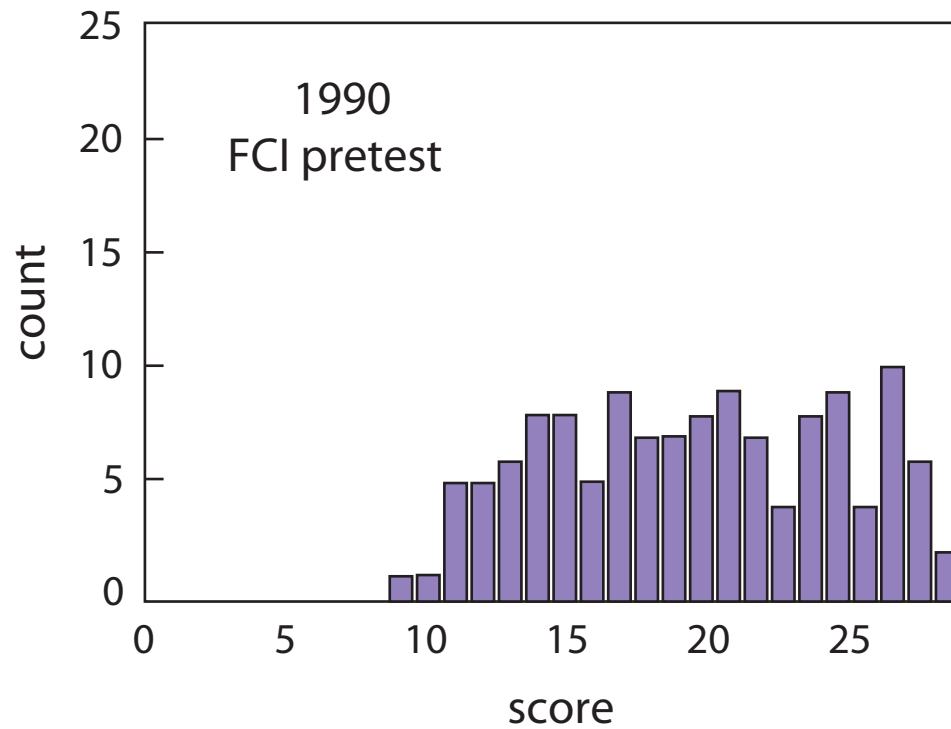
# Education

lectures focus on delivery of information



# Education

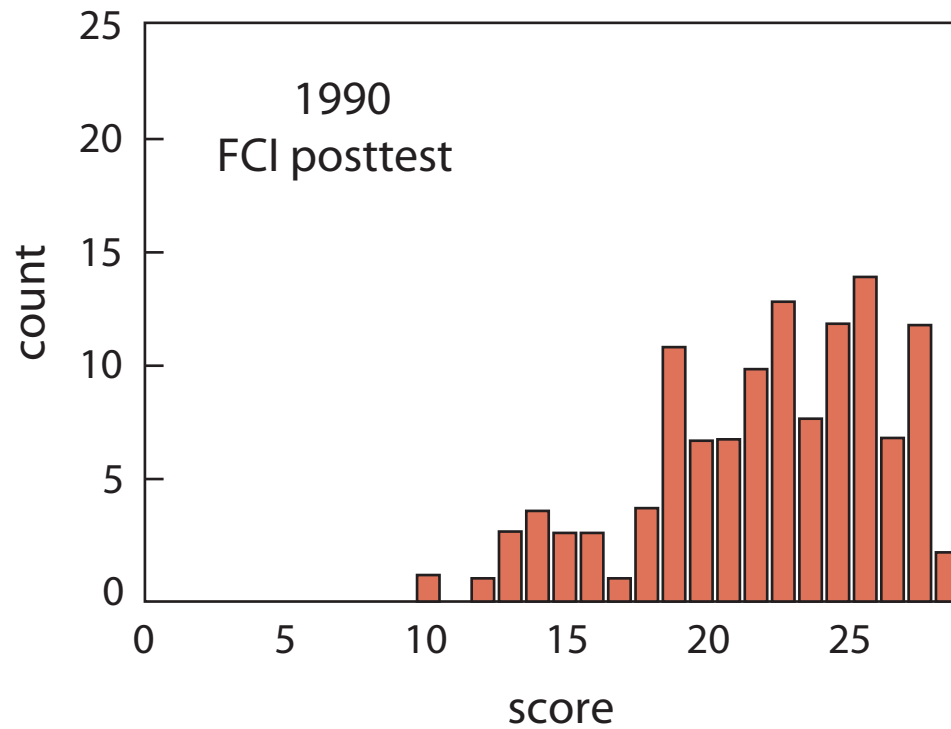
education is not just information transfer





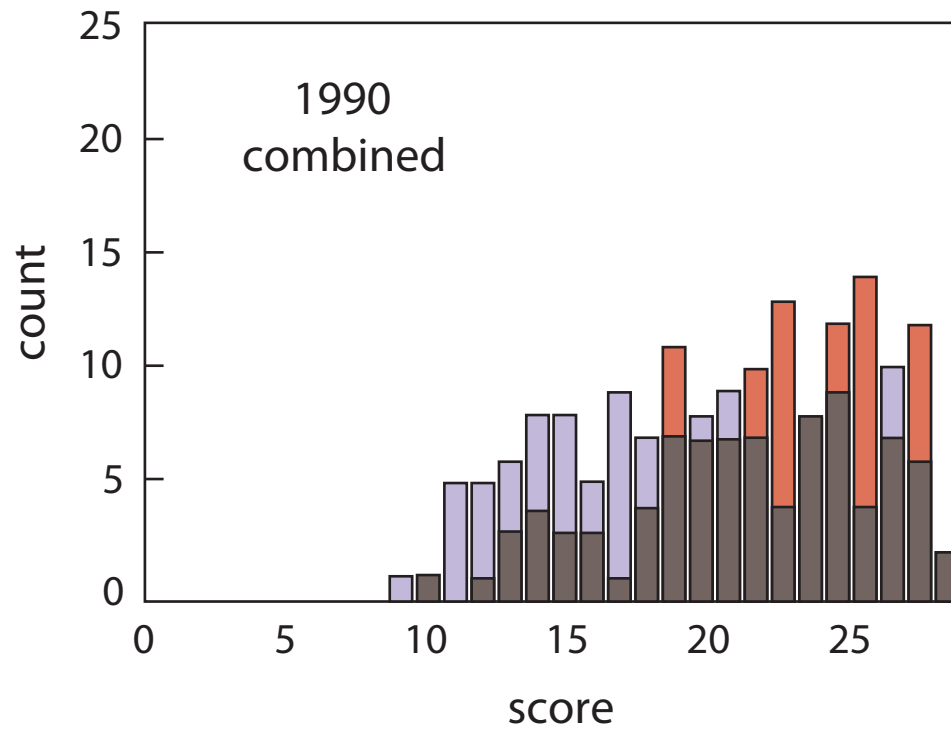
# Education

education is not just information transfer

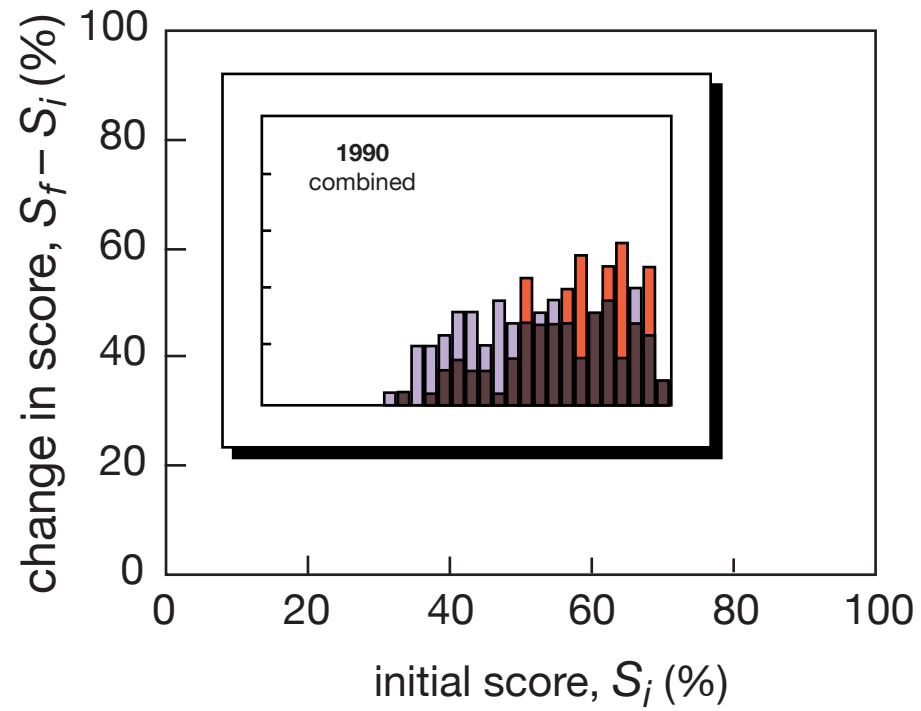


# Education

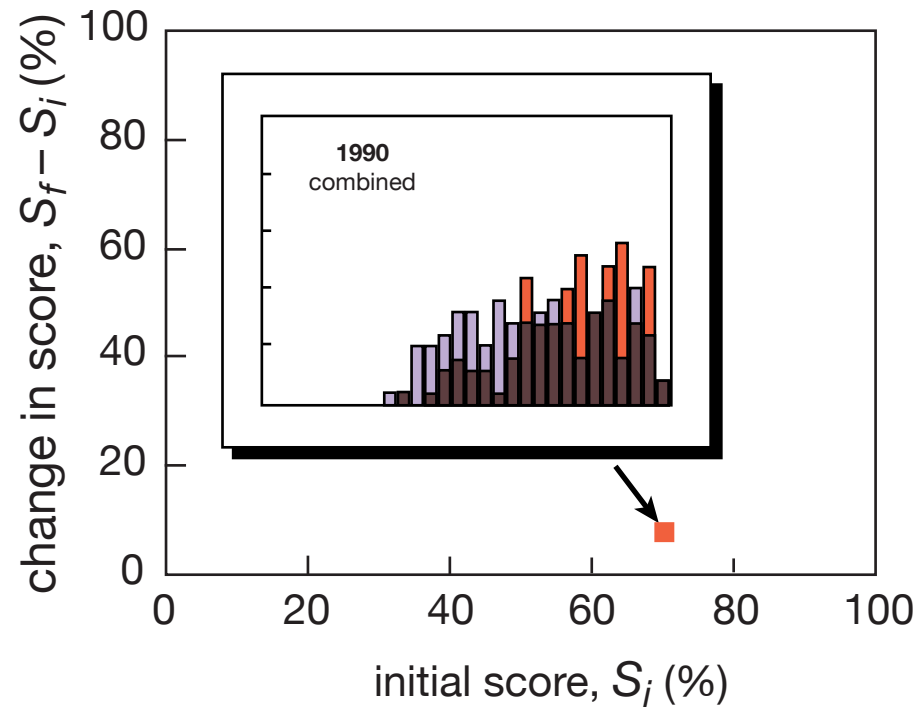
education is not just information transfer



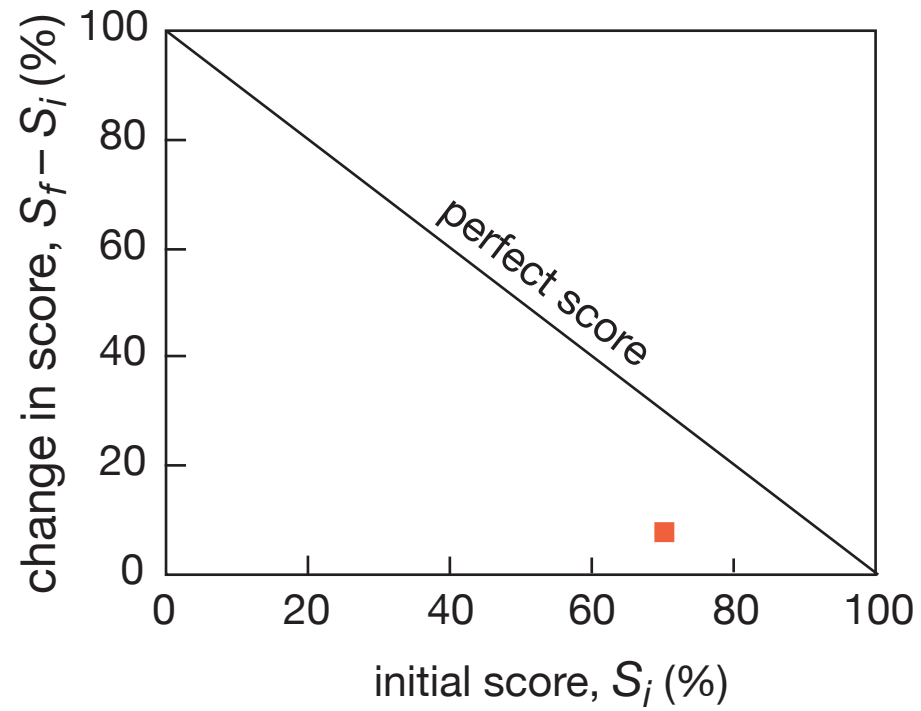
# Education



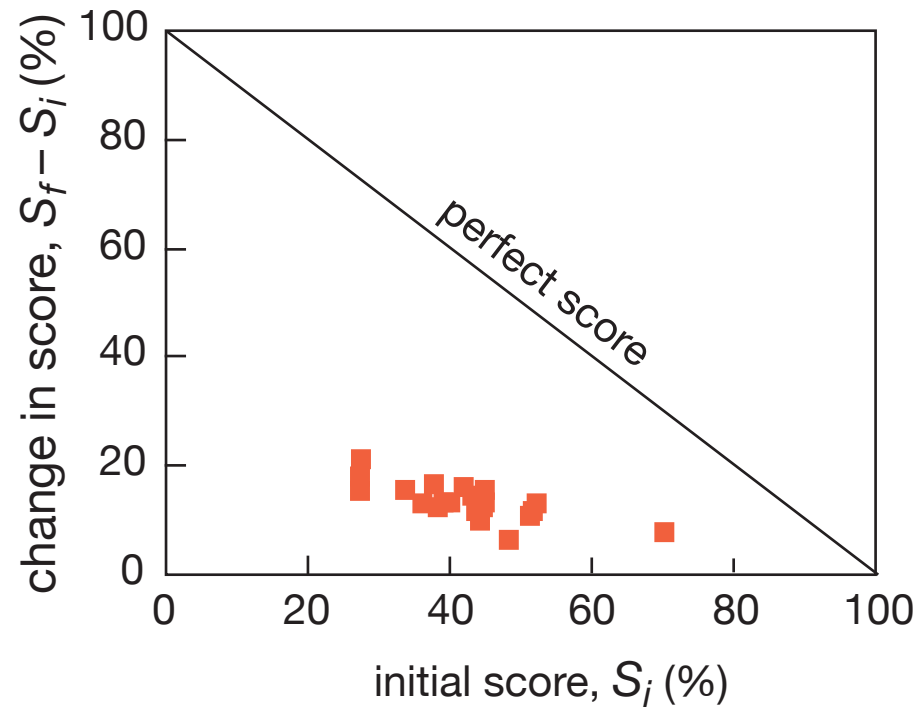
# Education



# Education

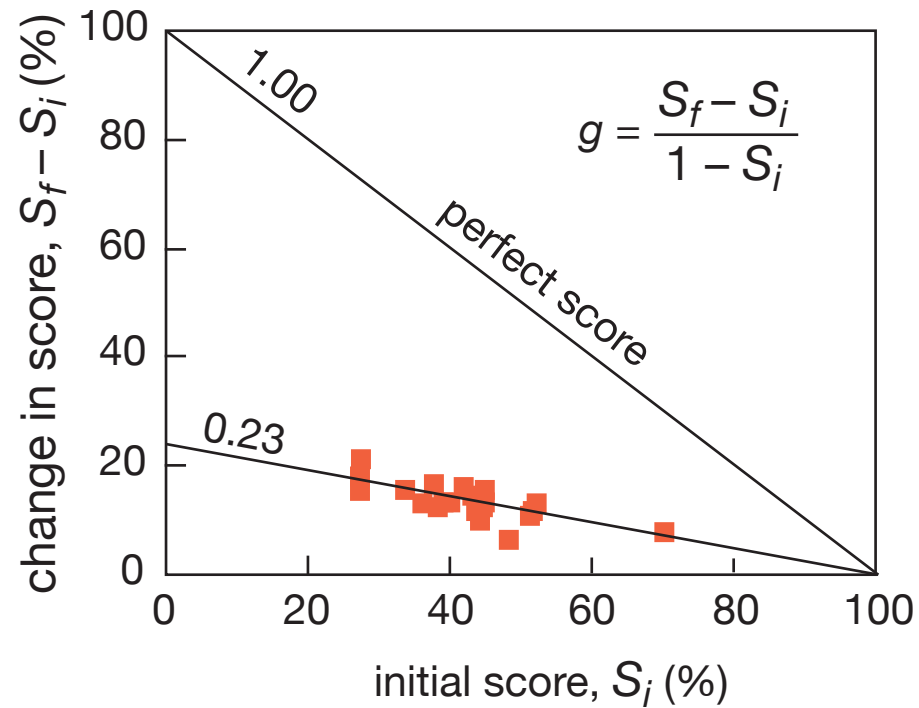


# Education



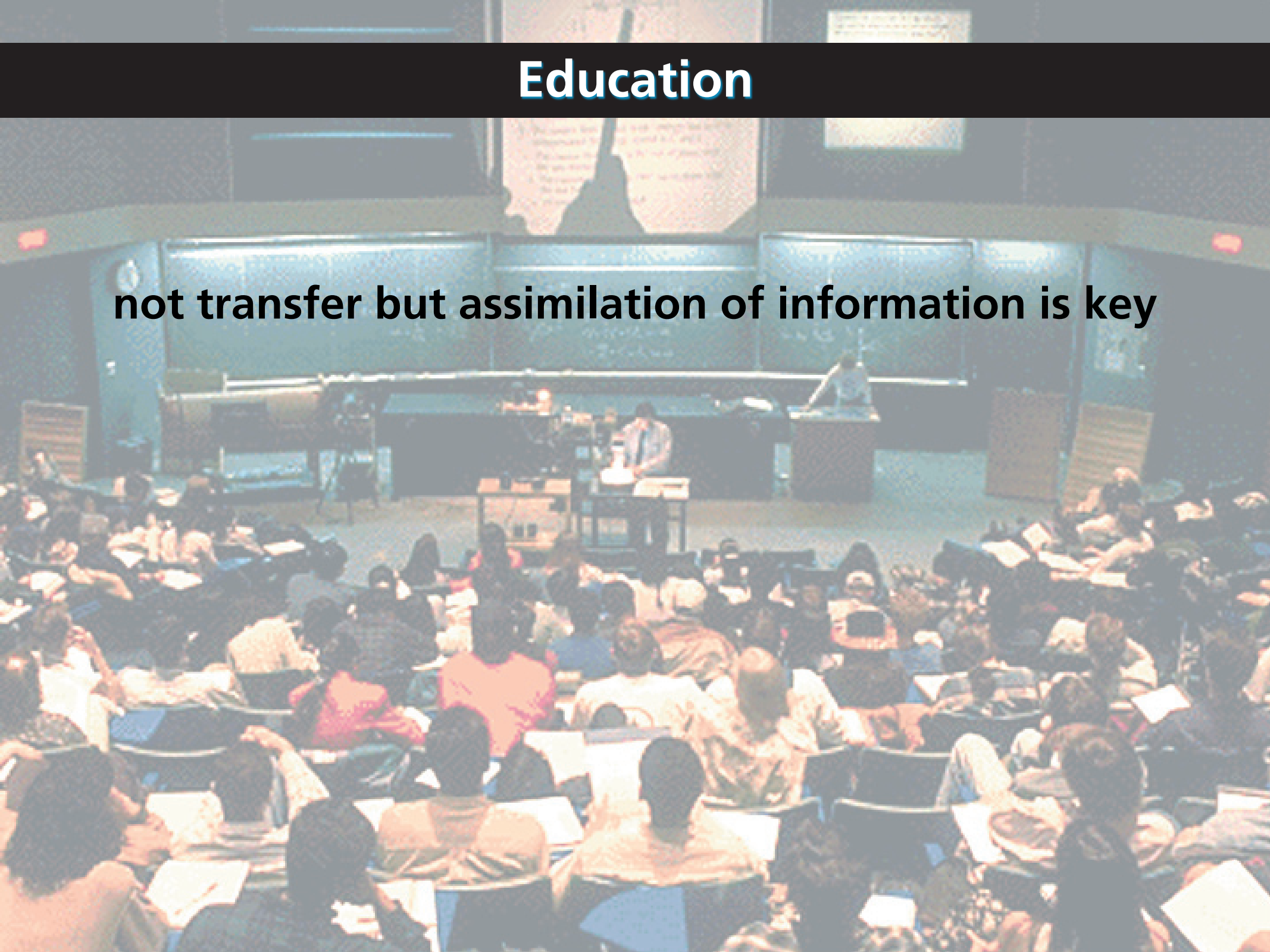
# Education

only one quarter of maximum gain realized



# Education

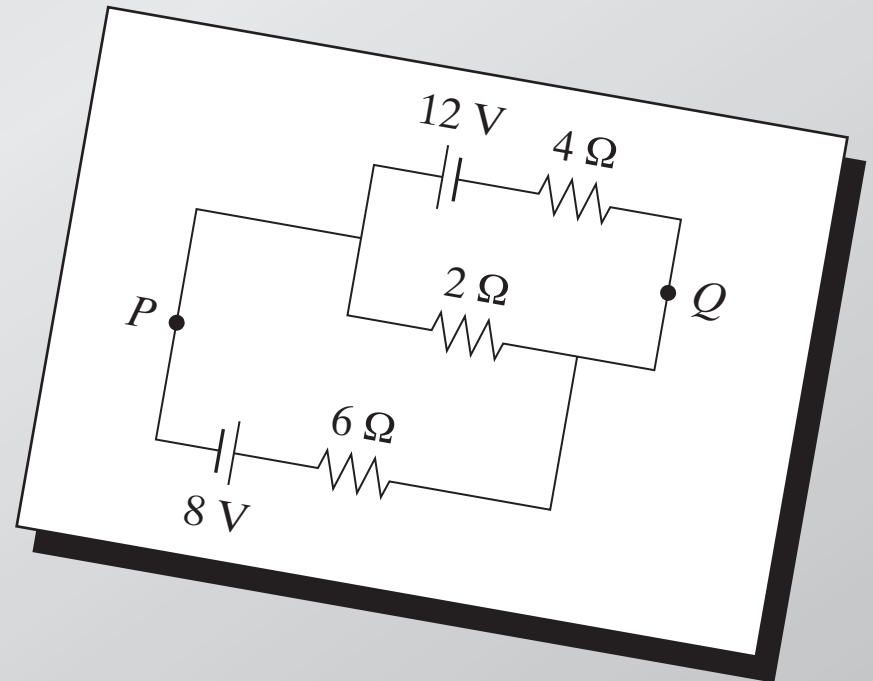
**not transfer but assimilation of information is key**





# Education

conventional problems misleading



# Education

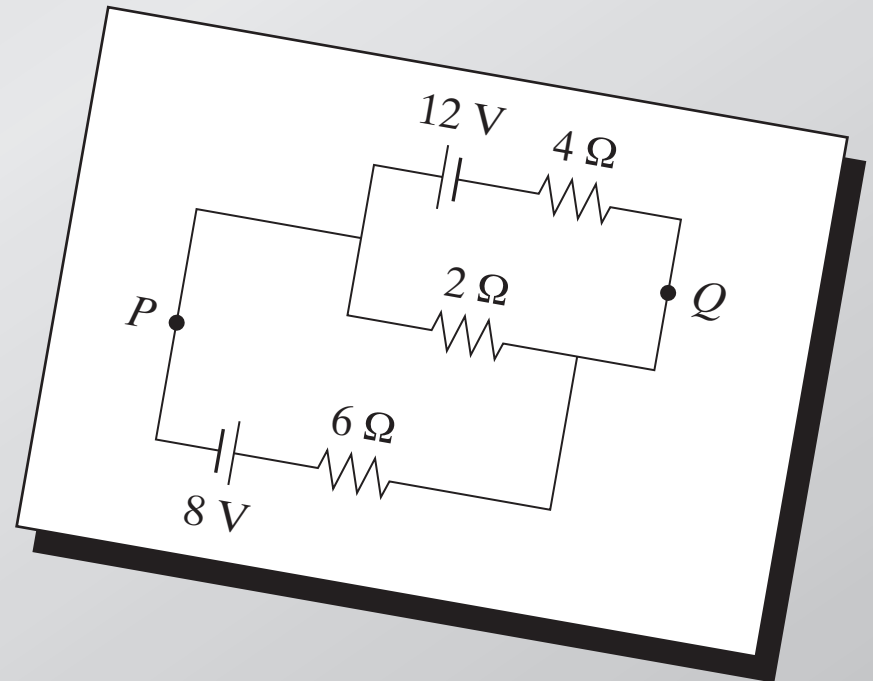
conventional problems misleading

Calculate:

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

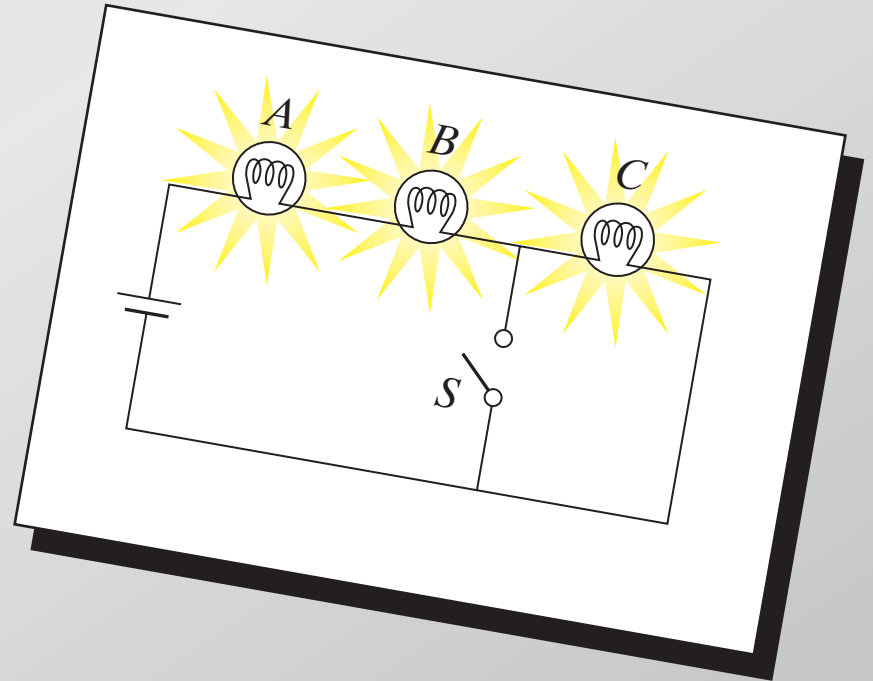
(b) potential difference

between  $P$  and  $Q$



# Education

are the basic principles understood?

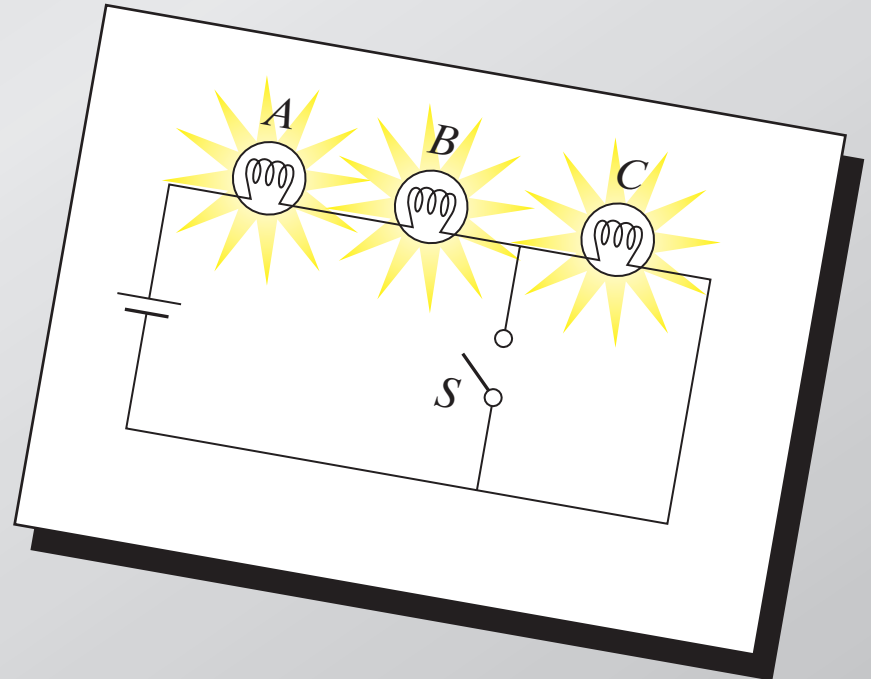


# Education

are the basic principles understood?

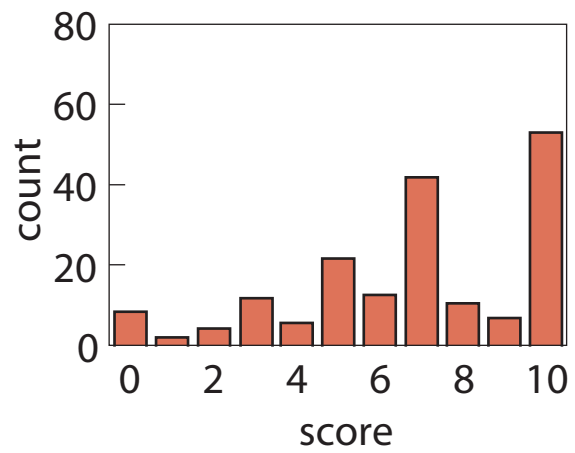
When  $S$  is closed, what happens to:

- (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?

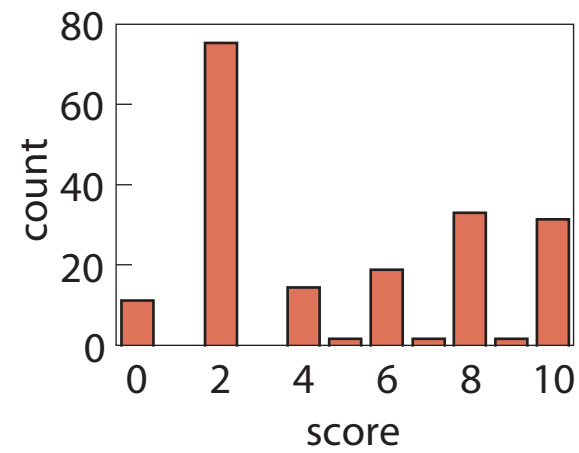


# Education

## conventional

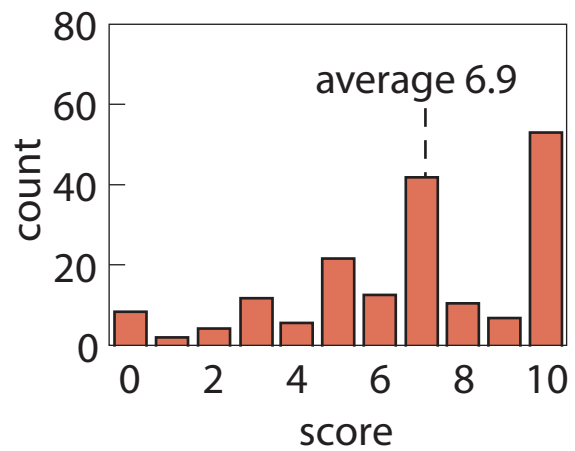


## conceptual

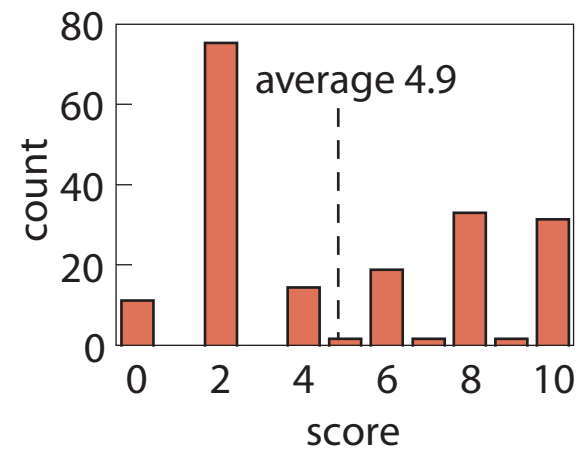


# Education

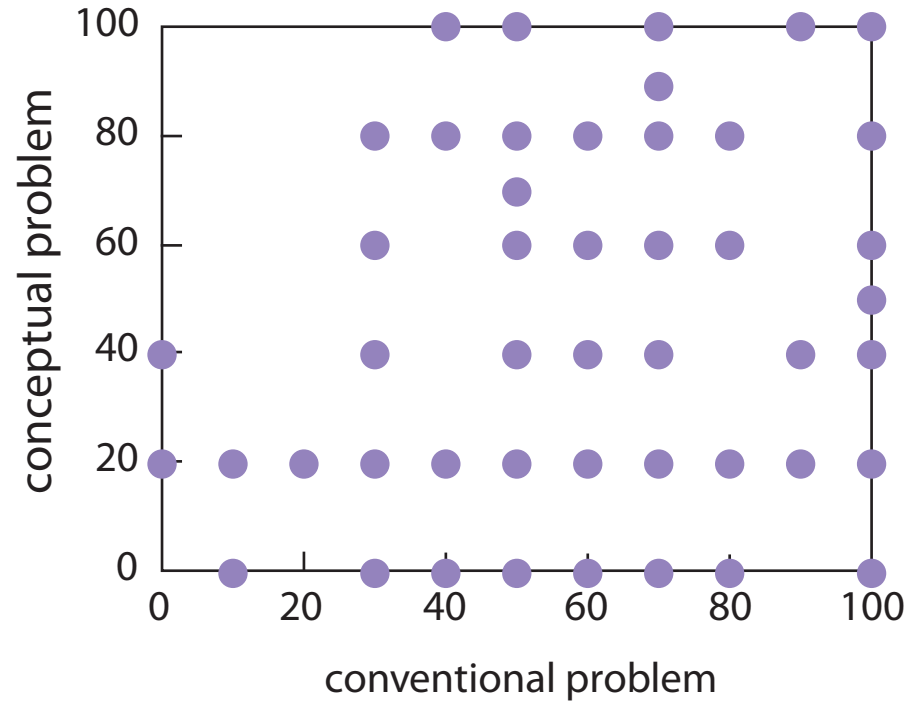
## conventional



## 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...**

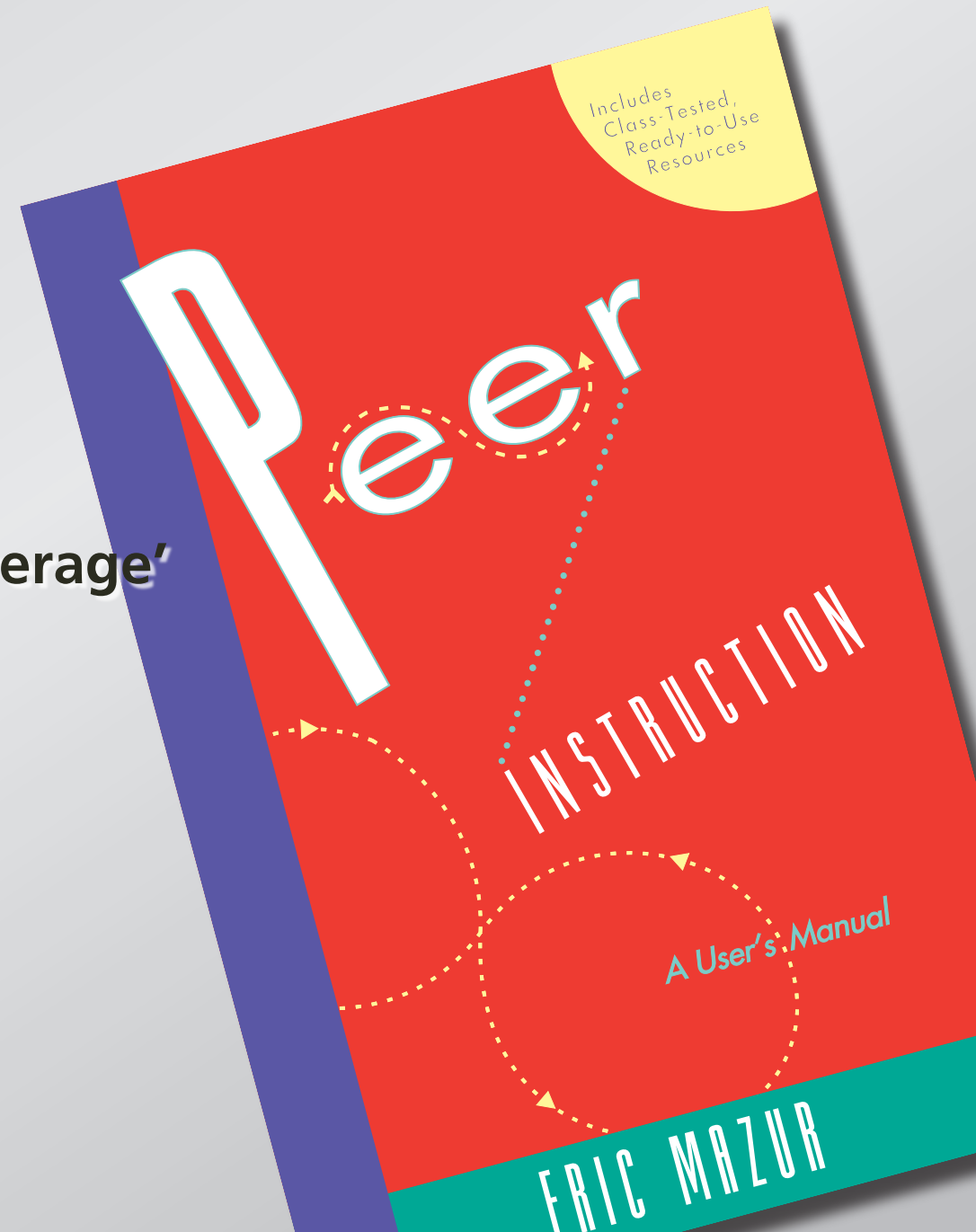
# Peer Instruction

**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:**

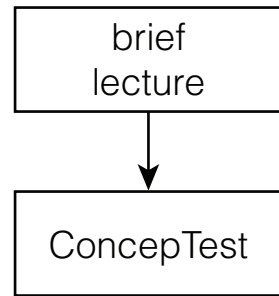
- 1. Question**
- 2. Thinking**
- 3. Individual answer**
- 4. Peer discussion**
- 5. Revised/Group answer**
- 6. Explanation**



# Peer Instruction

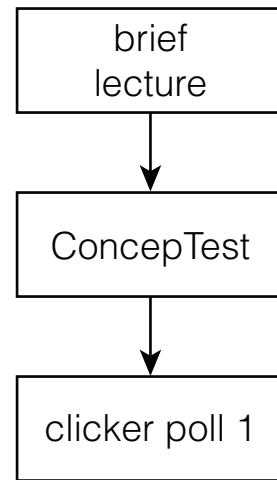
brief  
lecture

# Peer Instruction

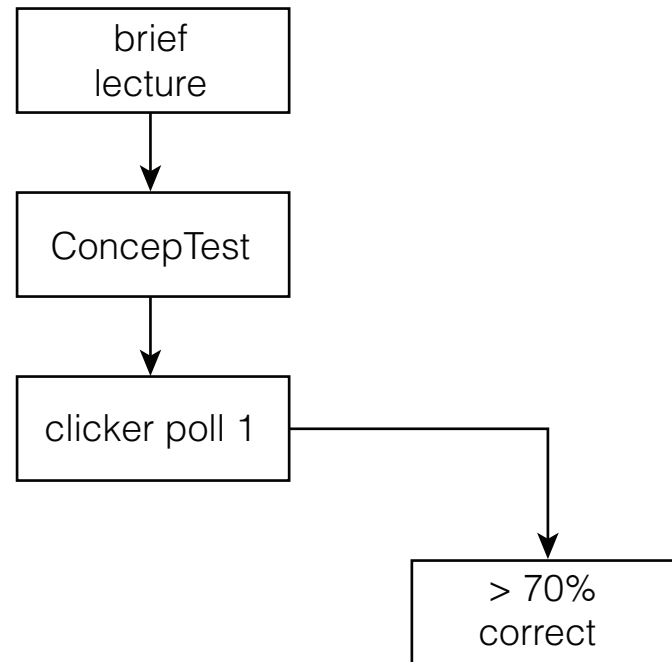




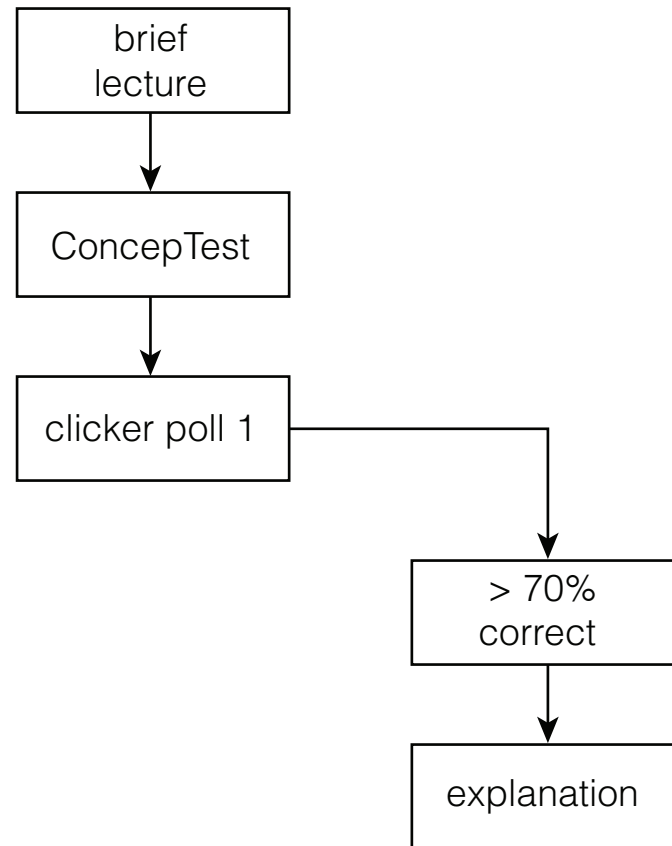
# Peer Instruction



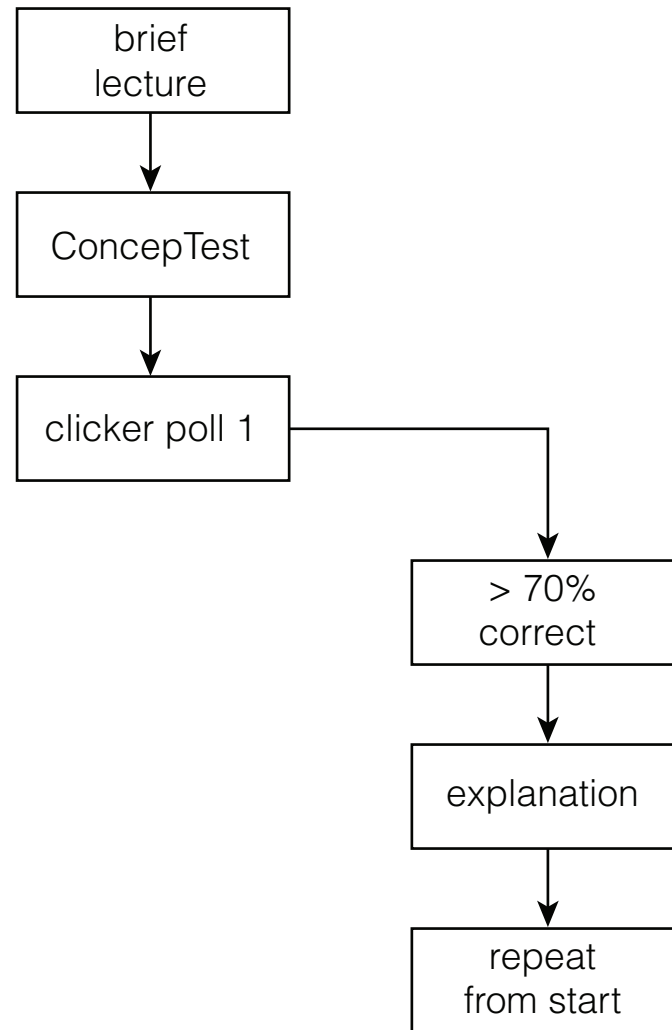
# Peer Instruction



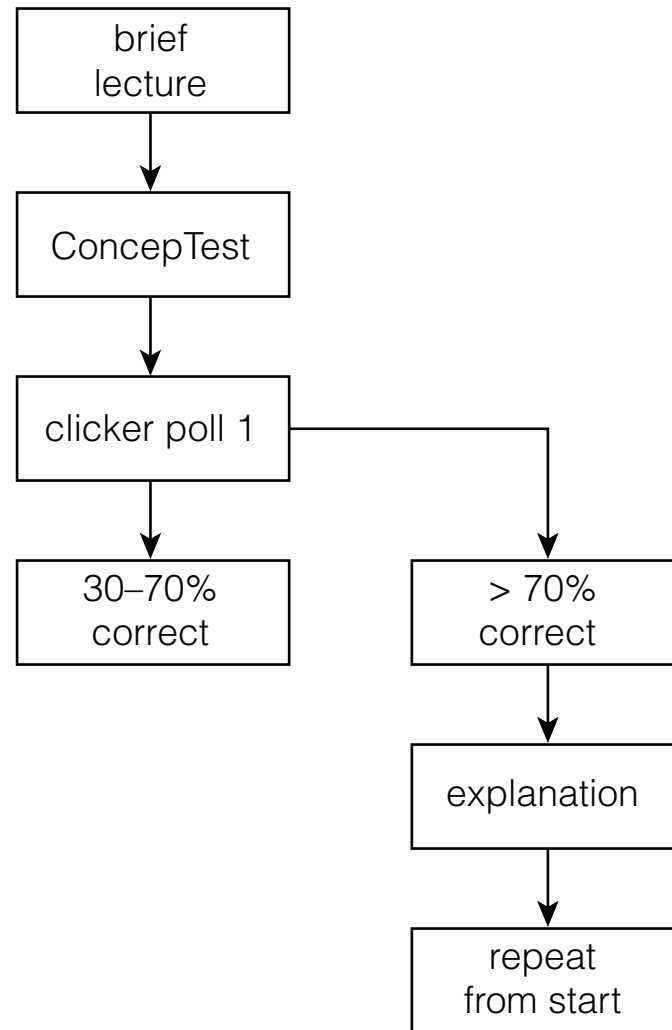
# Peer Instruction



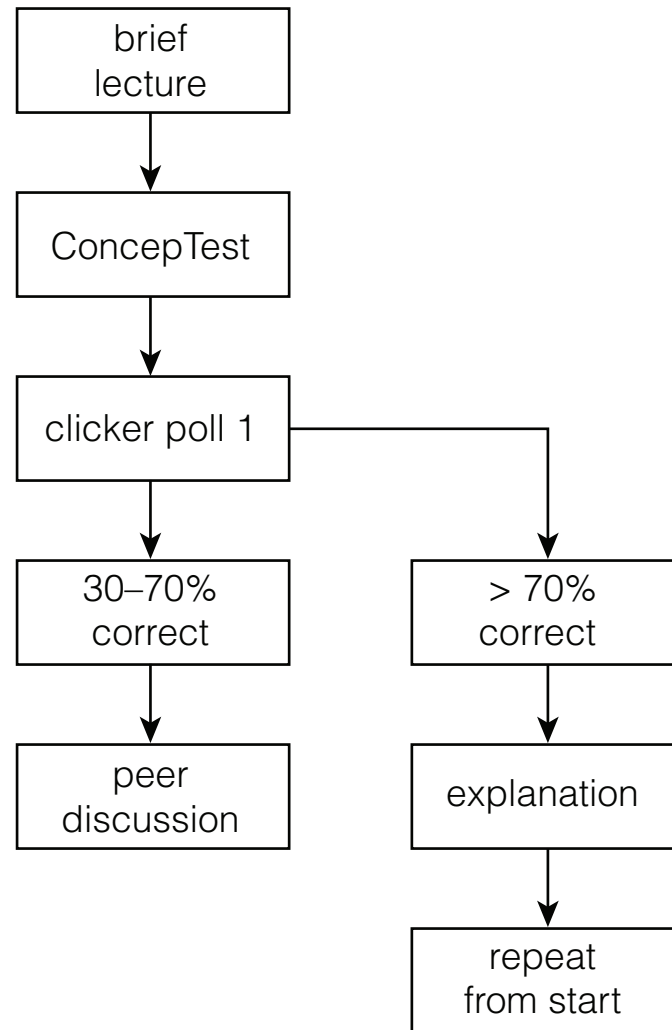
# Peer Instruction



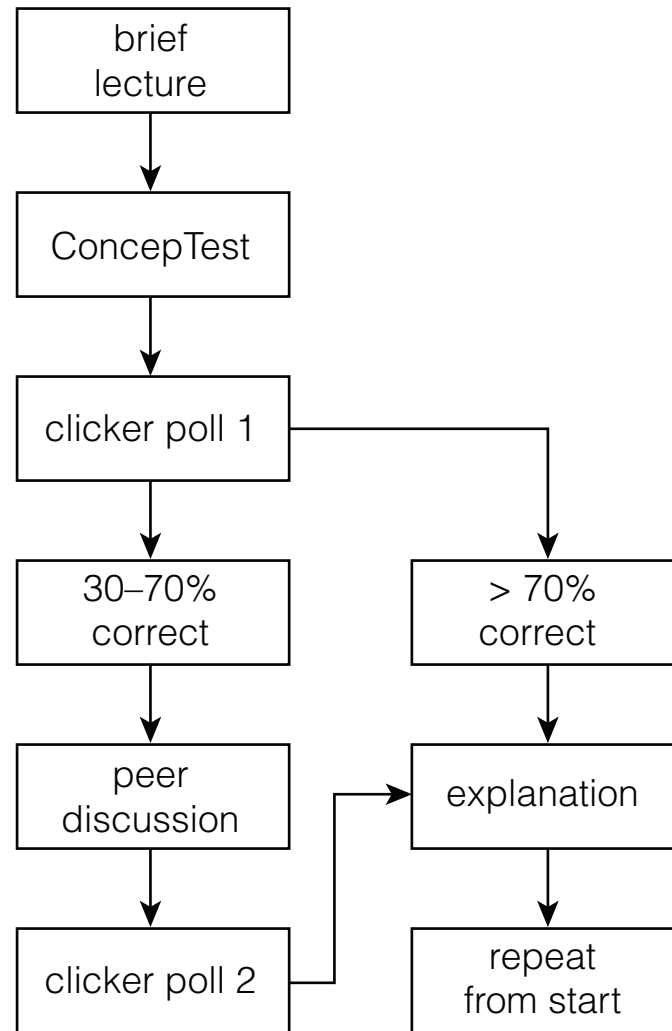
# Peer Instruction



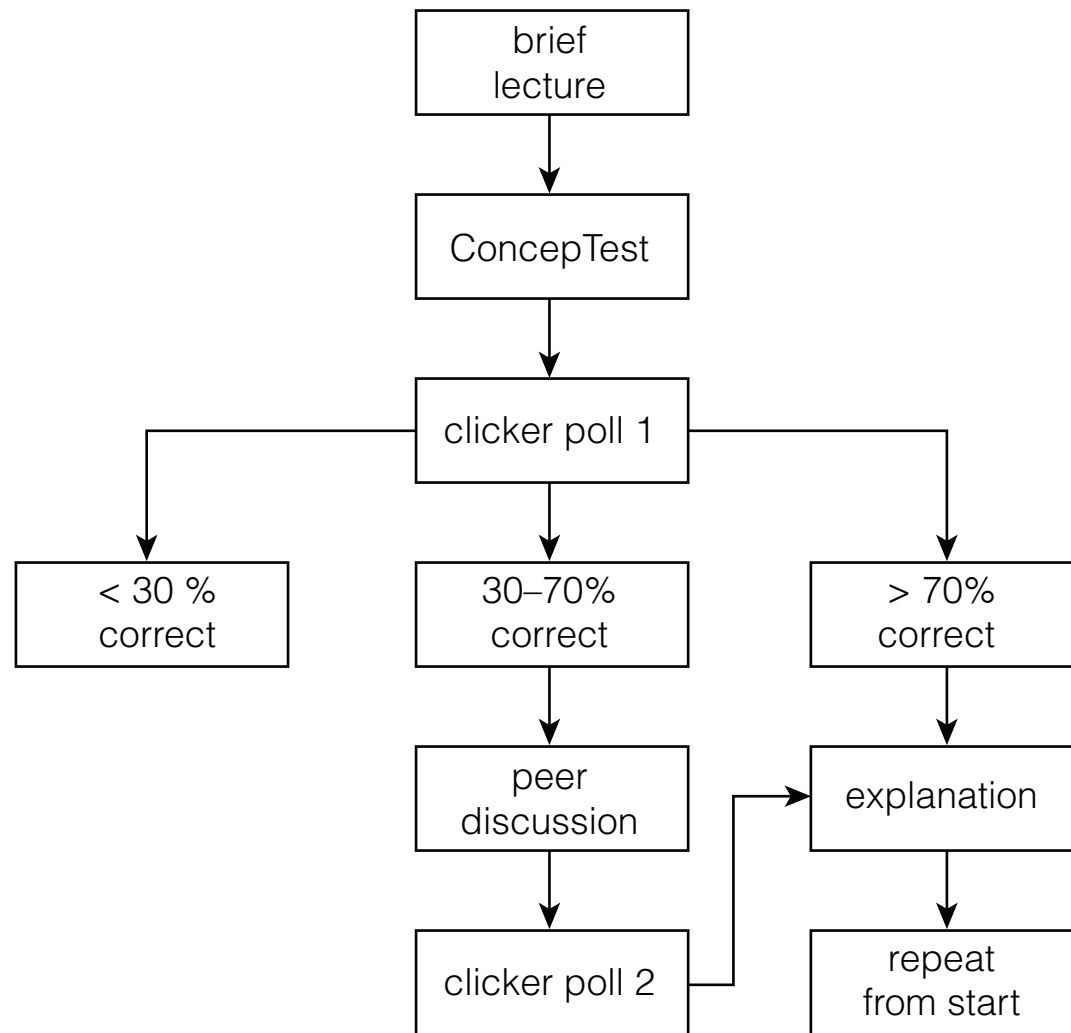
# Peer Instruction



# Peer Instruction

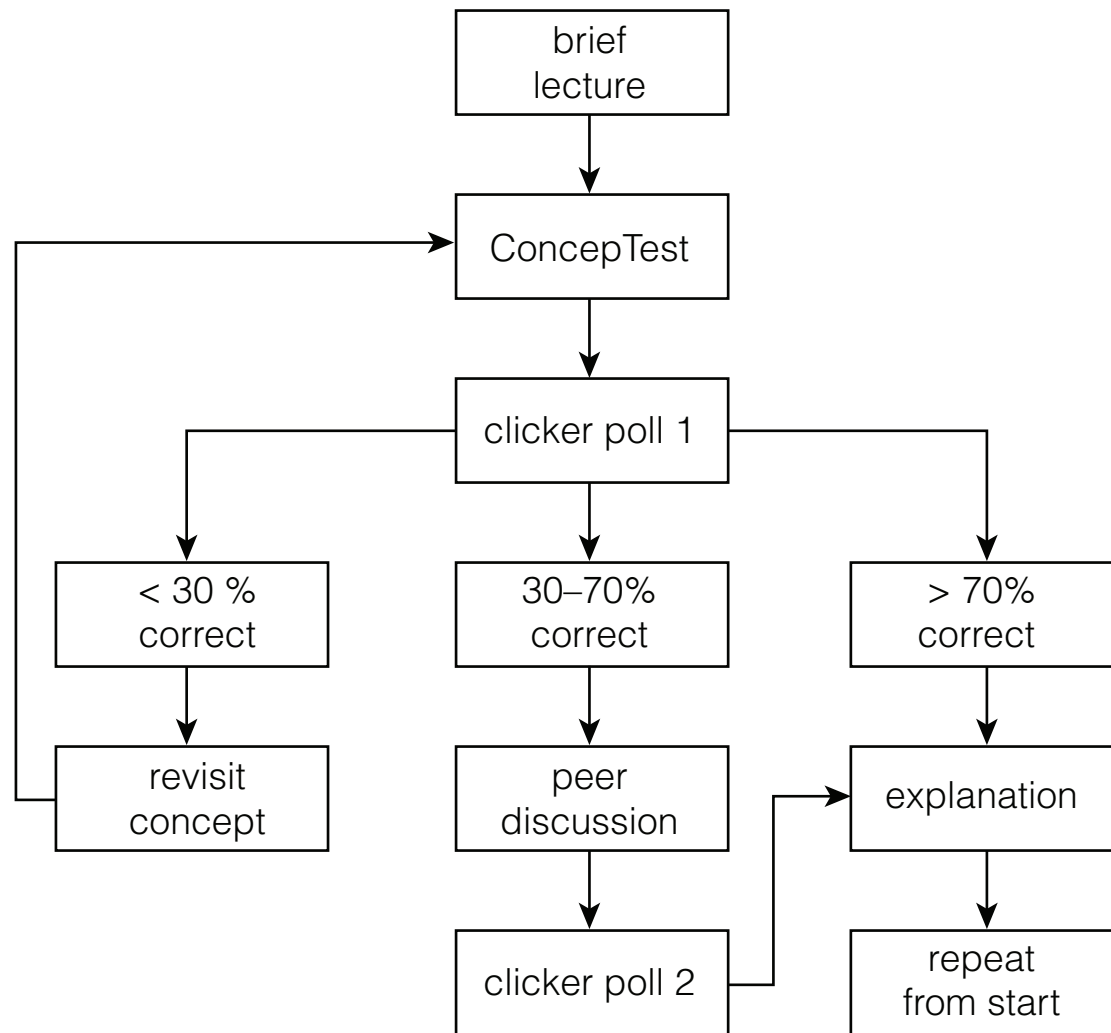


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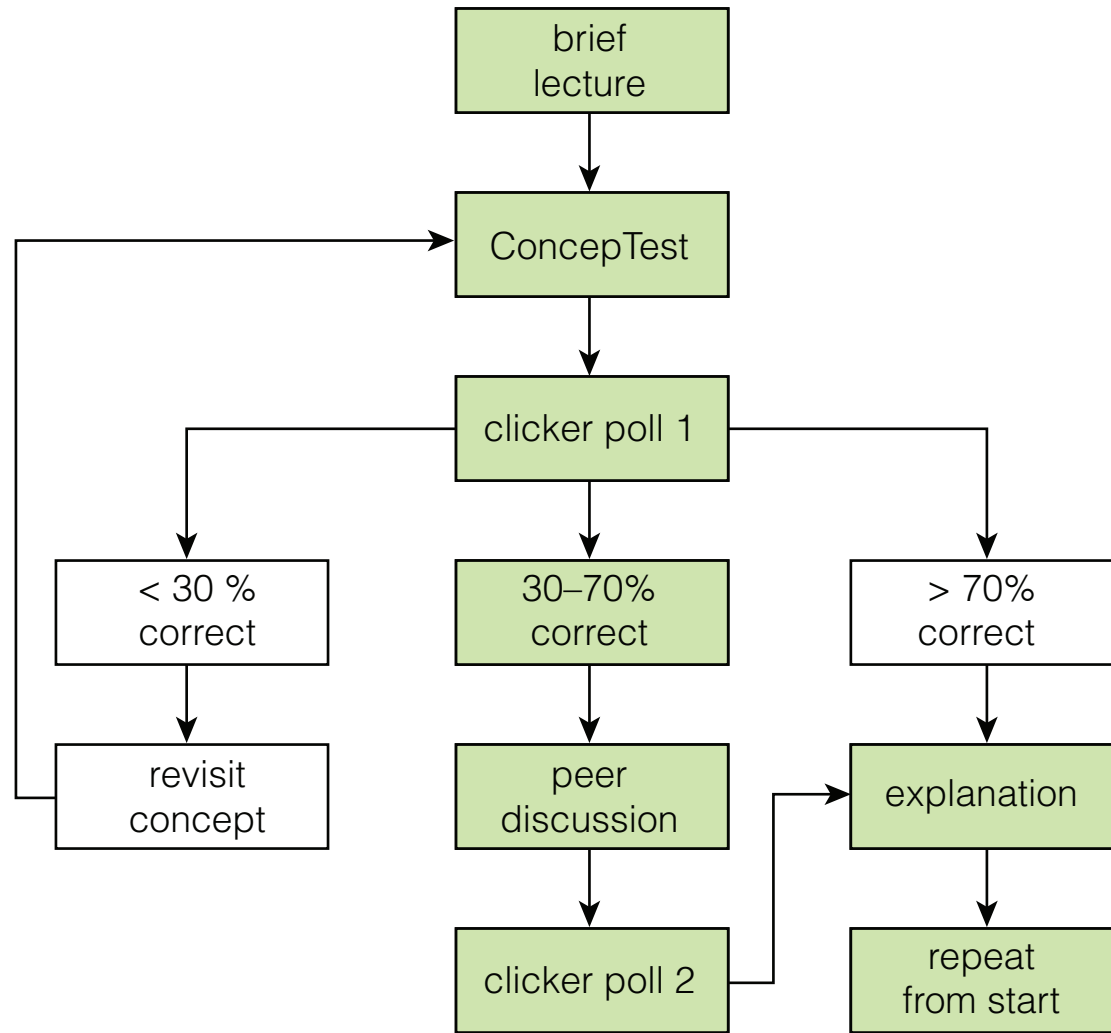




# Peer Instruction



# Peer Instruction



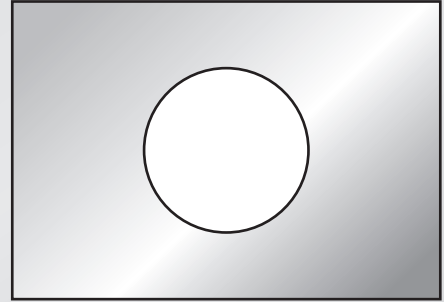
# Get your clickers ready!



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

# Let's try it!

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

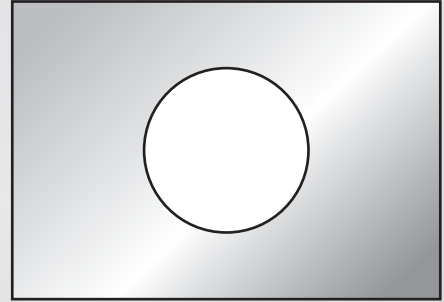


# Let's try it!

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.

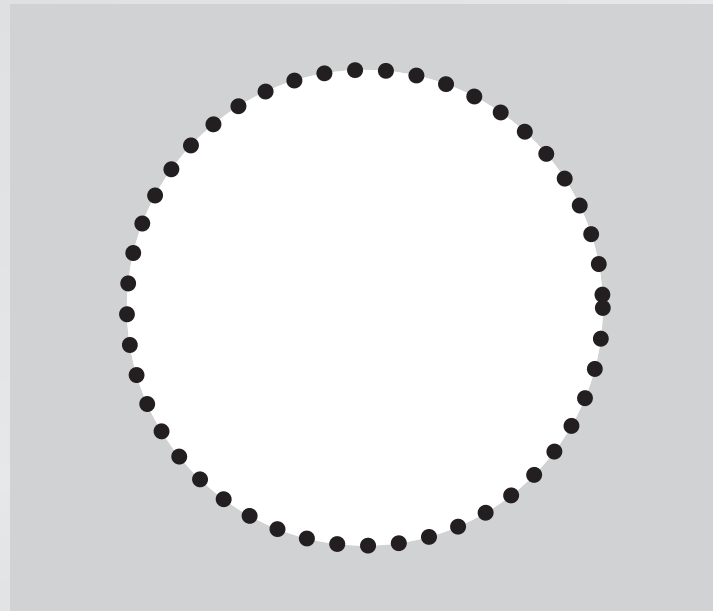


**Let's try it!**

*It's easy to fire up the audience!*

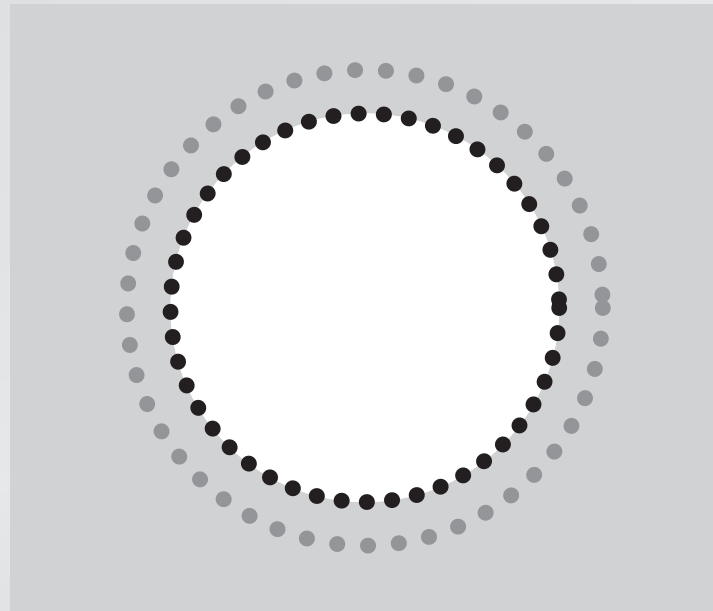
# Let's try it!

consider the atoms at the rim of the hole



# Let's try it!

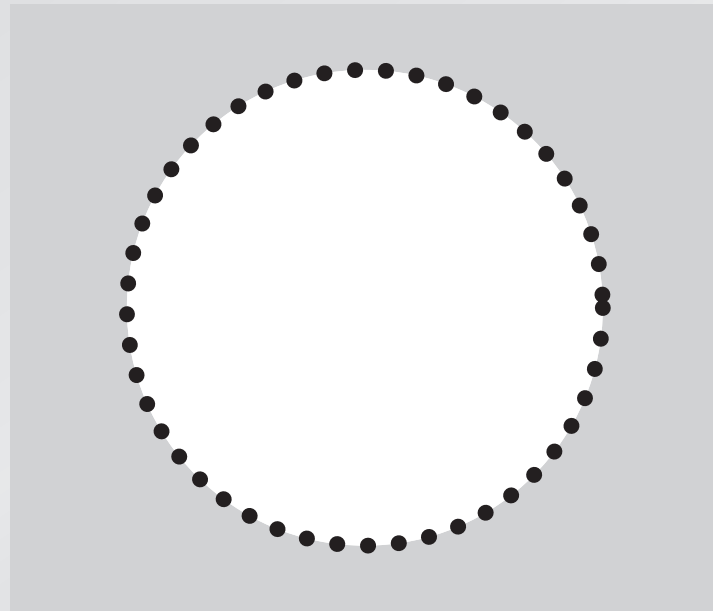
consider the atoms at the rim of the hole





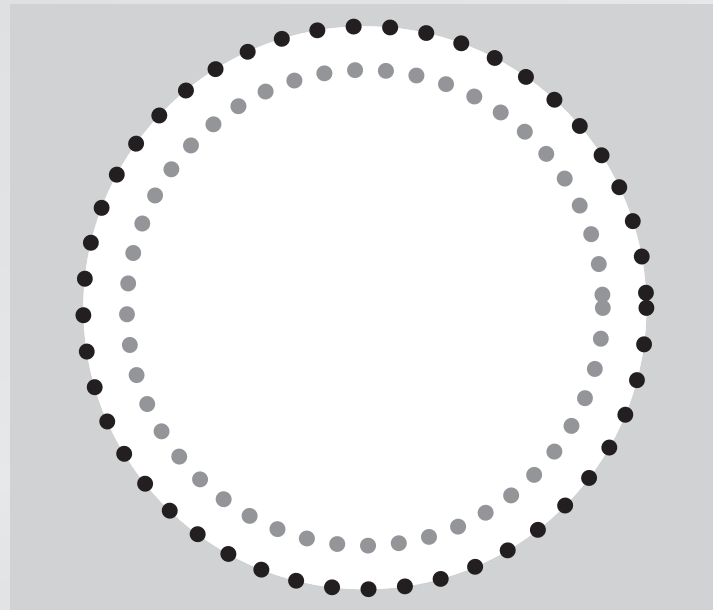
# Let's try it!

consider the atoms at the rim of the hole



# Let's try it!

consider the atoms at the rim of the hole



# 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!

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?

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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

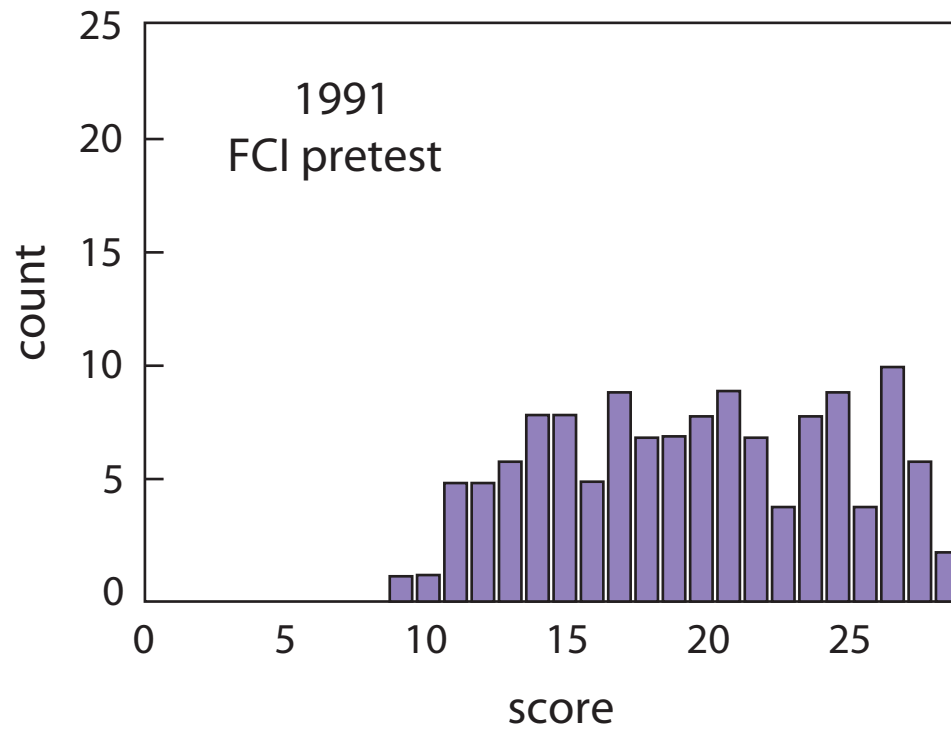
**need to test mental model!**

# Results

**is it any good?**

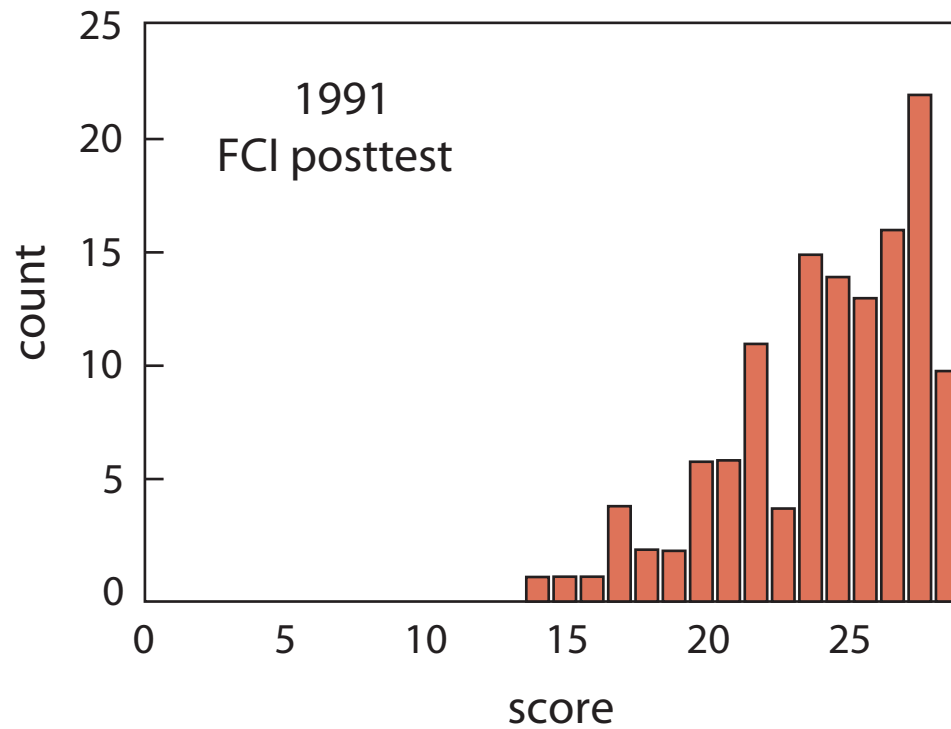
# Results

## first year of implementing PI



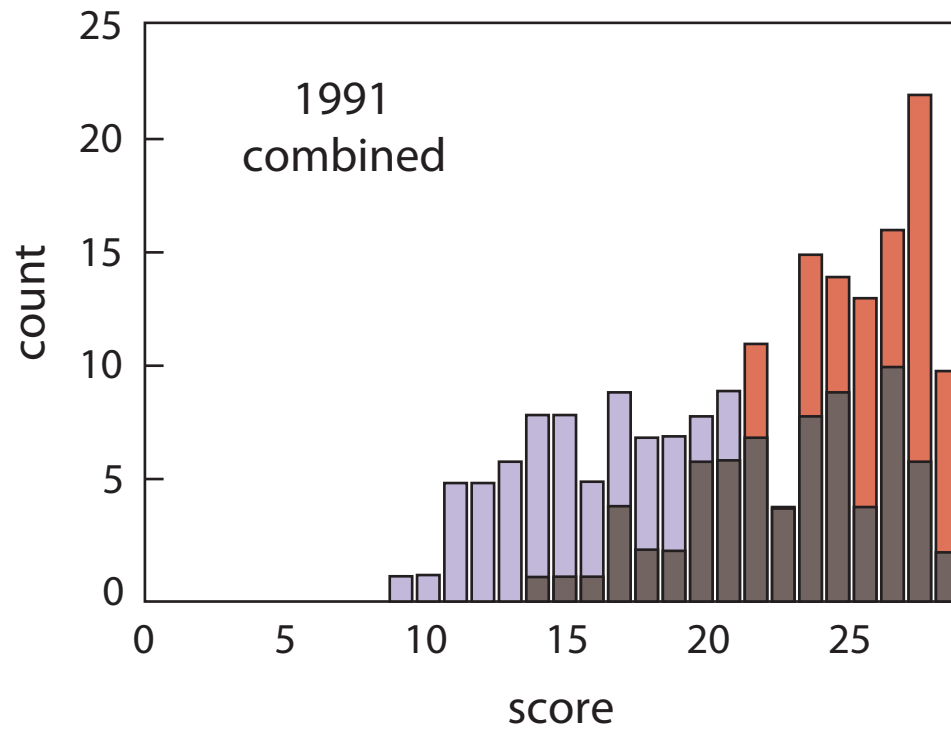
# Results

## first year of implementing PI

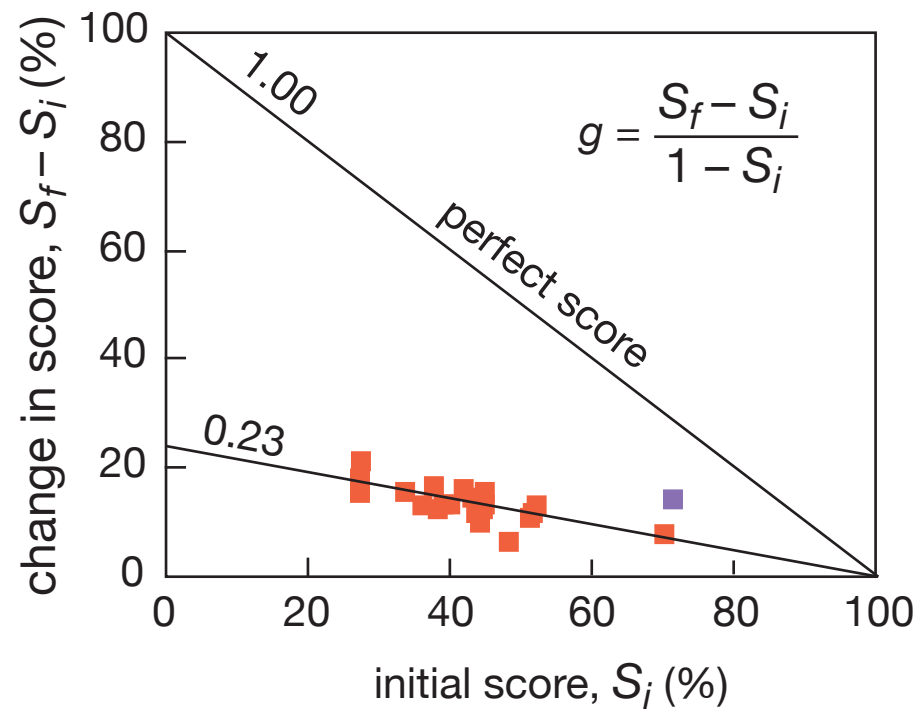


# Results

## first year of implementing PI

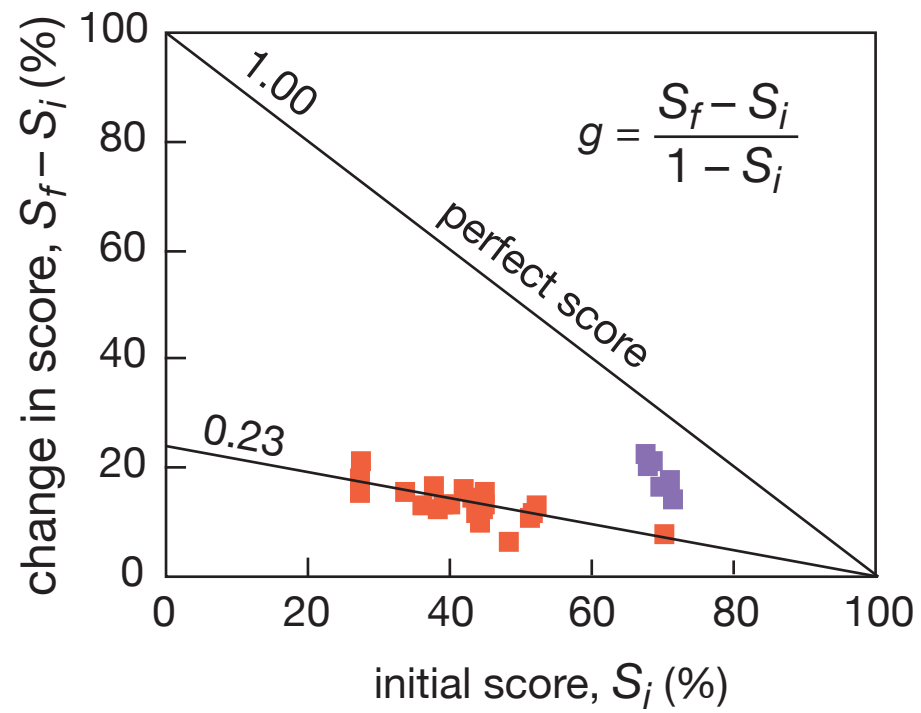


# Results

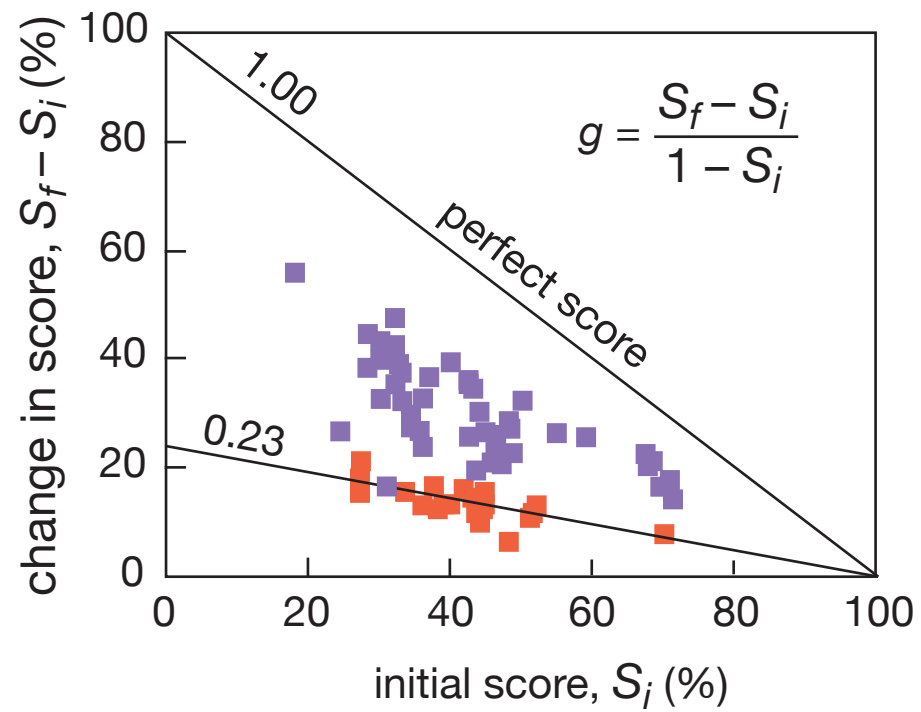




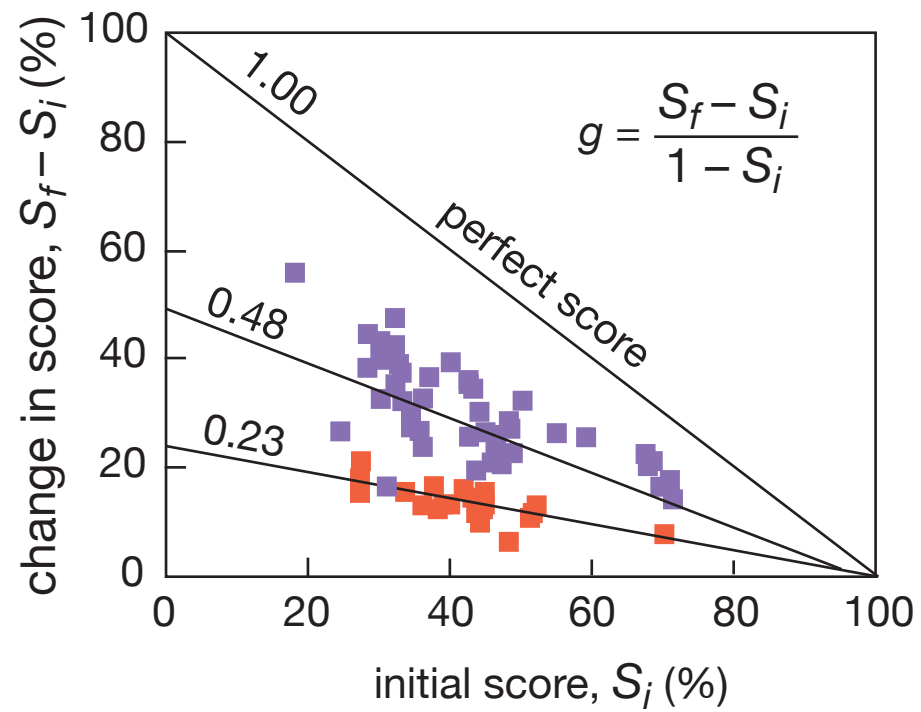
# Results



# Results



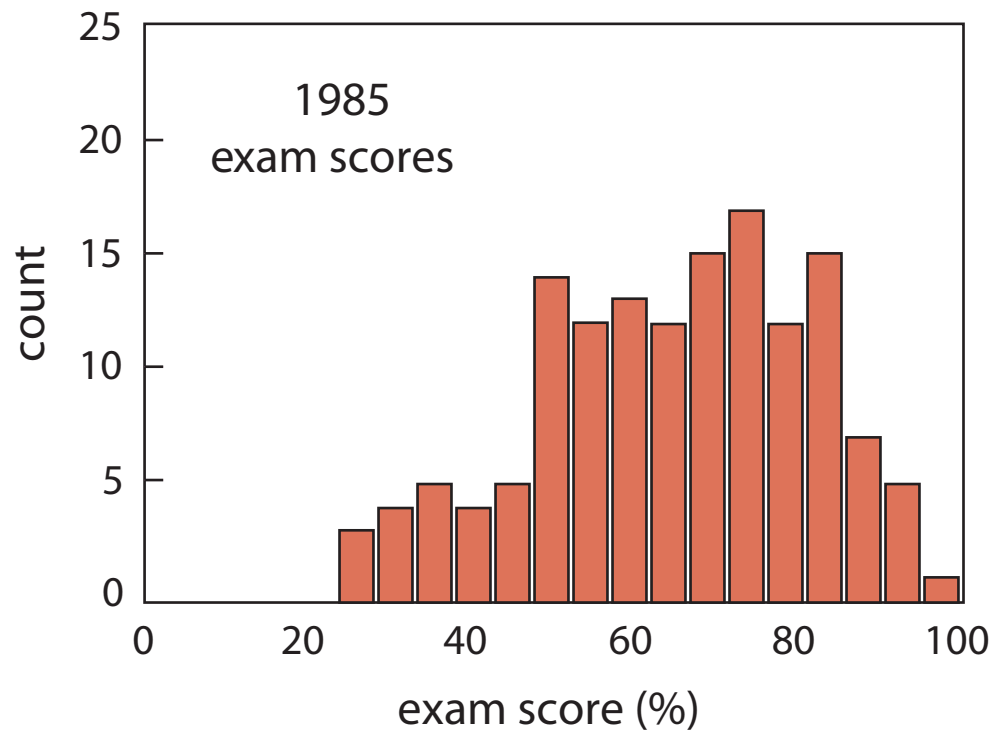
# Results



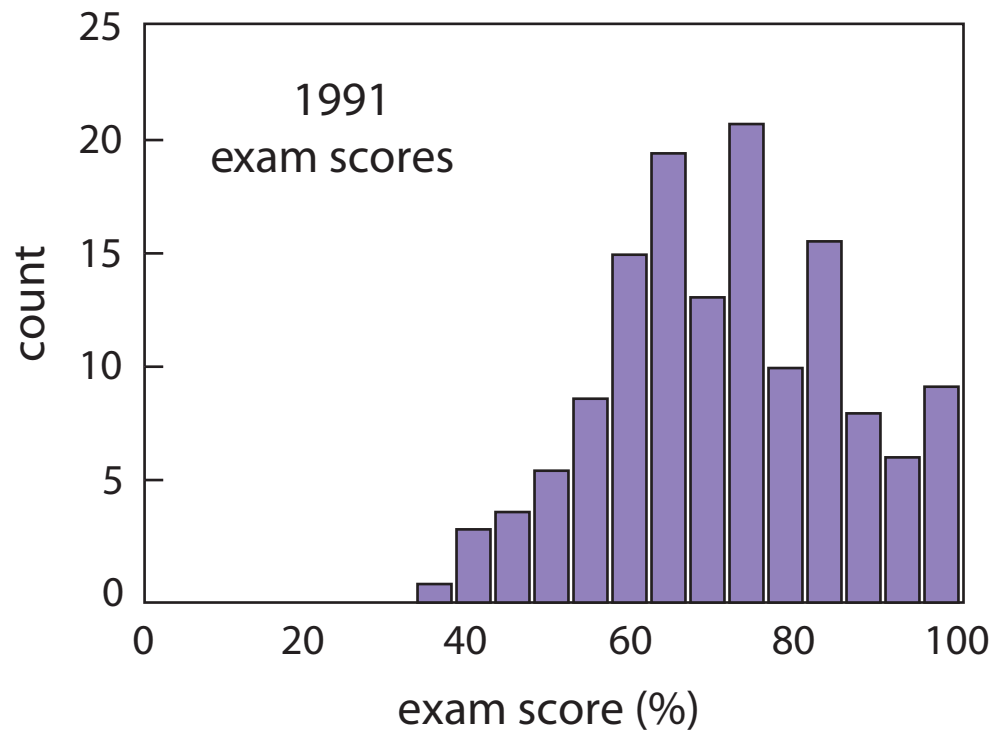
# Results

**what about problem solving?**

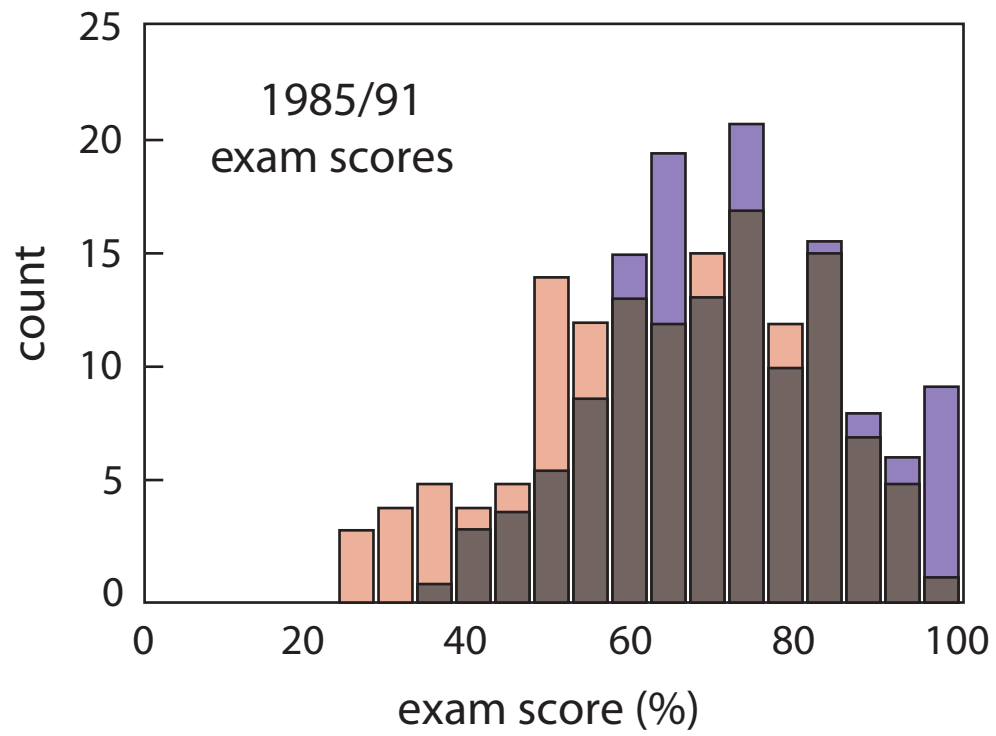
# Results



# 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!)**



# Summary

**Traditional indicators of success misleading**

# Summary

**Traditional indicators of success misleading**

**Education is no longer about information**

**Funding:**

**National Science Foundation**

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