

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



Speaker Series in Mathematics Education  
University of Connecticut  
Storrs, CT, 23 September 2010



# My message

**shift focus from "teaching" to helping students learn**



# Outline

- Education




# Outline

- Education
- Peer Instruction



# Outline

- Education
  - Peer Instruction
  - Results
- 

# Education



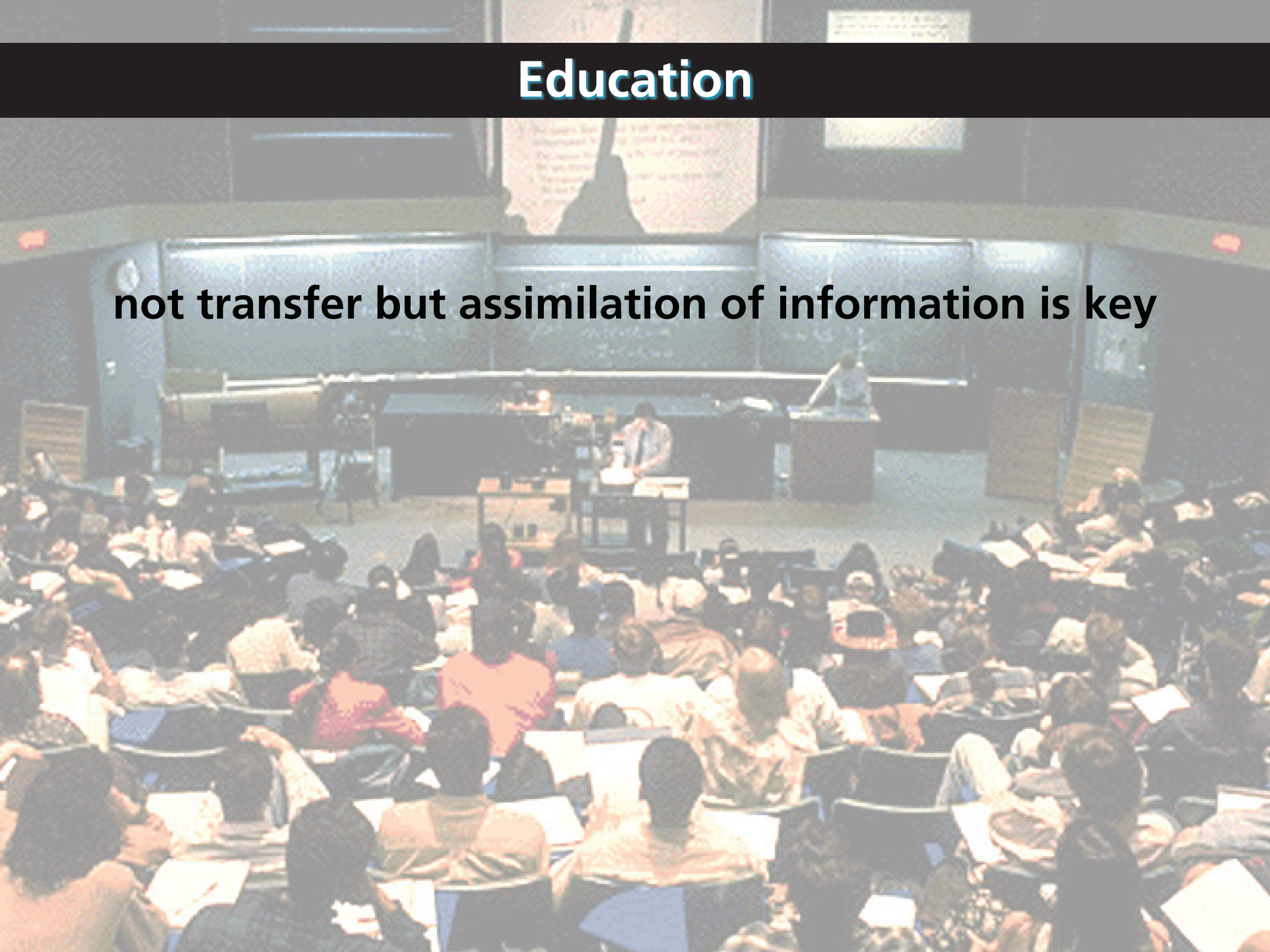
# Education

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 away from the camera towards the front of the room. Many students have papers or laptops open on their desks. At the front of the hall, a lecturer stands behind a podium, addressing the audience. Behind the lecturer is a large screen displaying a presentation slide with text and a silhouette of a person. The room has a curved wall and is well-lit.

# Education

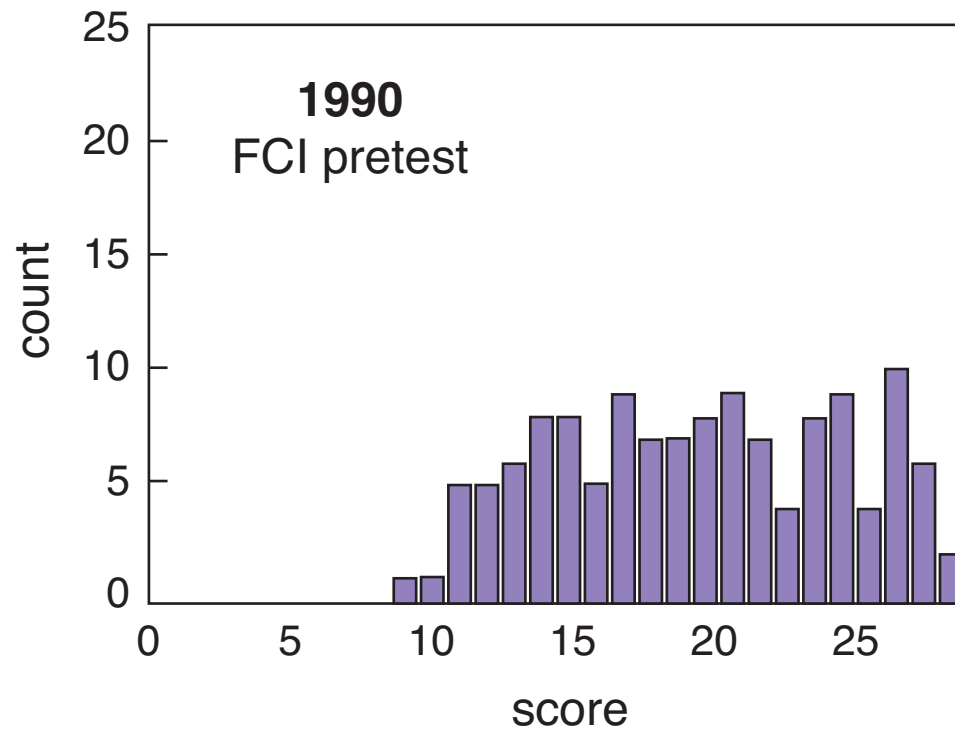
**not transfer but assimilation of information is key**





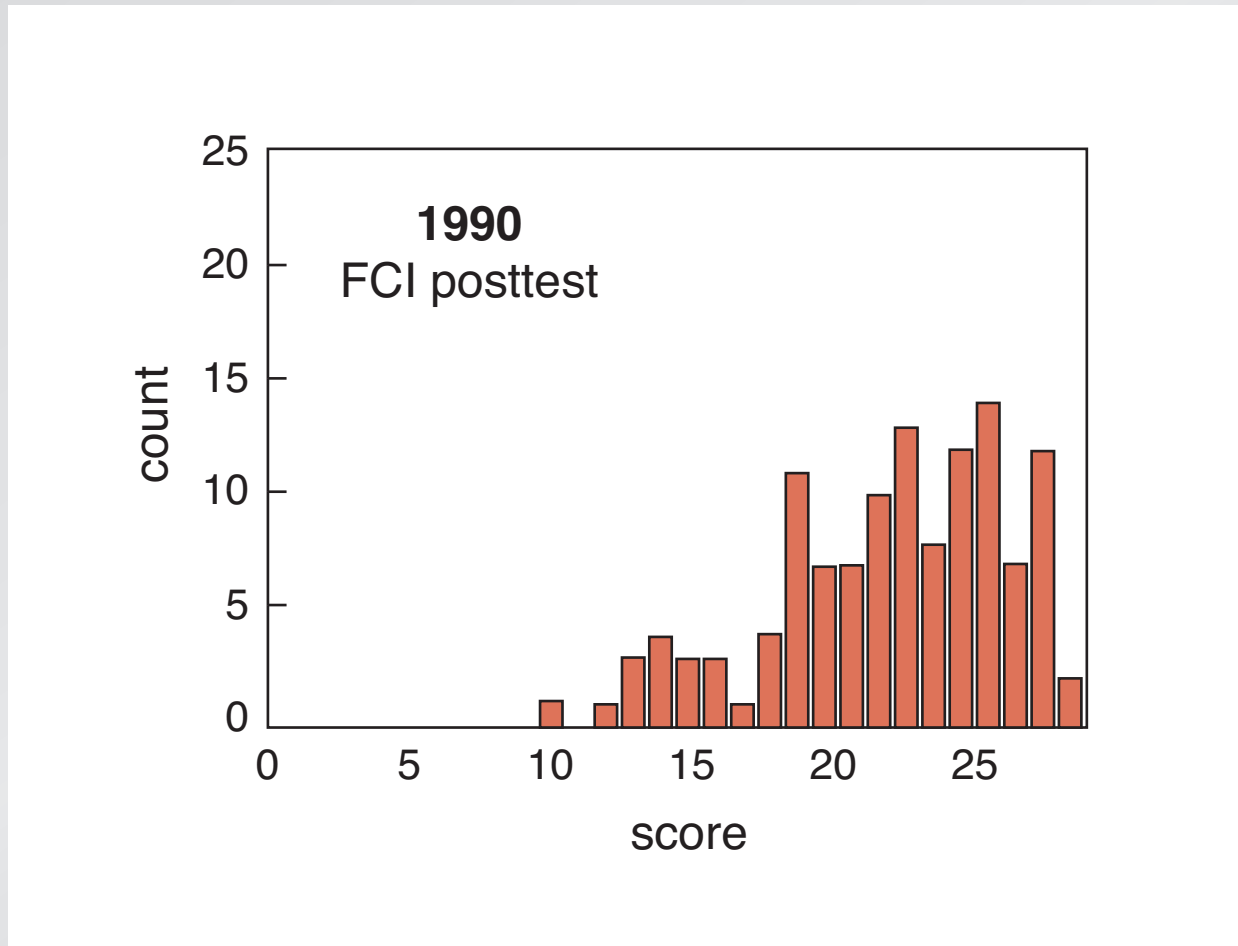
# Education

education is not just information transfer



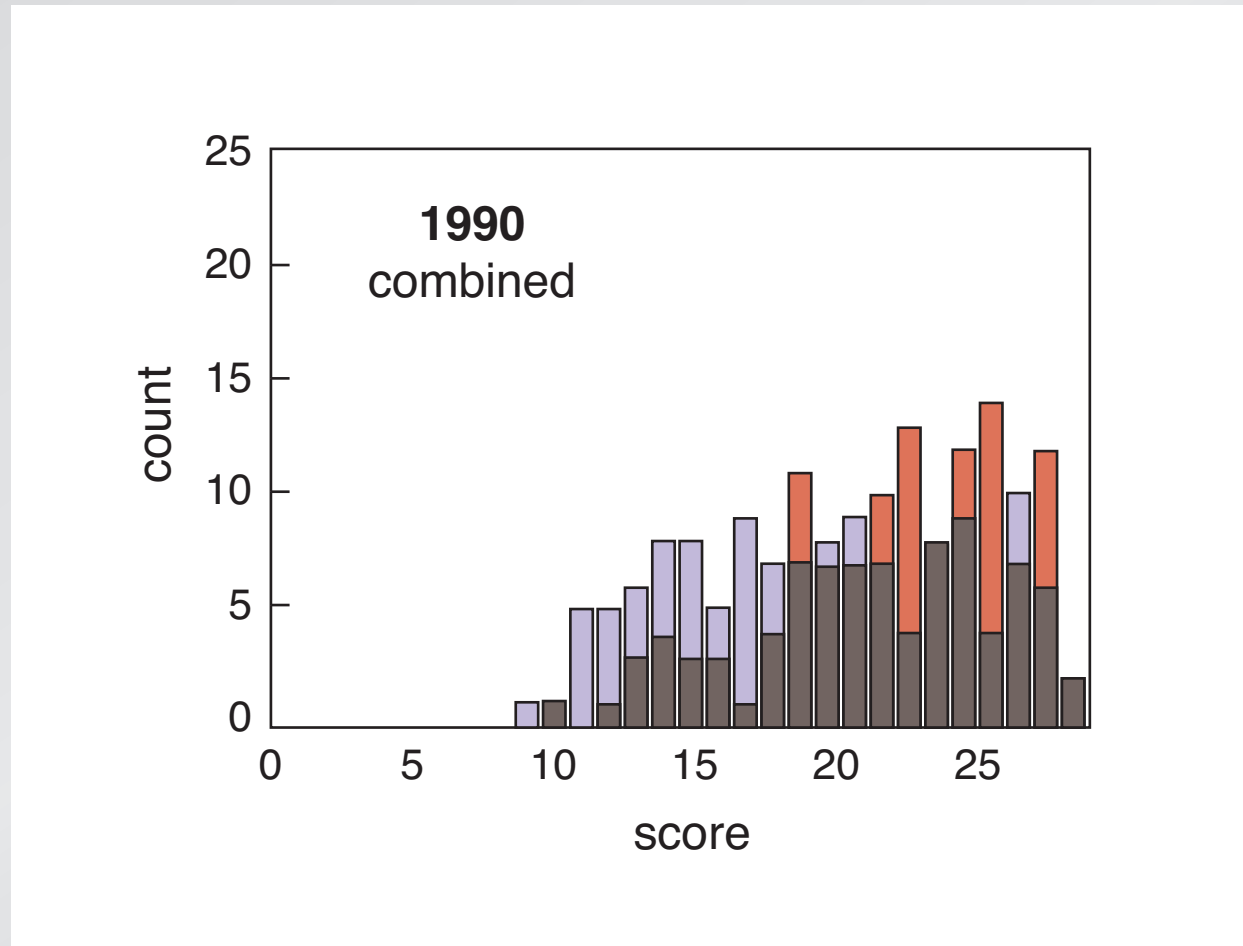
# Education

education is not just information transfer



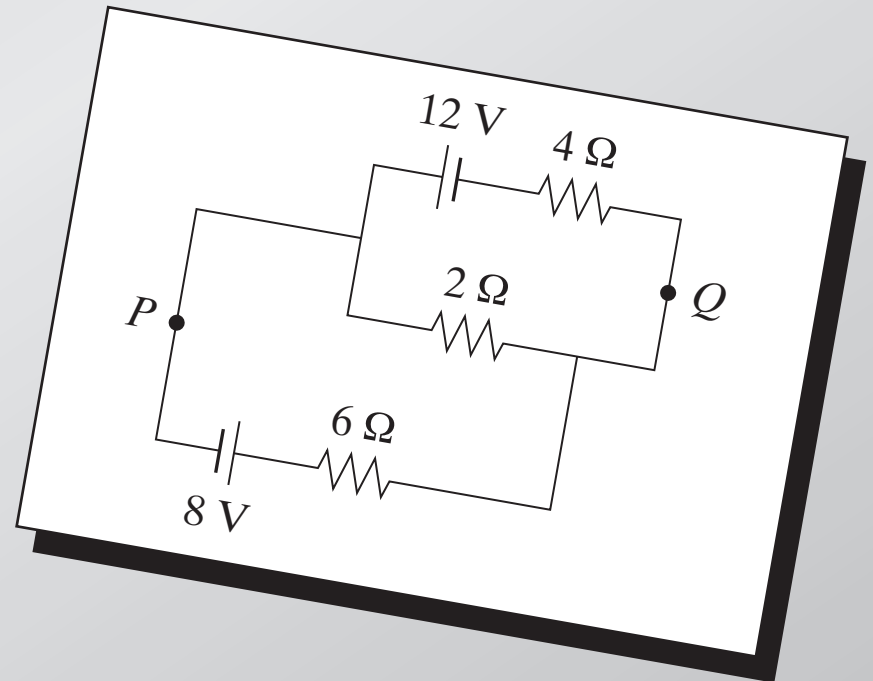
# Education

education is not just information transfer



# Education

conventional problems misleading



# Education

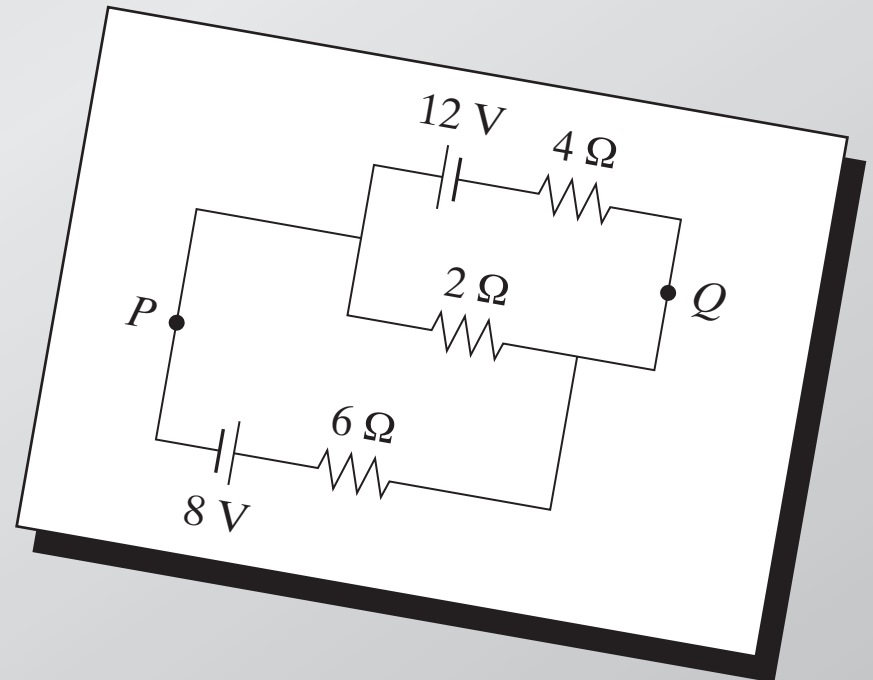
conventional problems misleading

Calculate:

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

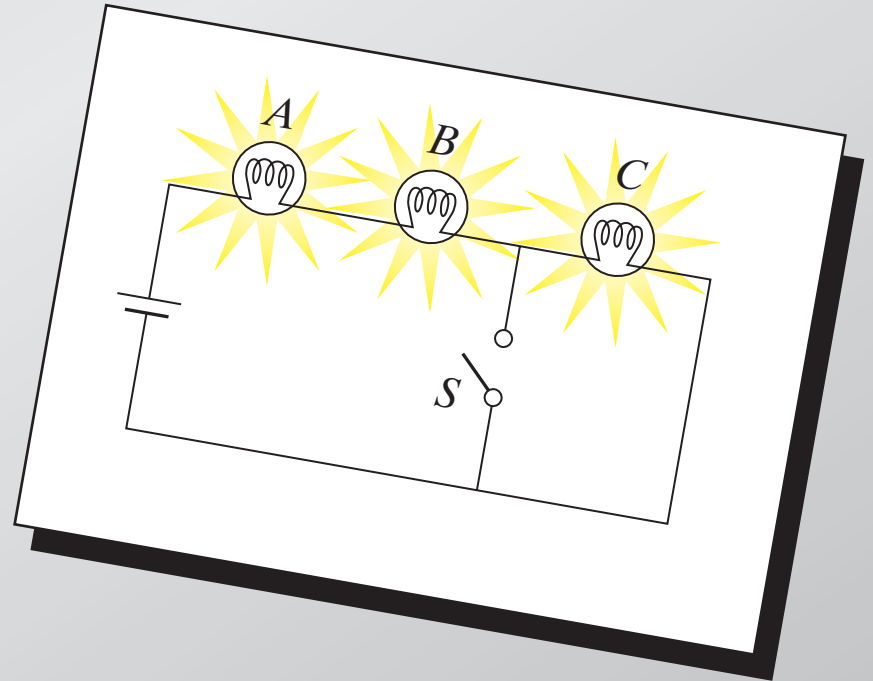
(b) potential difference

between  $P$  and  $Q$



# Education

are the basic principles understood?

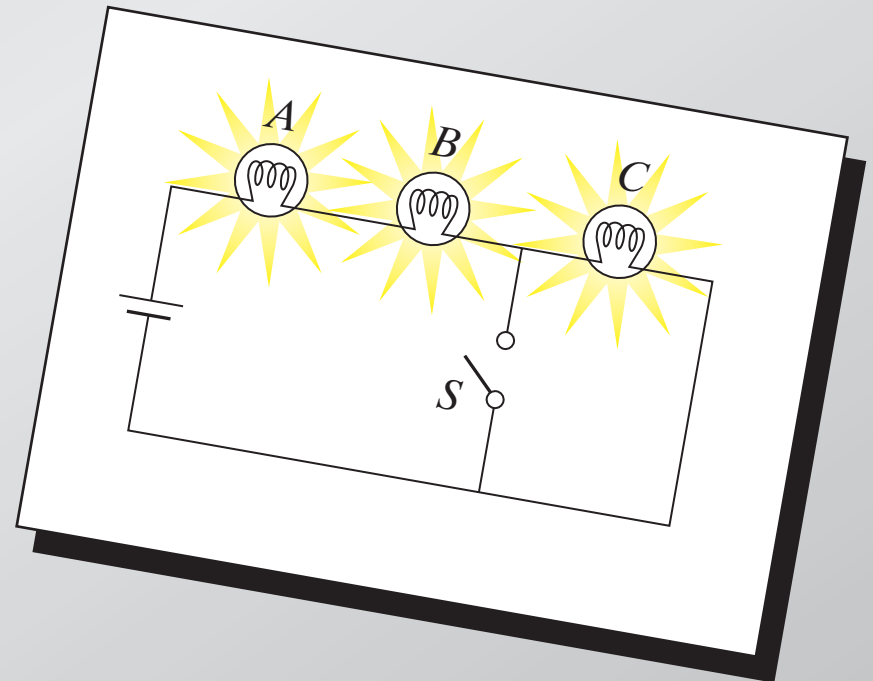


# Education

are the basic principles understood?

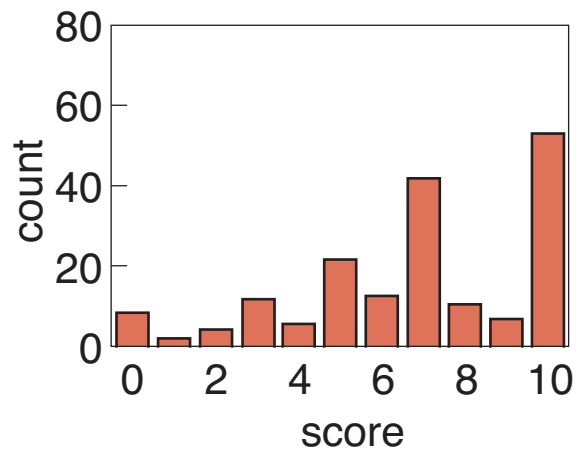
When  $S$  is closed, what happens to:

- (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?

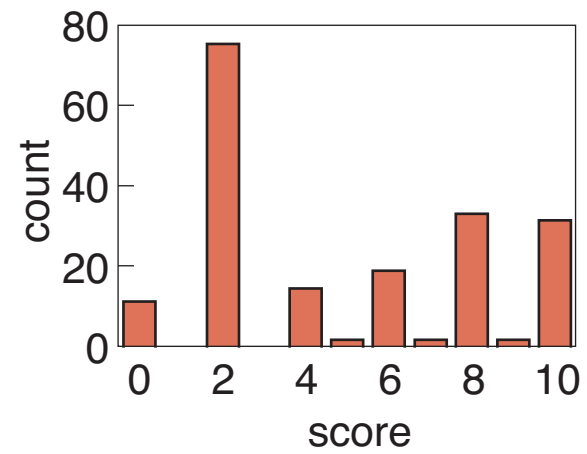


# Education

**conventional**



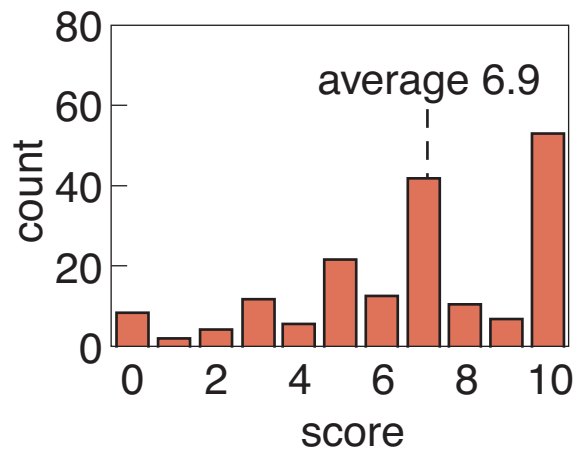
**conceptual**



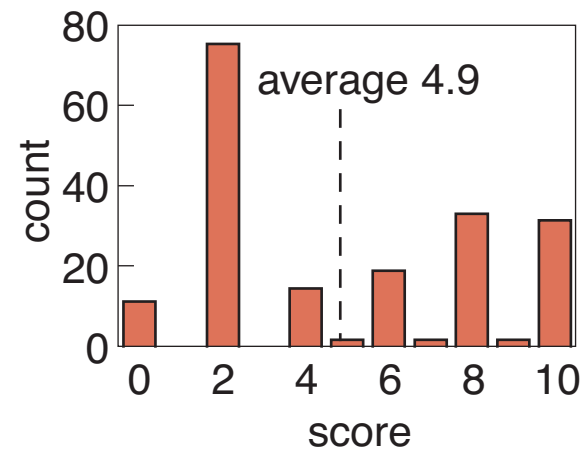


# Education

## conventional



## conceptual





# Peer Instruction

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

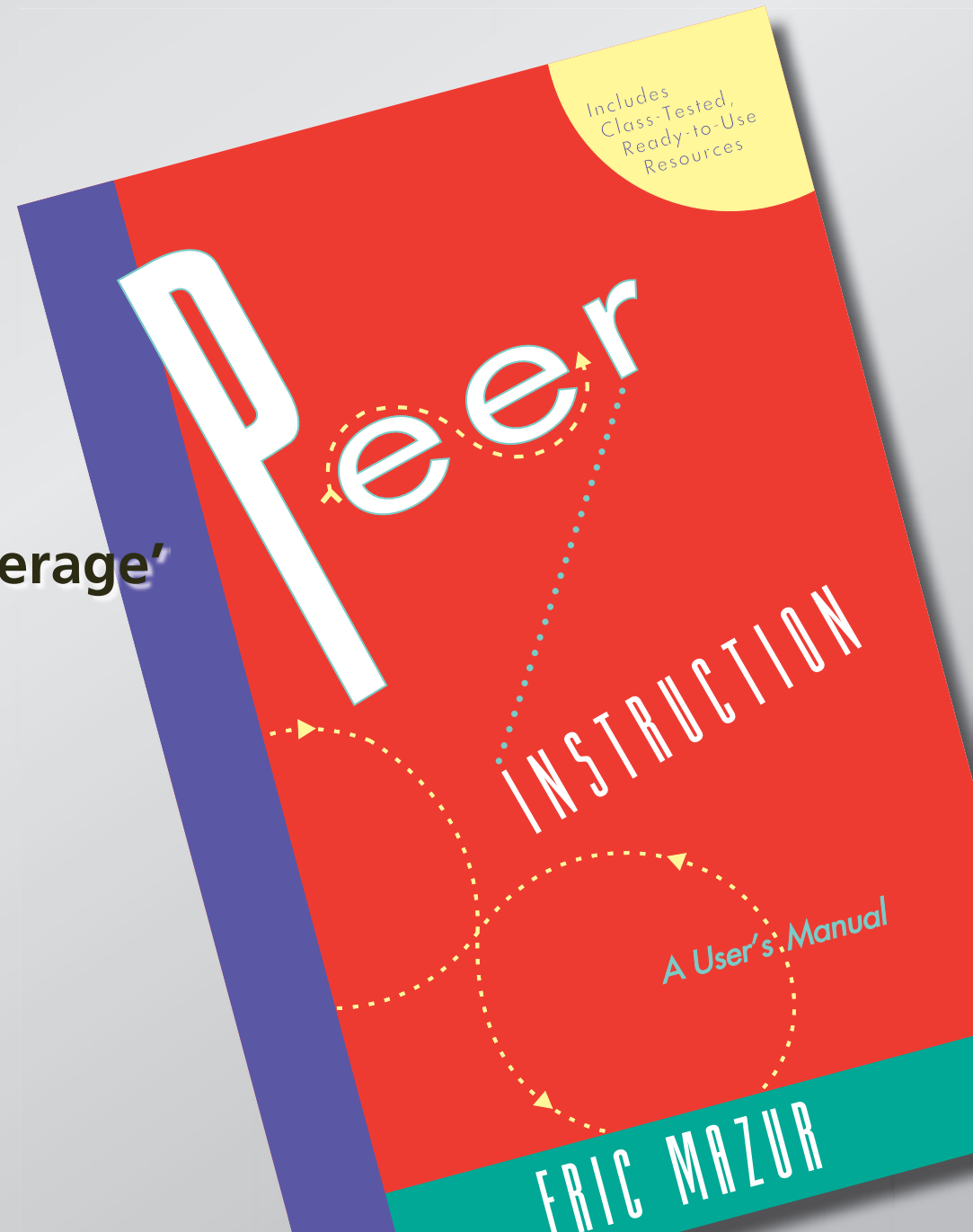
# Peer Instruction

**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**



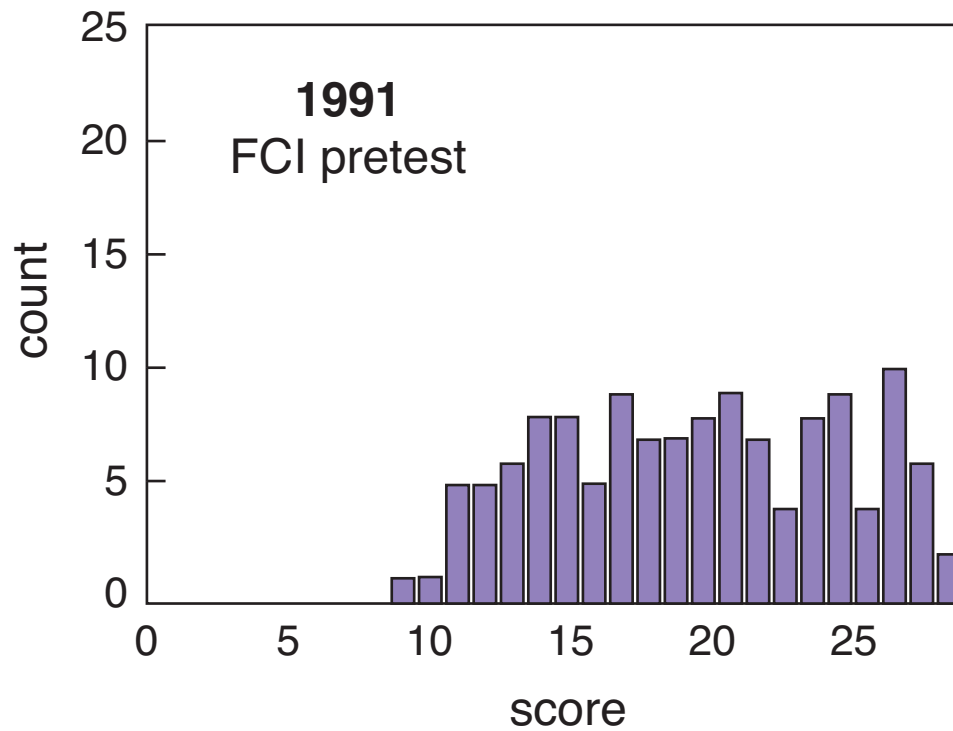
# Results

**is it any good?**



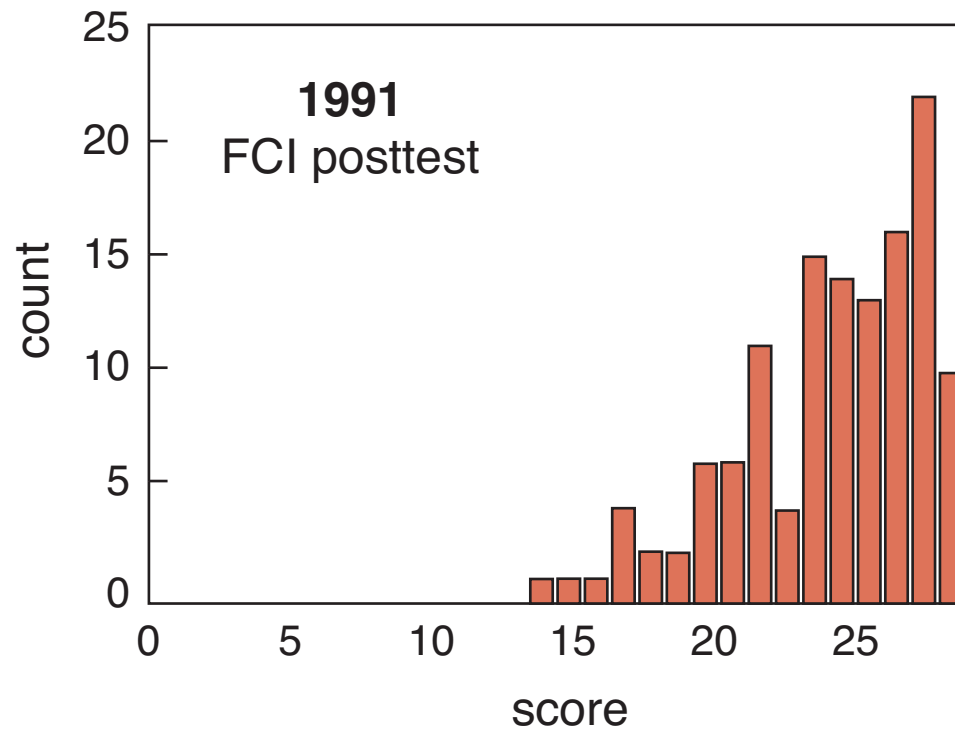
# Results

## first year of implementing PI



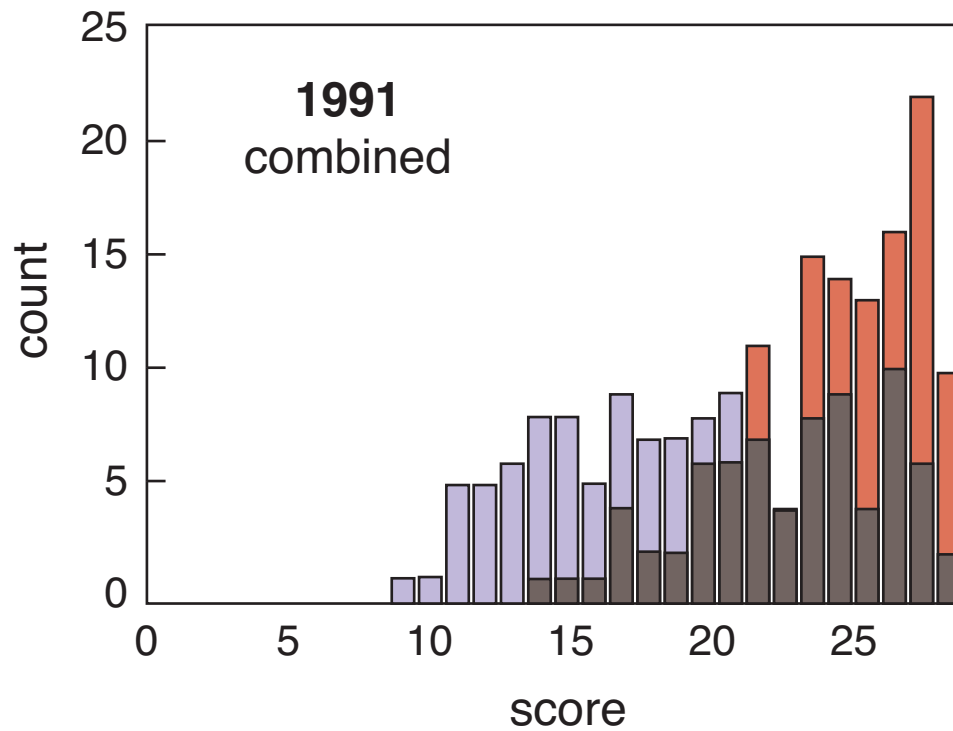
# Results

## first year of implementing PI



# Results

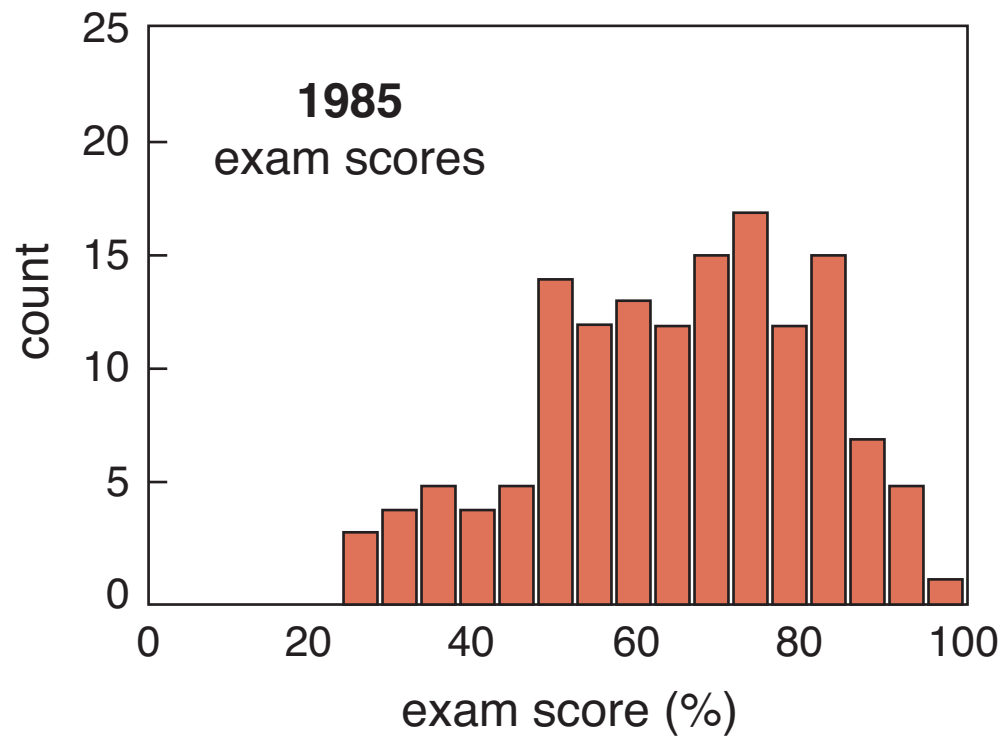
## first year of implementing PI



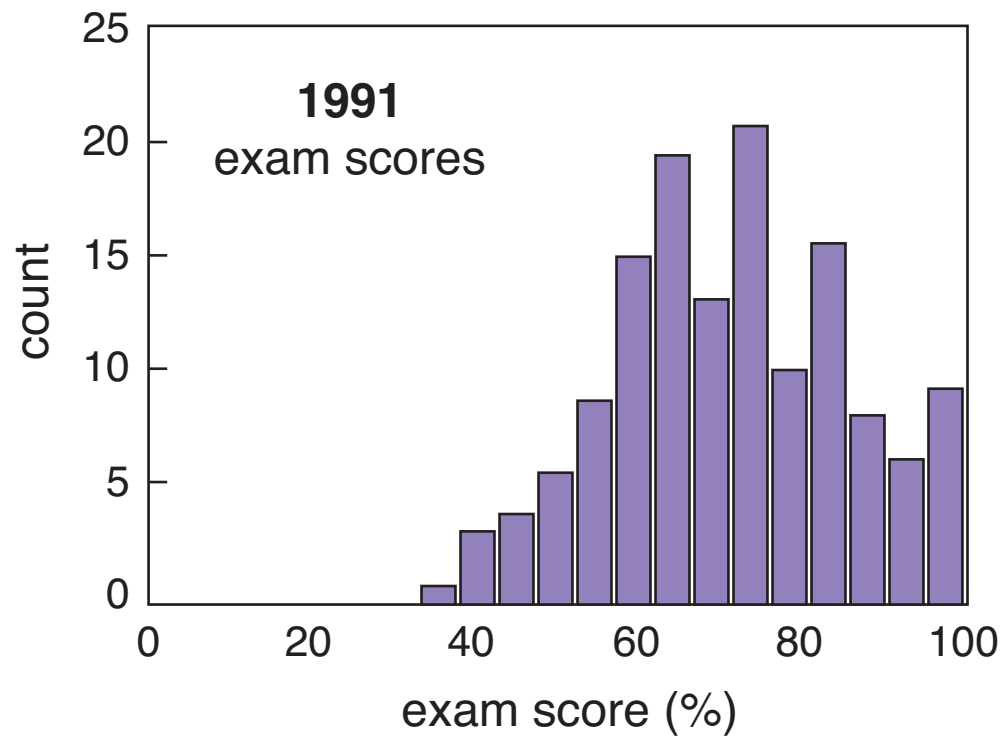
# Results

**what about problem solving?**

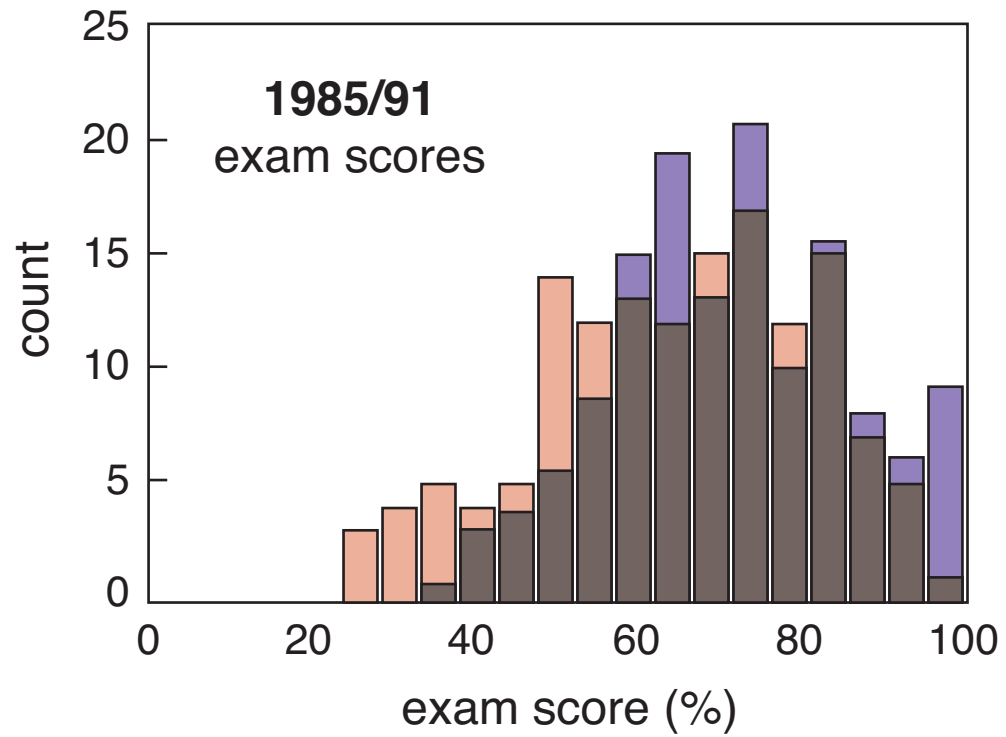
# Results



# 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!)**

**Funding:**

**National Science Foundation**

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