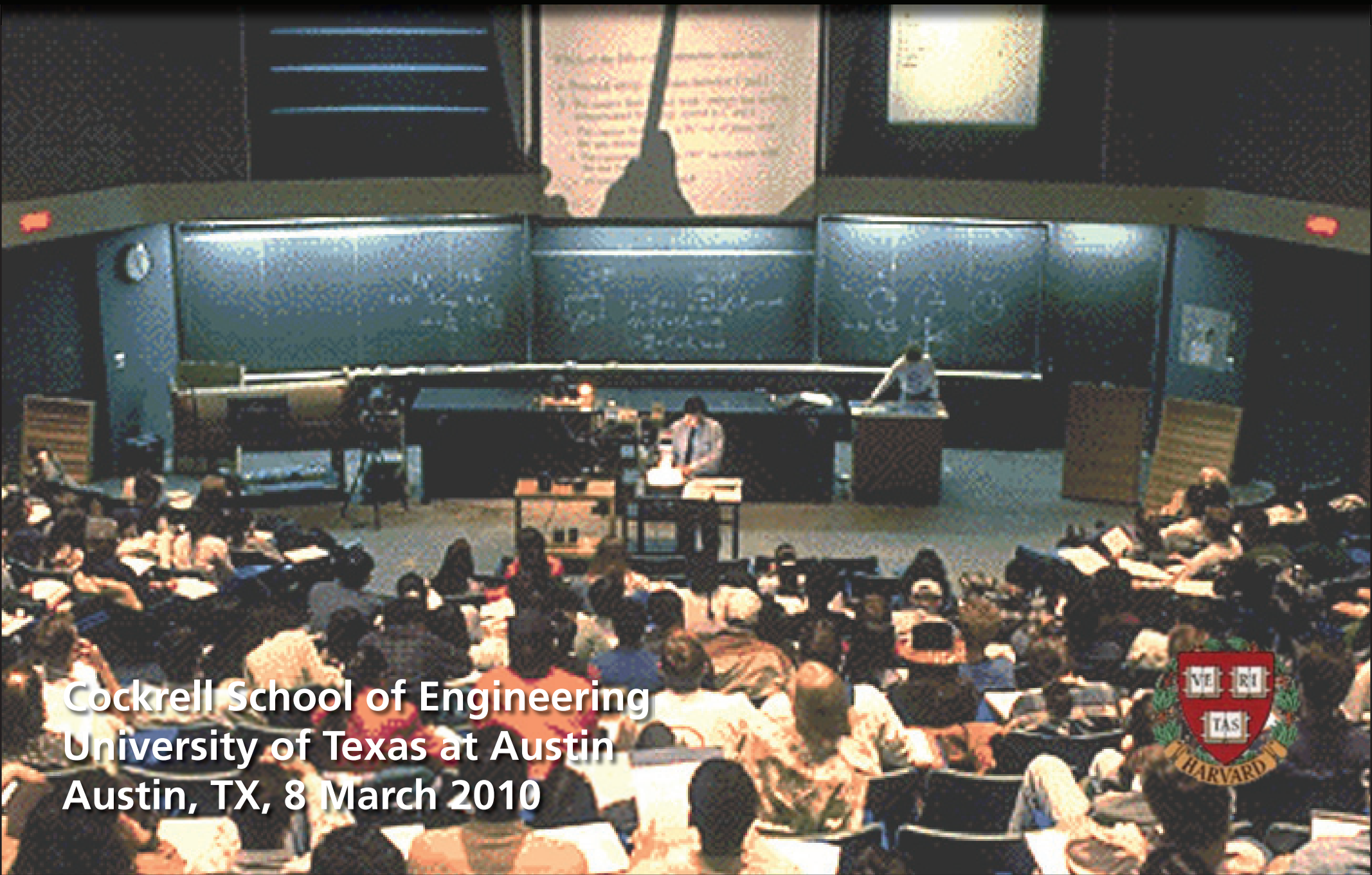


# Memorization or understanding: are we teaching the right thing?

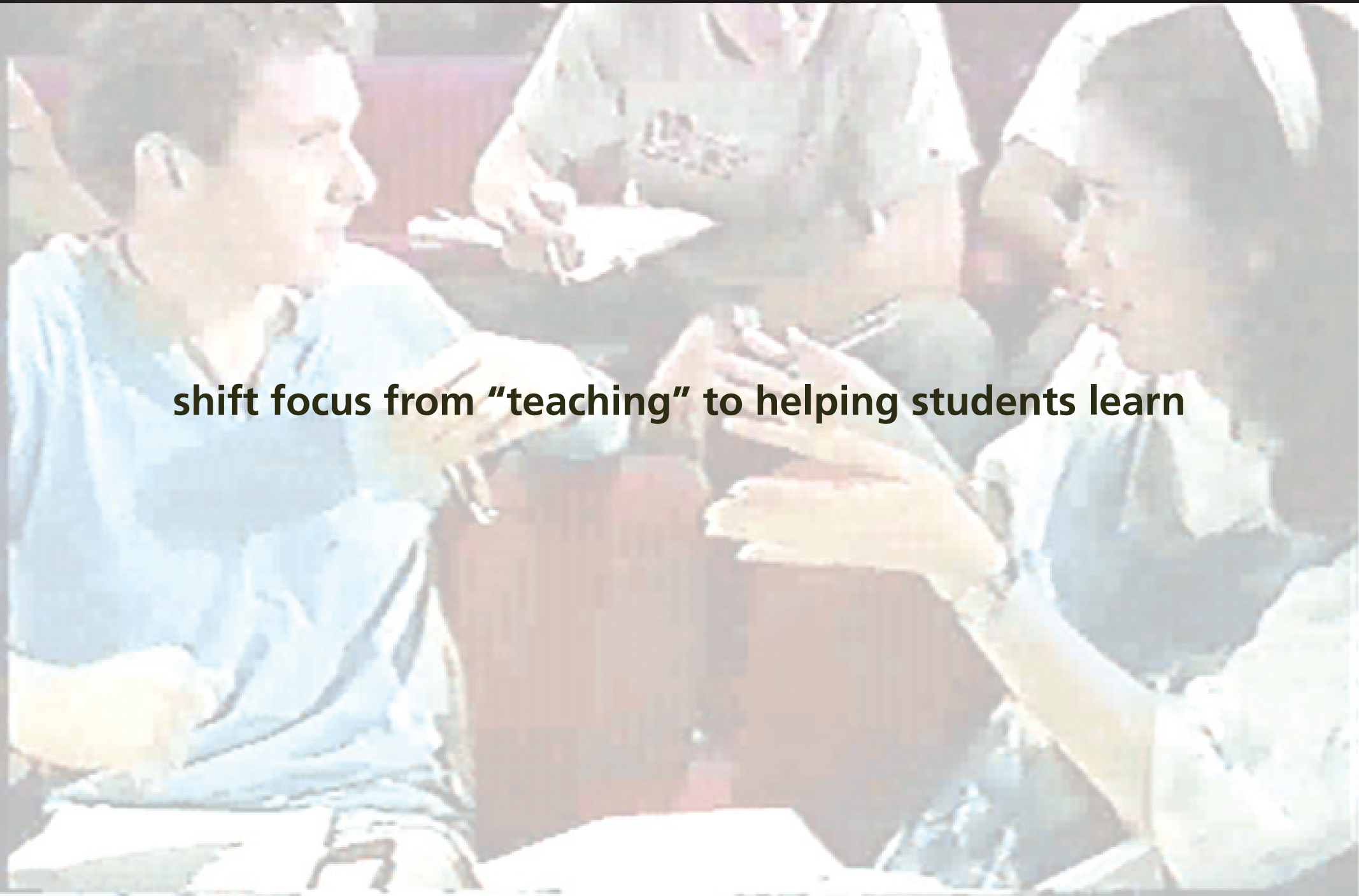


Cockrell School of Engineering  
University of Texas at Austin  
Austin, TX, 8 March 2010



# My message

shift focus from "teaching" to helping students learn



# Outline

- Education



# Outline

- Education
- Peer Instruction



# Outline

- Education
- Peer Instruction
- Results





# Education



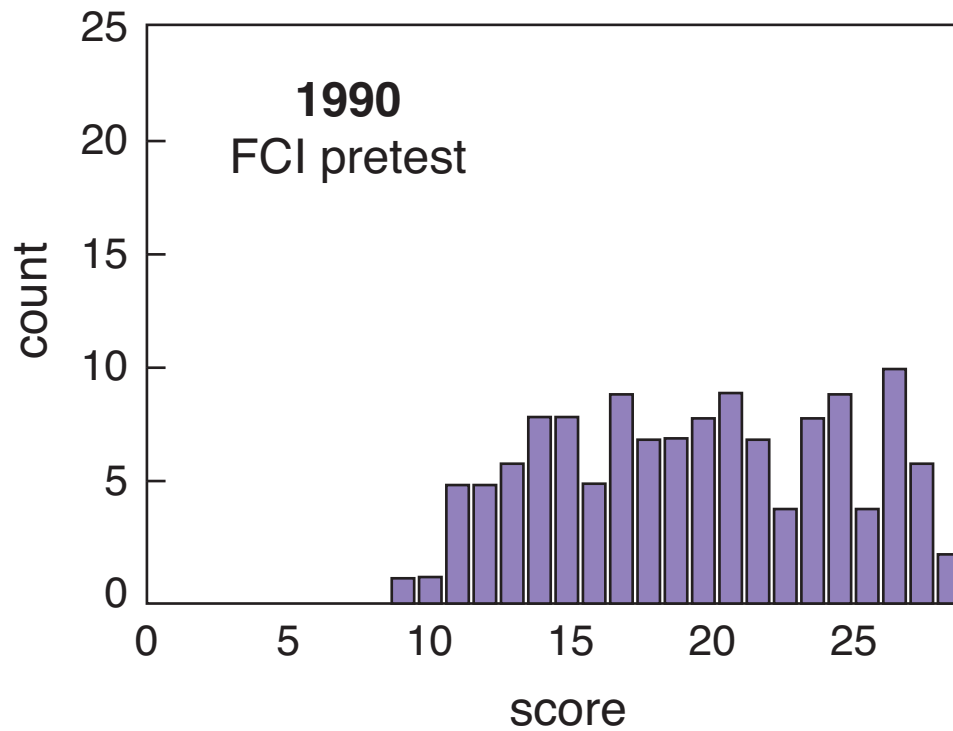
# Education

lectures focus on delivery of information

A wide-angle photograph of a large lecture hall. In the foreground, rows of students are seated at desks, facing the front of the room. Many students have papers or laptops open. At the front of the hall, a lecturer stands behind a podium, addressing the class. The room features a large screen at the front displaying text, and several blackboards. The lighting is bright, and the overall atmosphere is that of a formal educational setting.

# Education

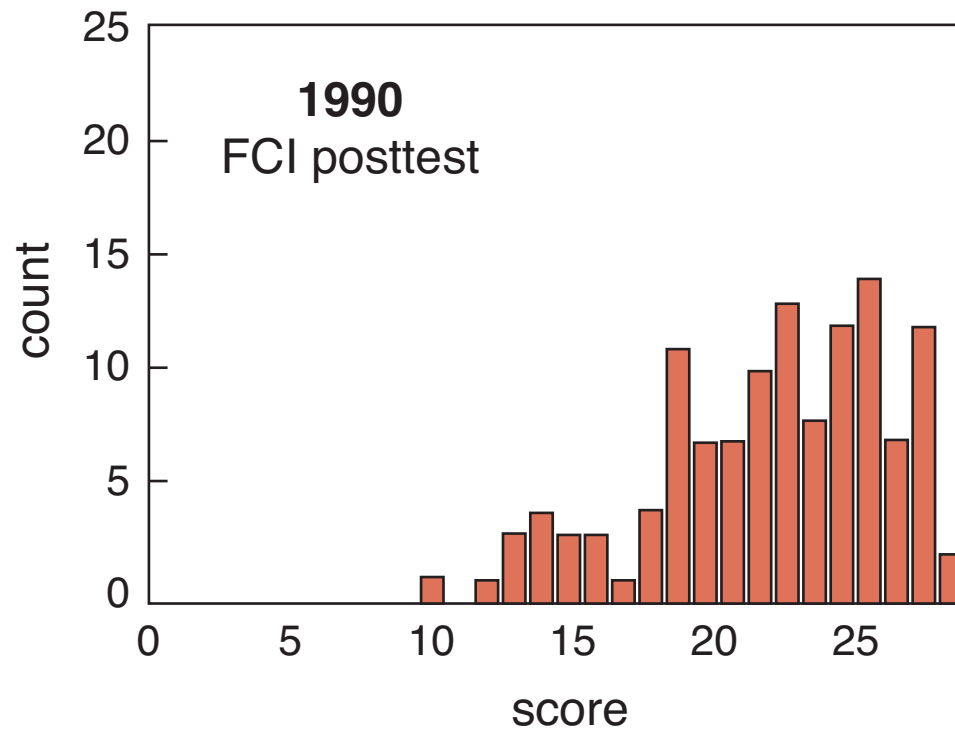
education is not just information transfer





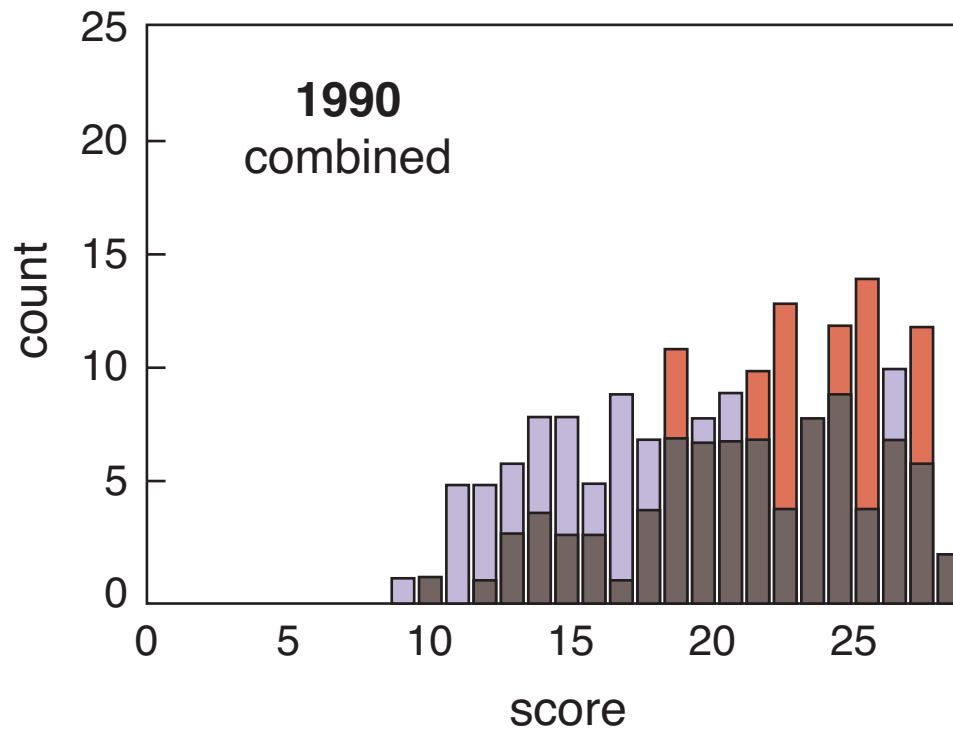
# Education

education is not just information transfer

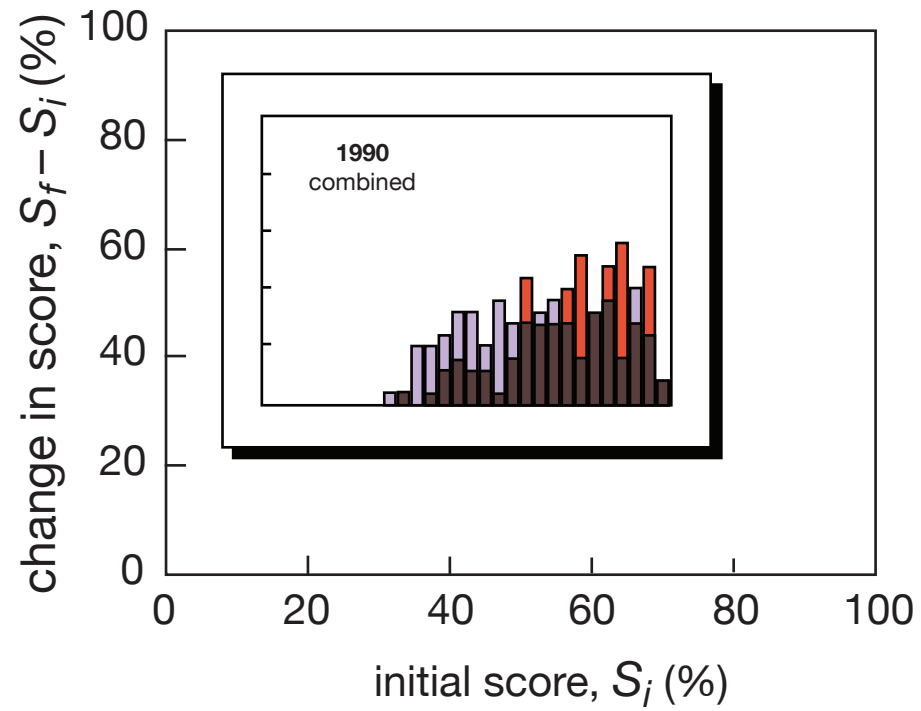


# Education

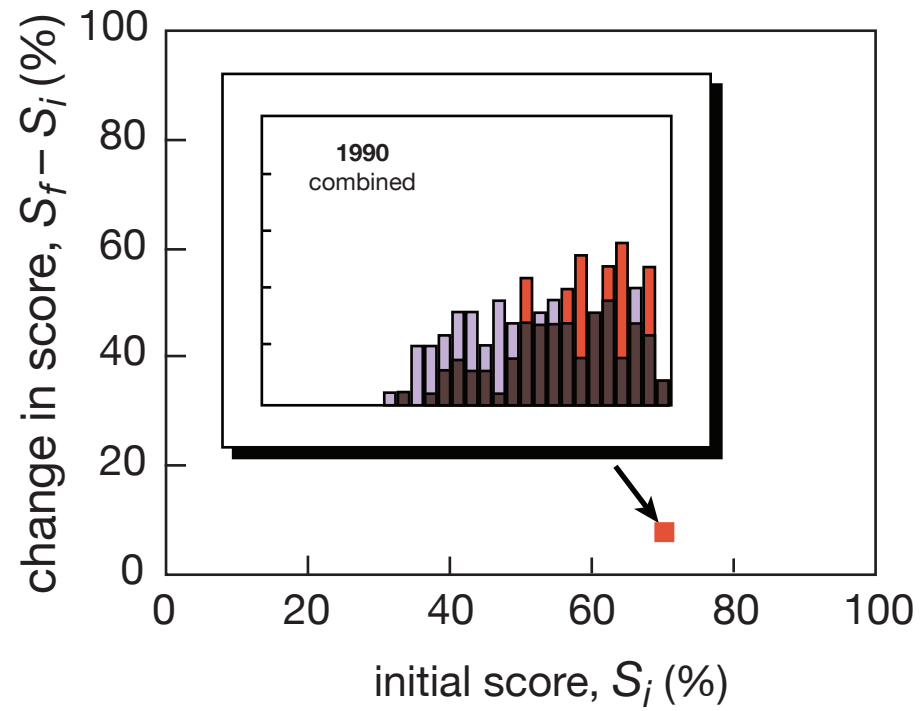
education is not just information transfer



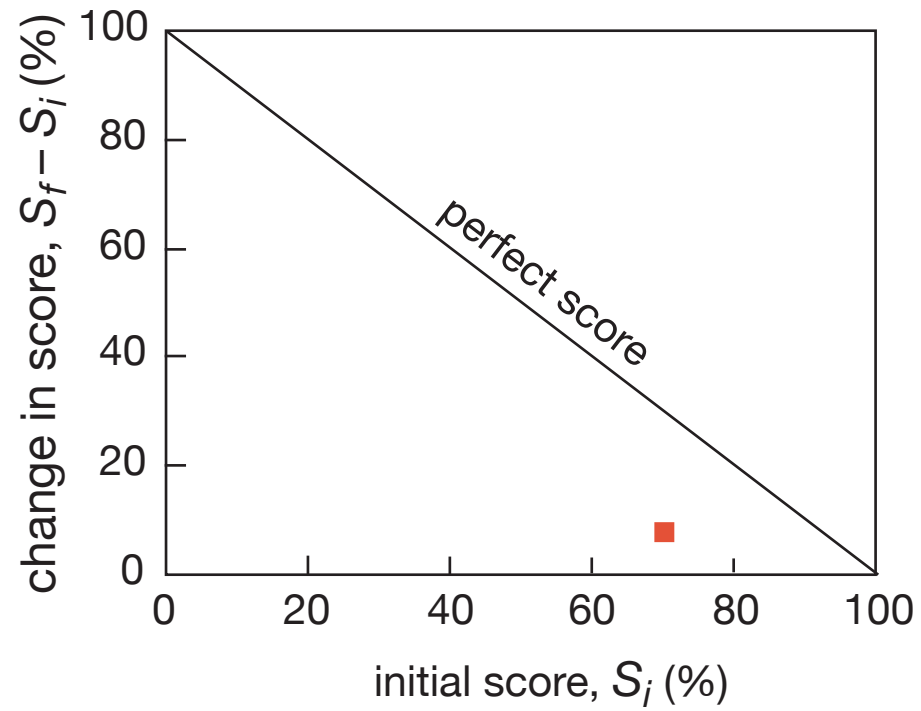
# Education



# Education

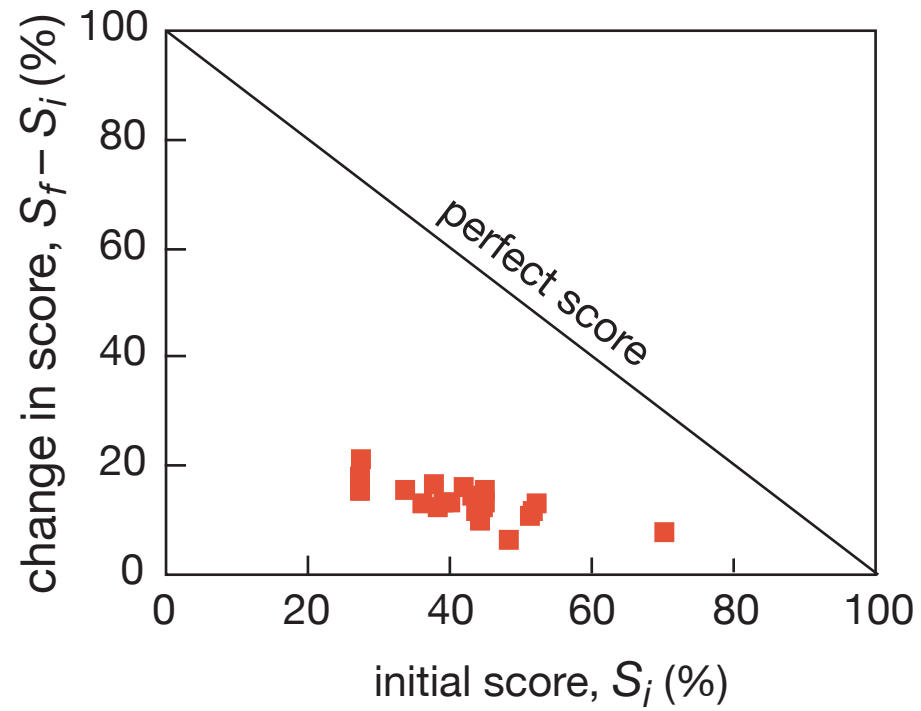


# Education



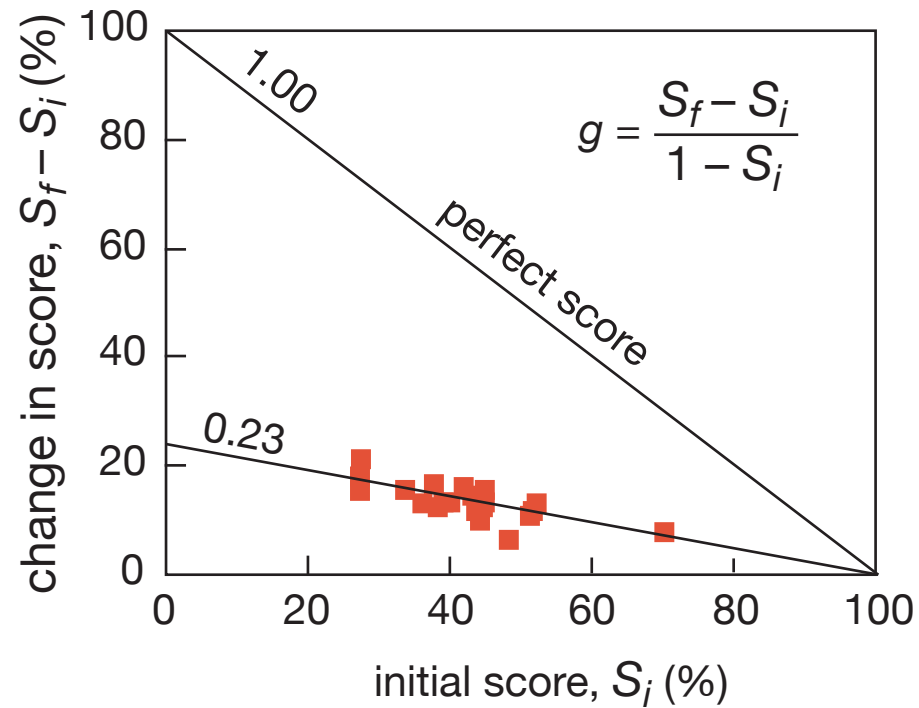


# Education



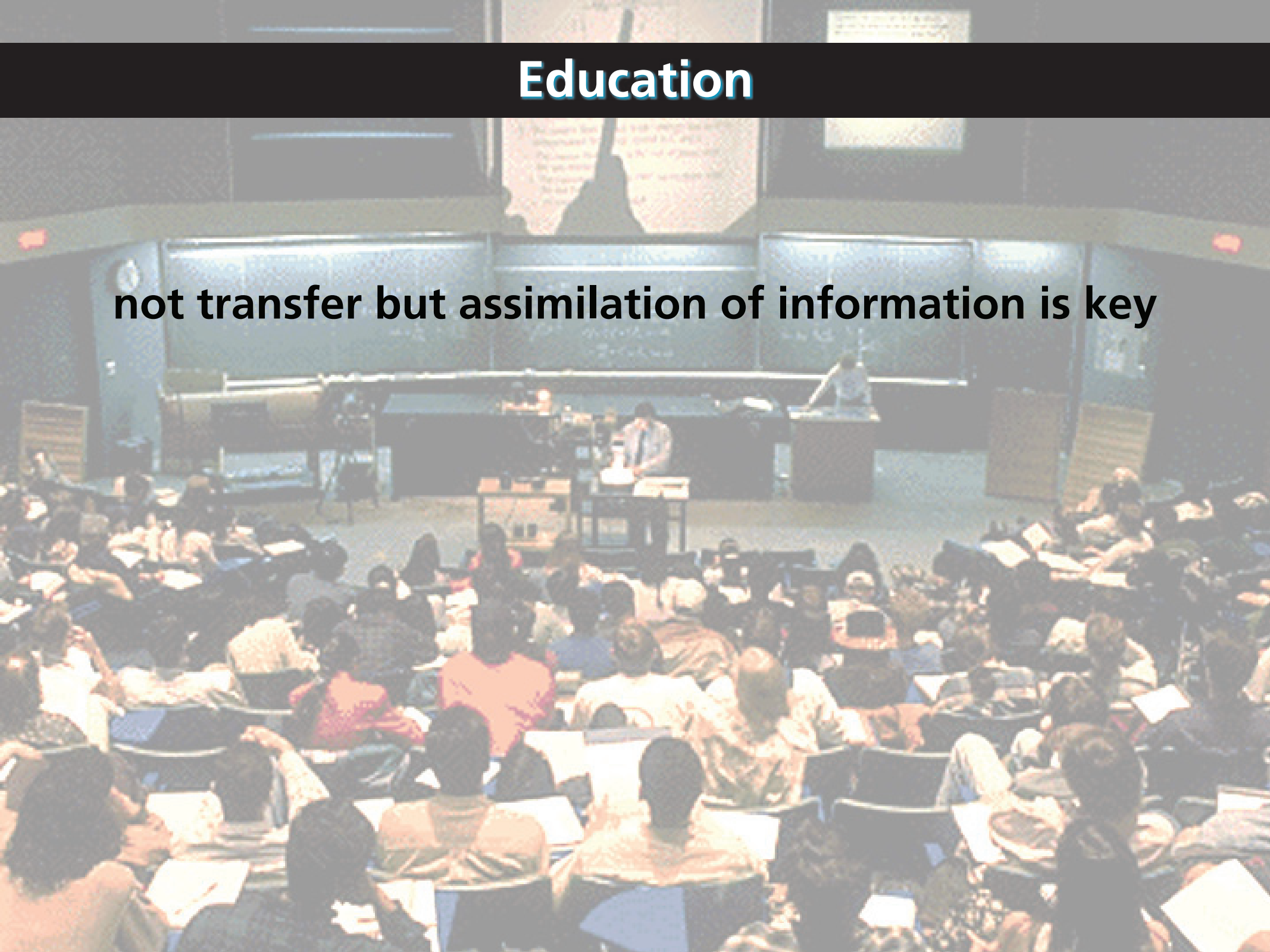
# Education

only one quarter of maximum gain realized



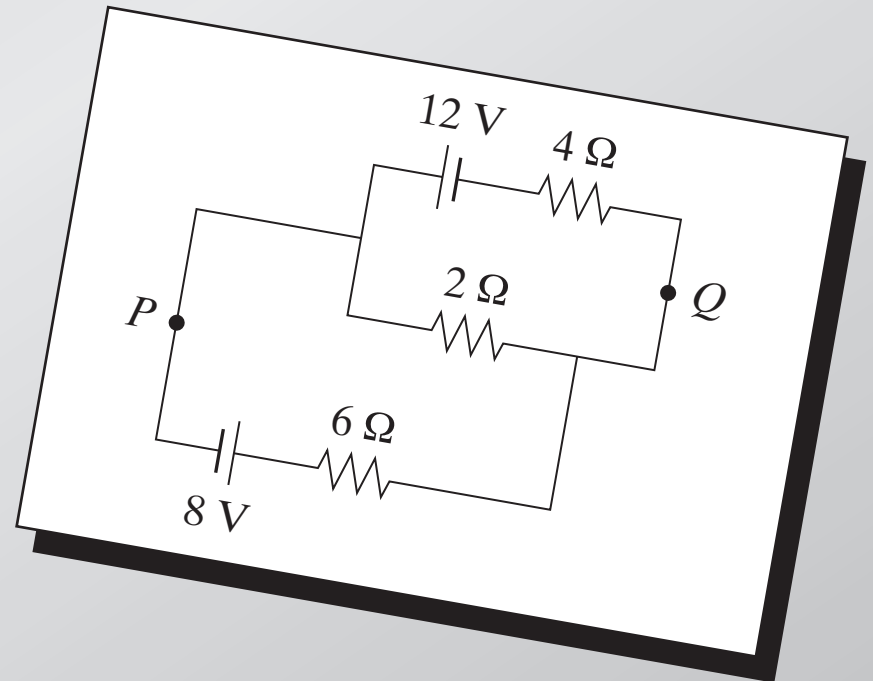
# Education

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



# Education

conventional problems misleading



# Education

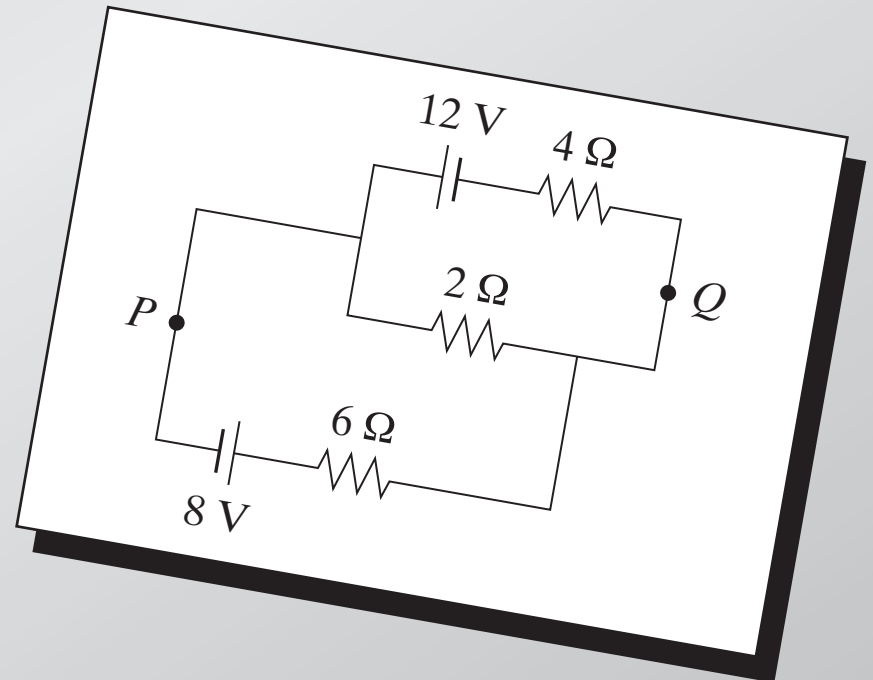
conventional problems misleading

Calculate:

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

(b) potential difference

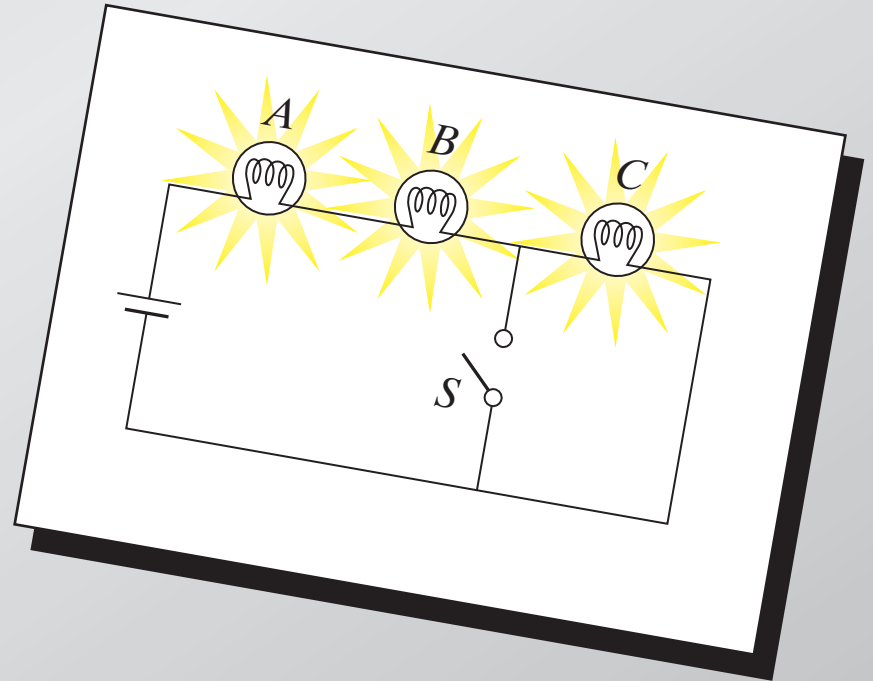
between  $P$  and  $Q$





# Education

are the basic principles understood?

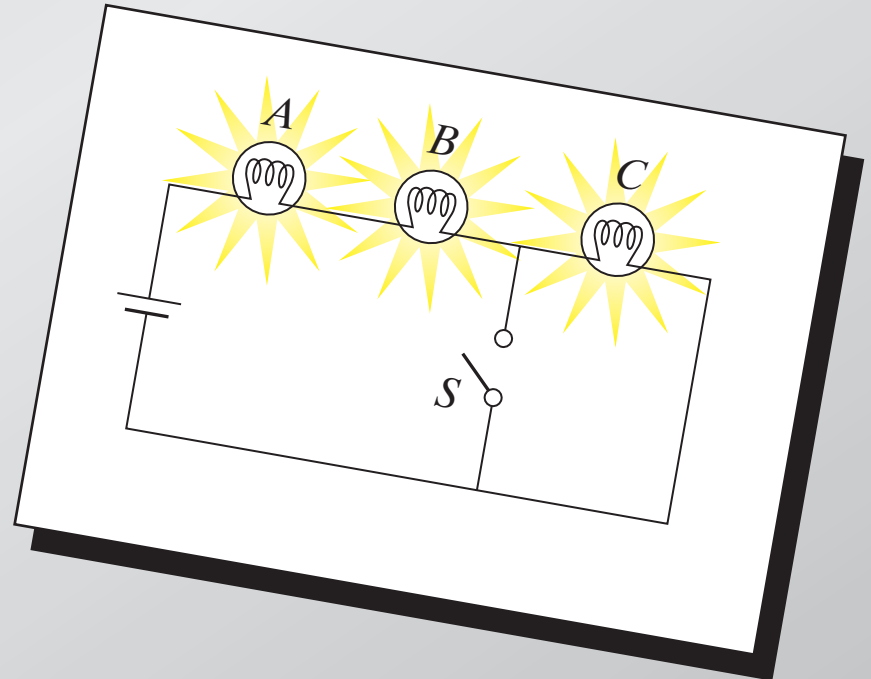


# Education

are the basic principles understood?

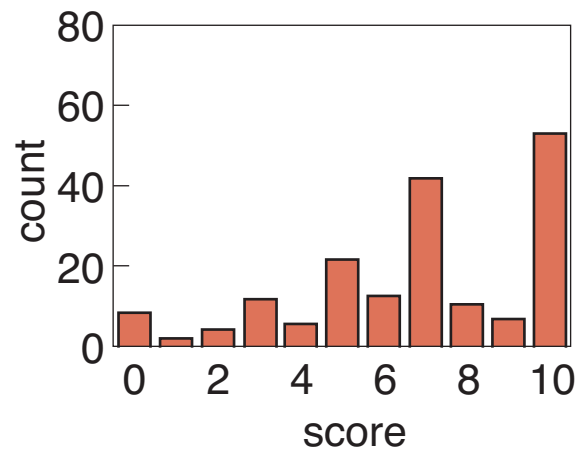
When  $S$  is closed, what happens to:

- (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?

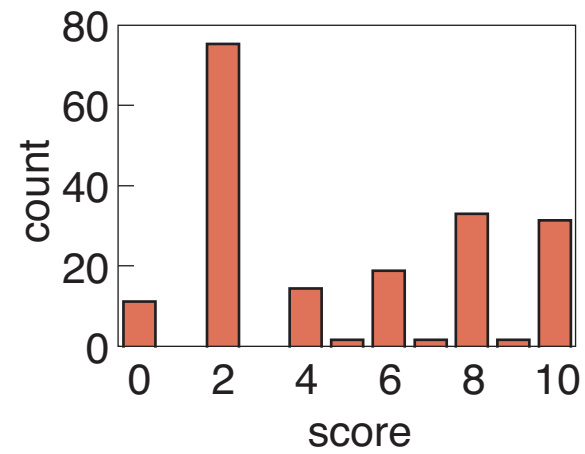


# Education

## conventional

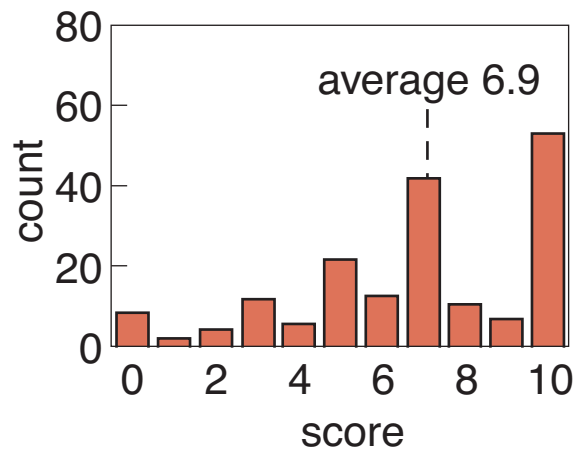


## conceptual

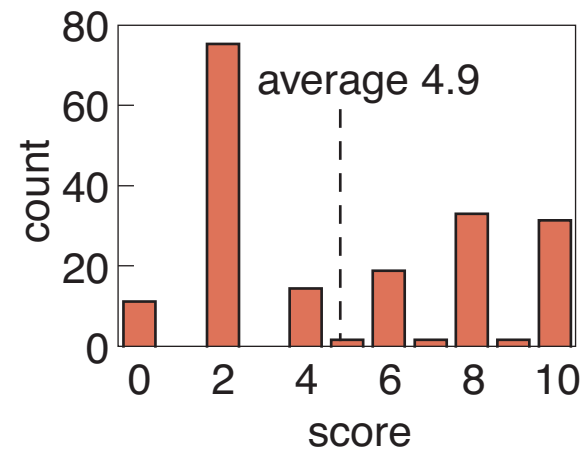


# Education

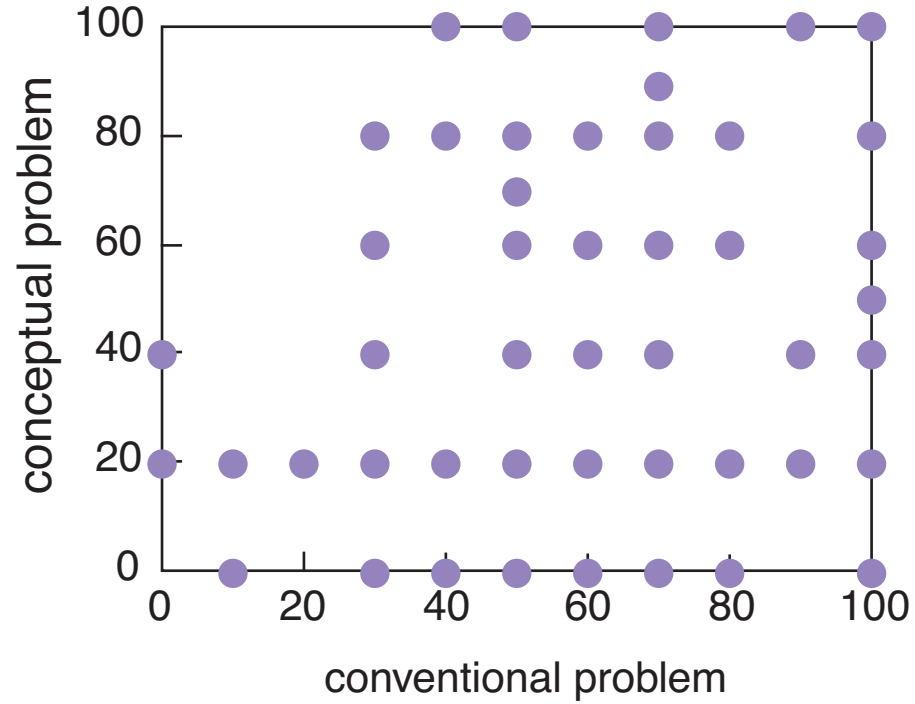
## conventional



## conceptual

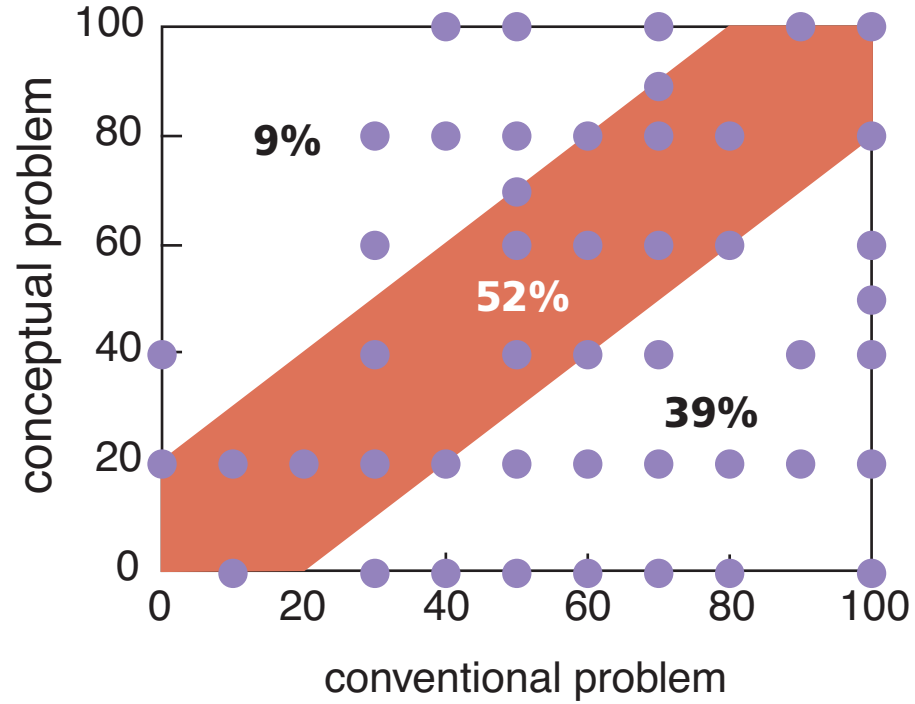


# Education





# Education



A large lecture hall with students seated at desks, facing a stage. A lecturer is standing at a podium on the stage. A large screen at the front of the room displays text. The text on the screen is partially legible and appears to be a list or a set of instructions. The text on the screen includes: "1. The first step is to identify the problem.", "2. The second step is to define the problem.", "3. The third step is to analyze the problem.", "4. The fourth step is to develop a solution.", "5. The fifth step is to implement the solution.", "6. The sixth step is to evaluate the solution.", "7. The seventh step is to communicate the solution.", "8. The eighth step is to monitor the solution.", "9. The ninth step is to maintain the solution.", "10. The tenth step is to improve the solution." The text is displayed in a white font on a dark background. The lecture hall is filled with students, and the atmosphere appears to be one of a formal academic setting. The text "So what should we do?" is overlaid on the image in a white font, centered horizontally and vertically.

So what should we do?

# Peer Instruction

**Give students more responsibility for gathering information...**

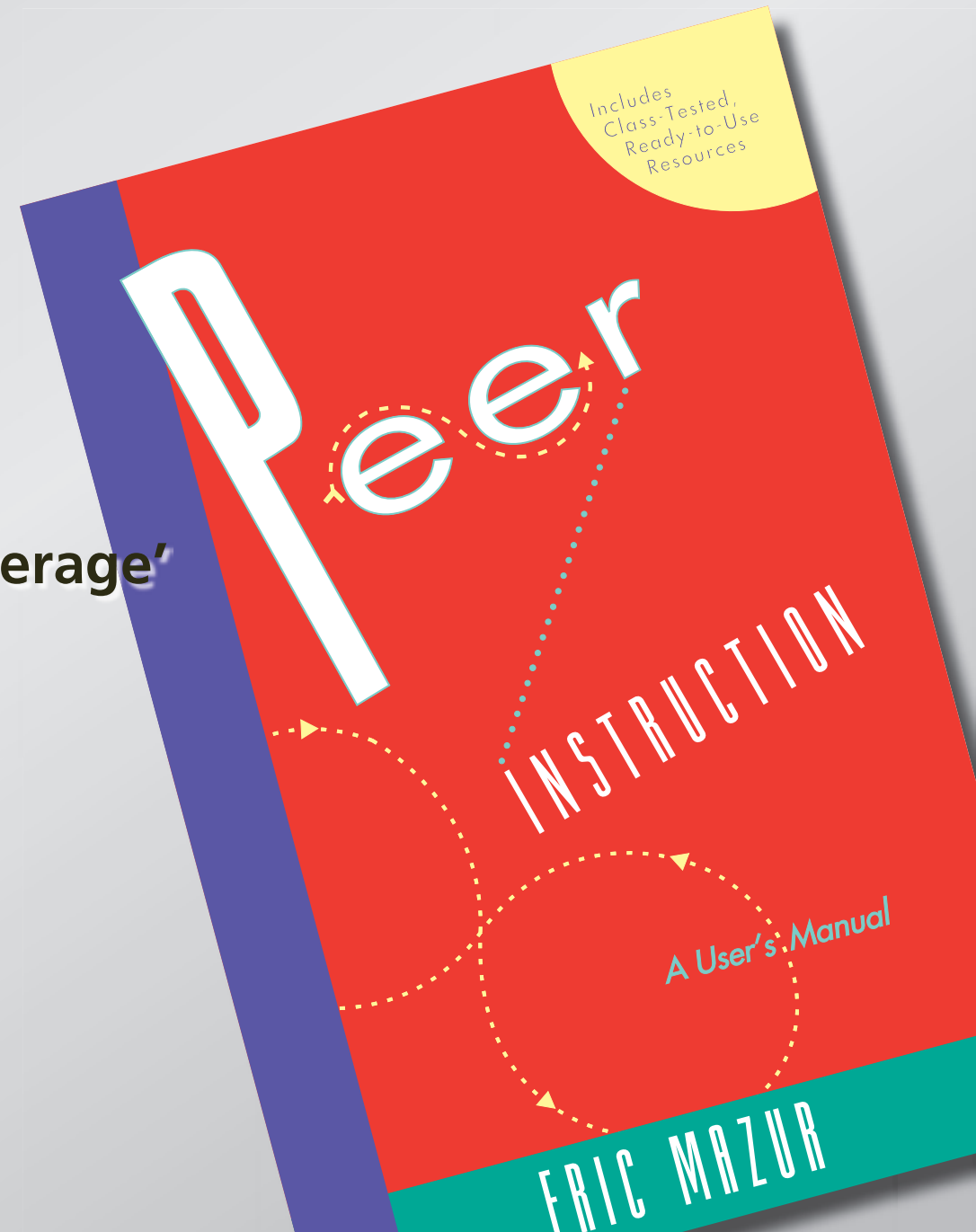
# Peer Instruction

**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**



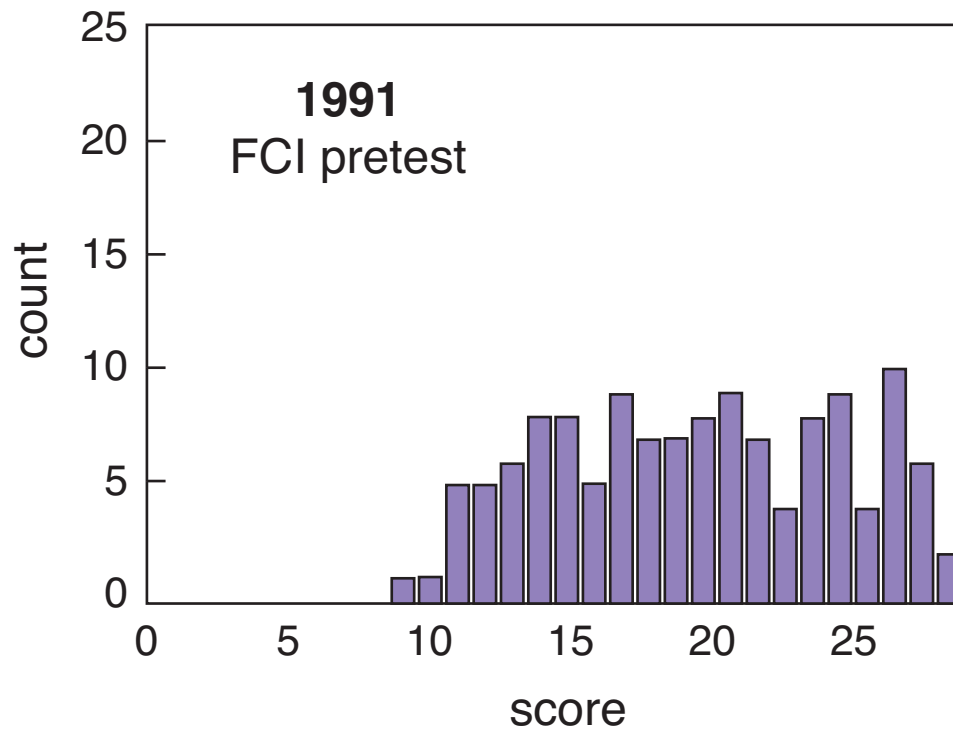
# Results

**is it any good?**



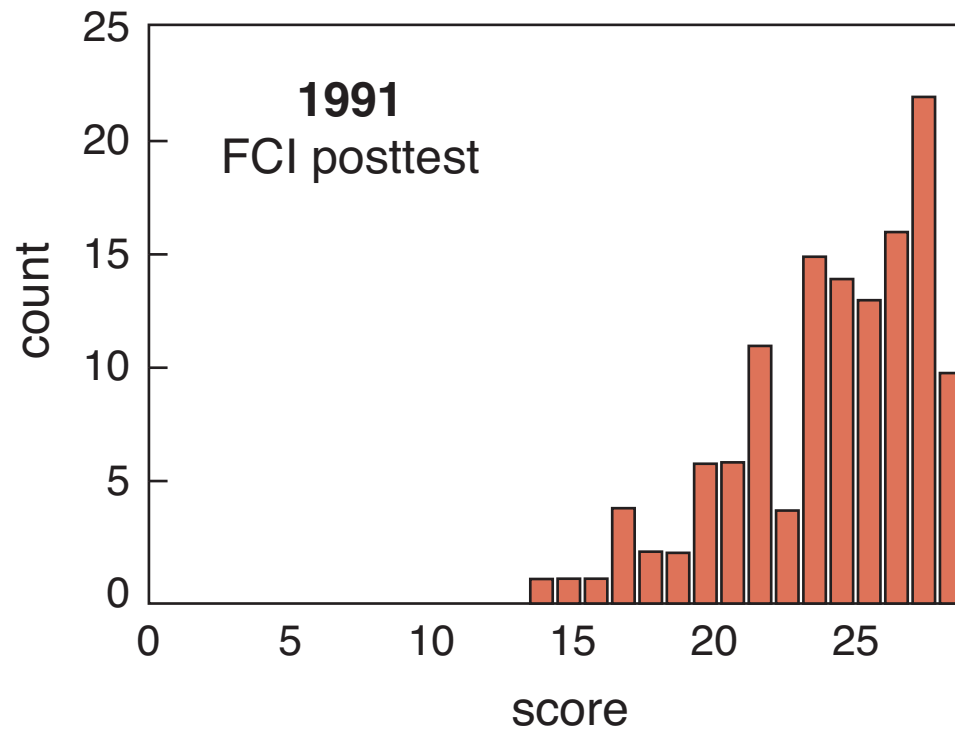
# Results

## first year of implementing PI



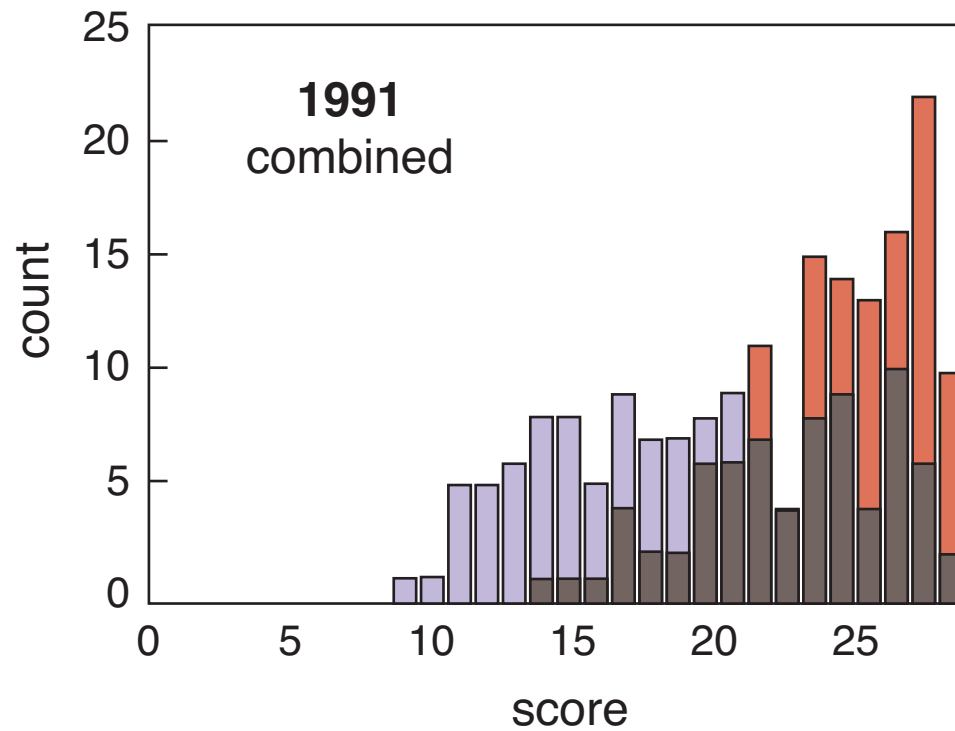
# Results

## first year of implementing PI

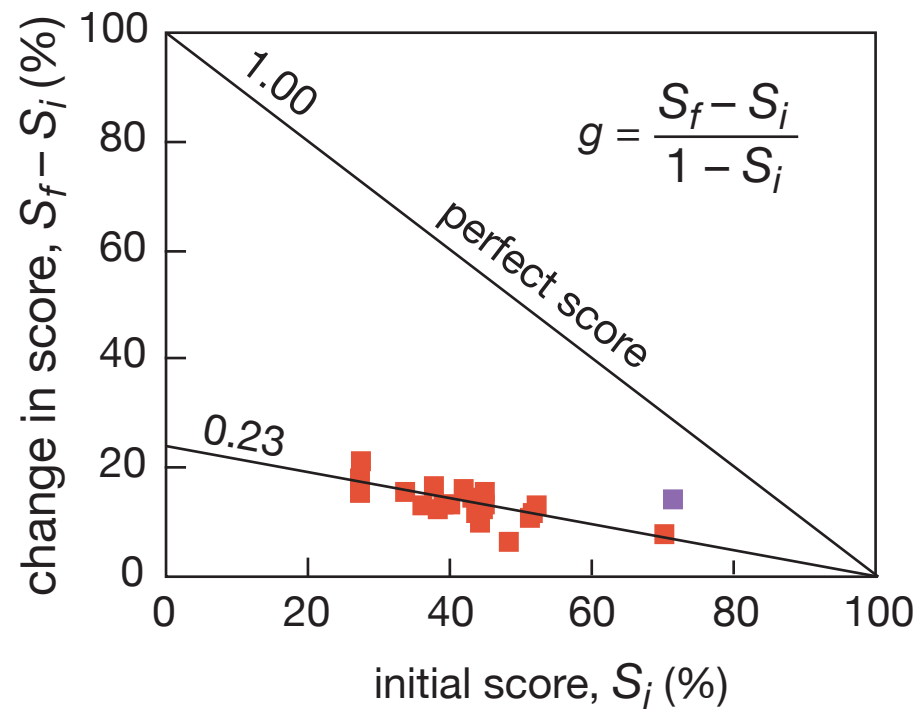


# Results

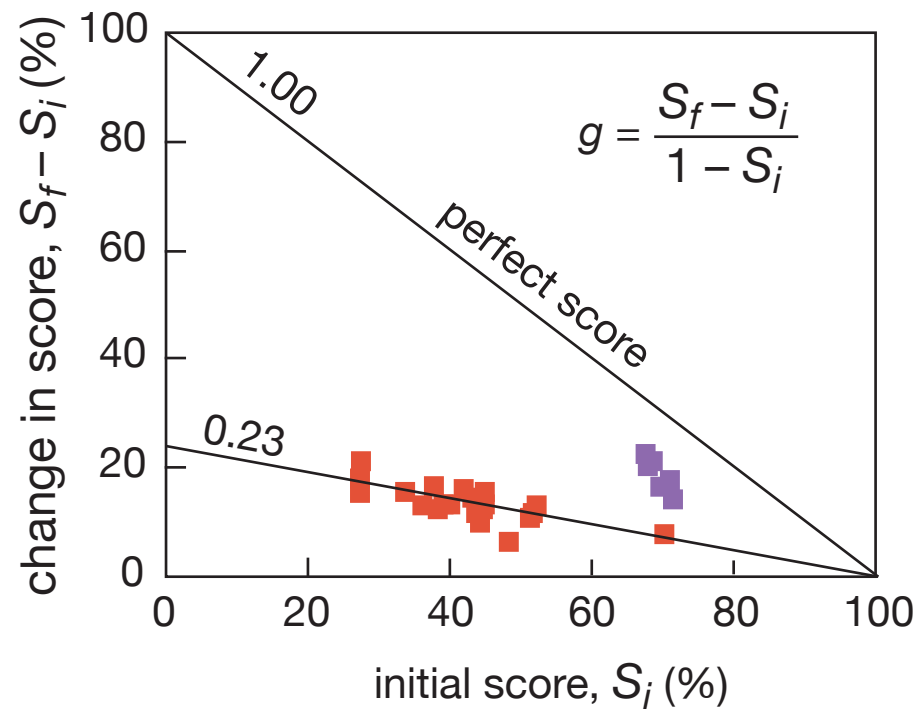
## first year of implementing PI



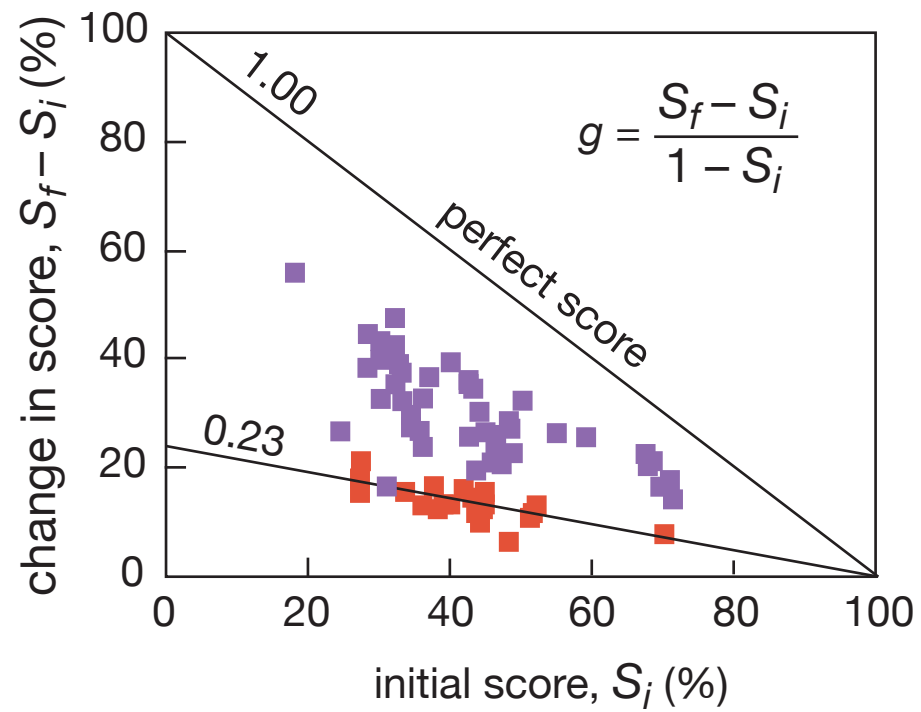
# Results



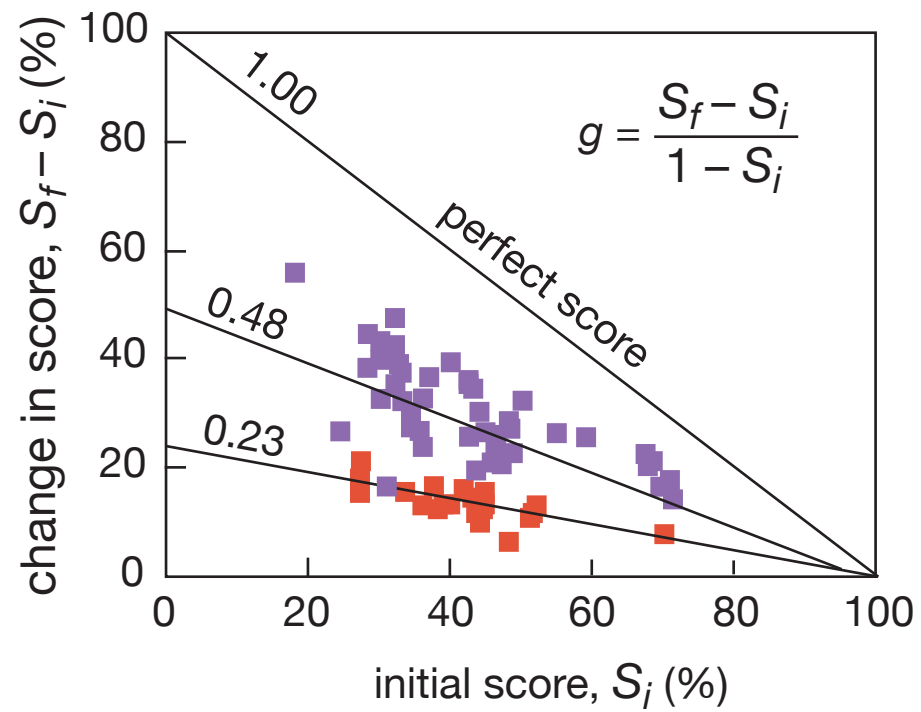
# Results



# Results



# Results

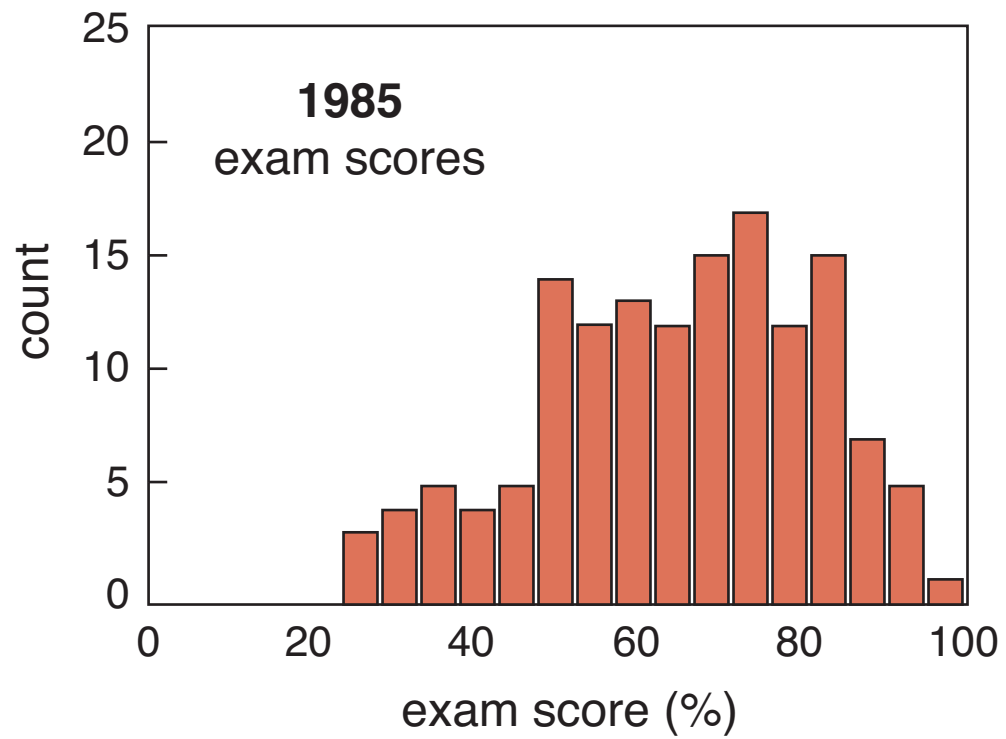


# Results

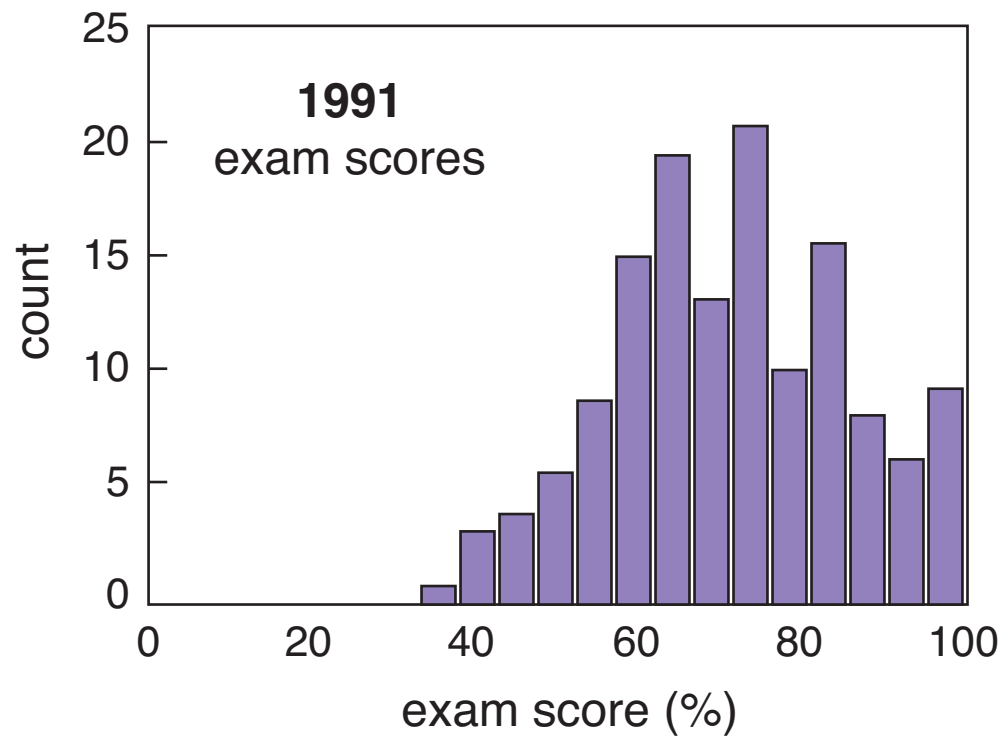
**what about problem solving?**



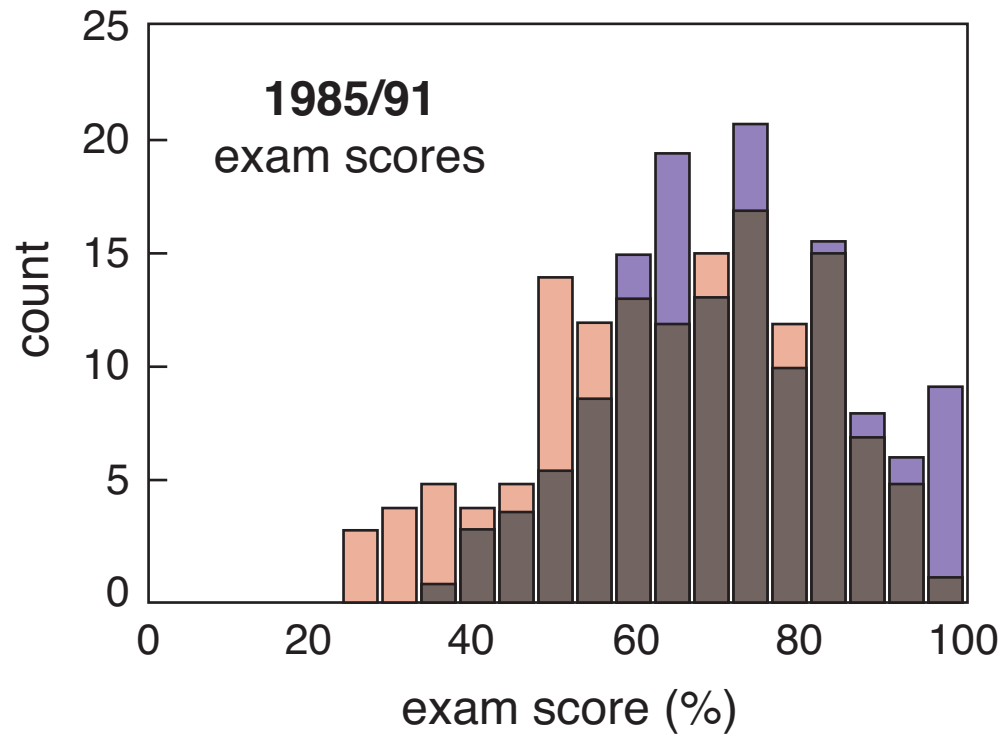
# Results



# Results



# Results



# Conclusion

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

# Conclusion

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

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

# Why does it work?

## Students:

- promotes thinking
- helps uncover and address misunderstanding
- boosts confidence

# Why does it work?

## Students:

- promotes thinking
- helps uncover and address misunderstanding
- boosts confidence

## Faculty:

- change of format, not content
- with existing questions, little effort
- adaptable





# 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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