

# Active learning and interactive lectures

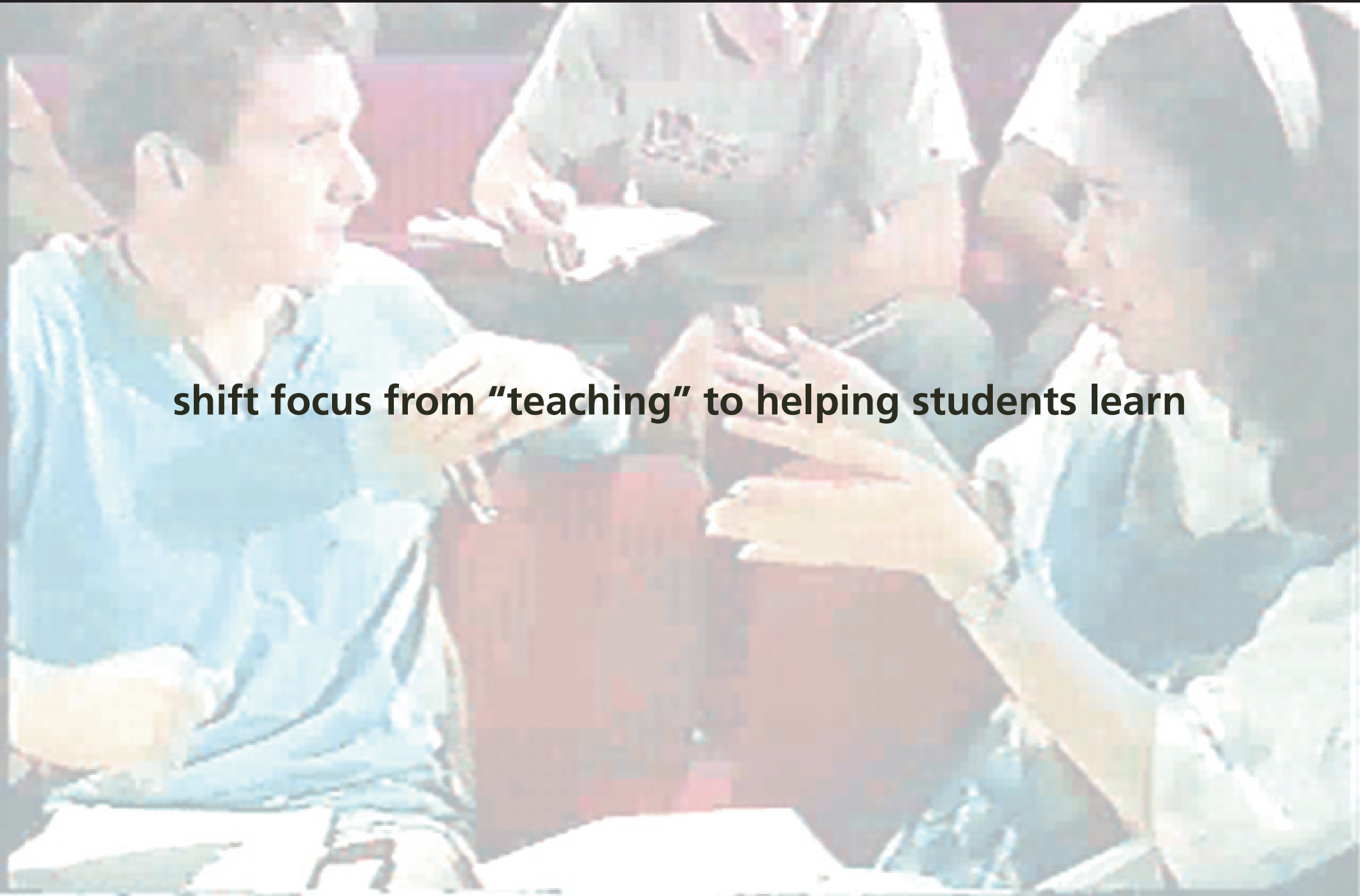


New Faculty Workshop  
American Center for Physics  
College Park, MD, 27 October 2006



# My message

**shift focus from “teaching” to helping students learn**



# Outline

- Education





# Outline

- Education
- Peer Instruction



# Outline

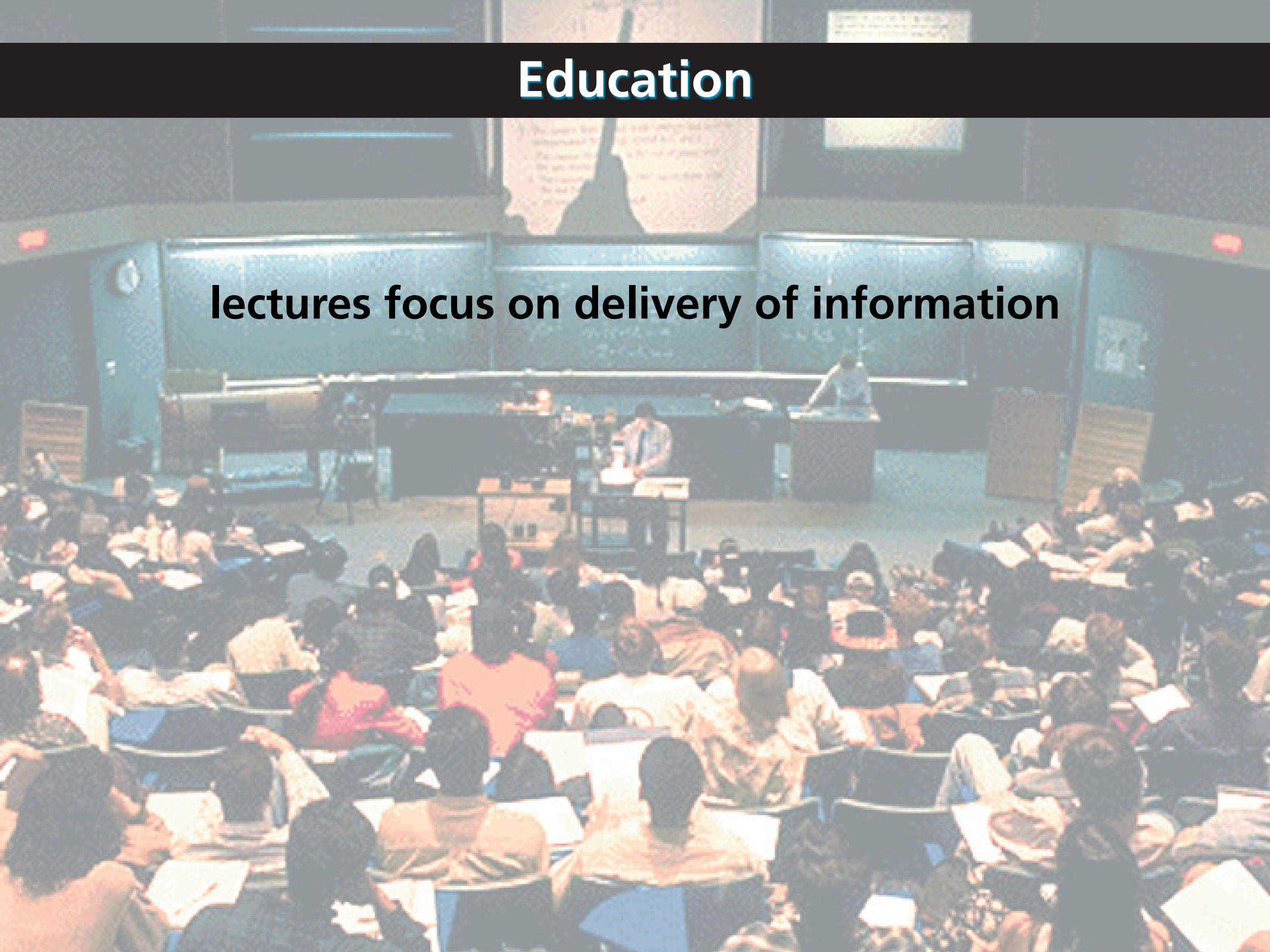
- Education
- Peer Instruction
- Results

# Education



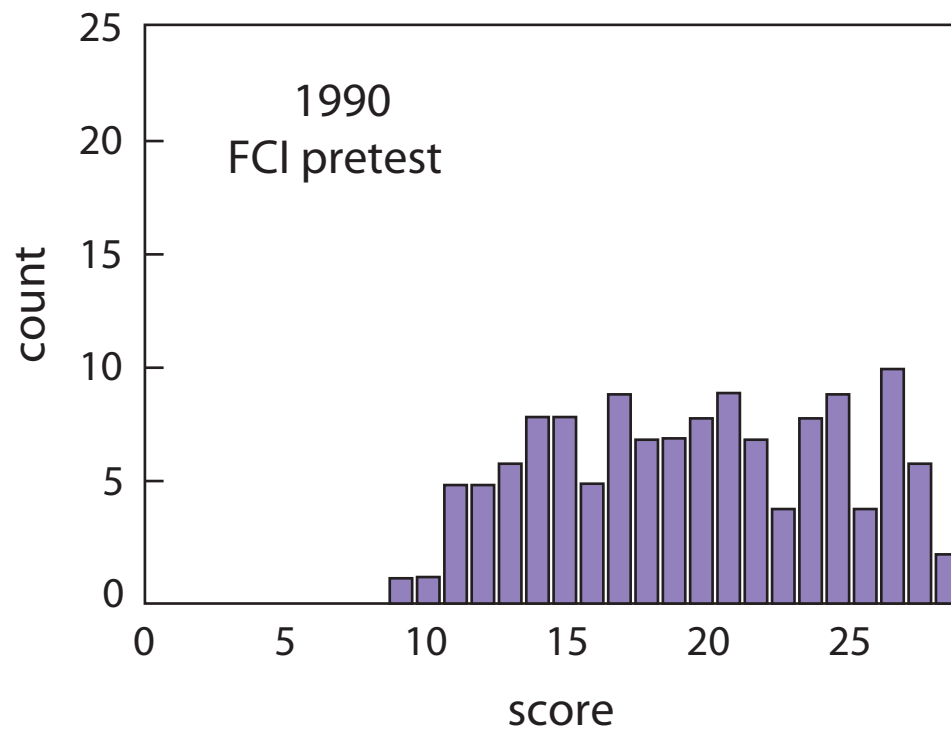
# Education

lectures focus on delivery of information



# Education

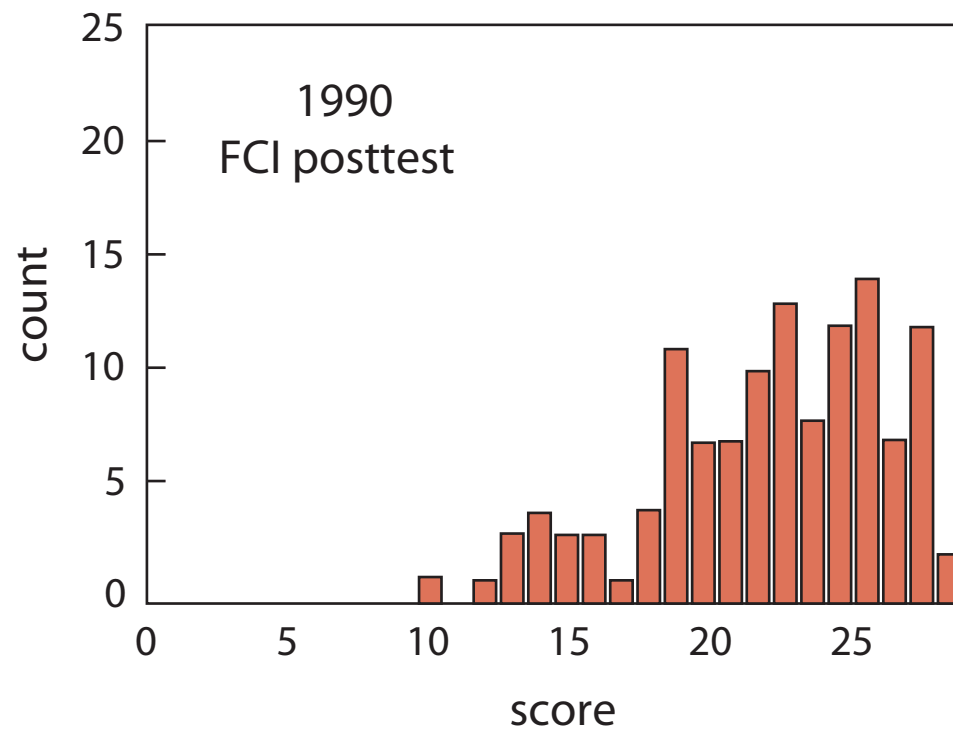
education is not just information transfer





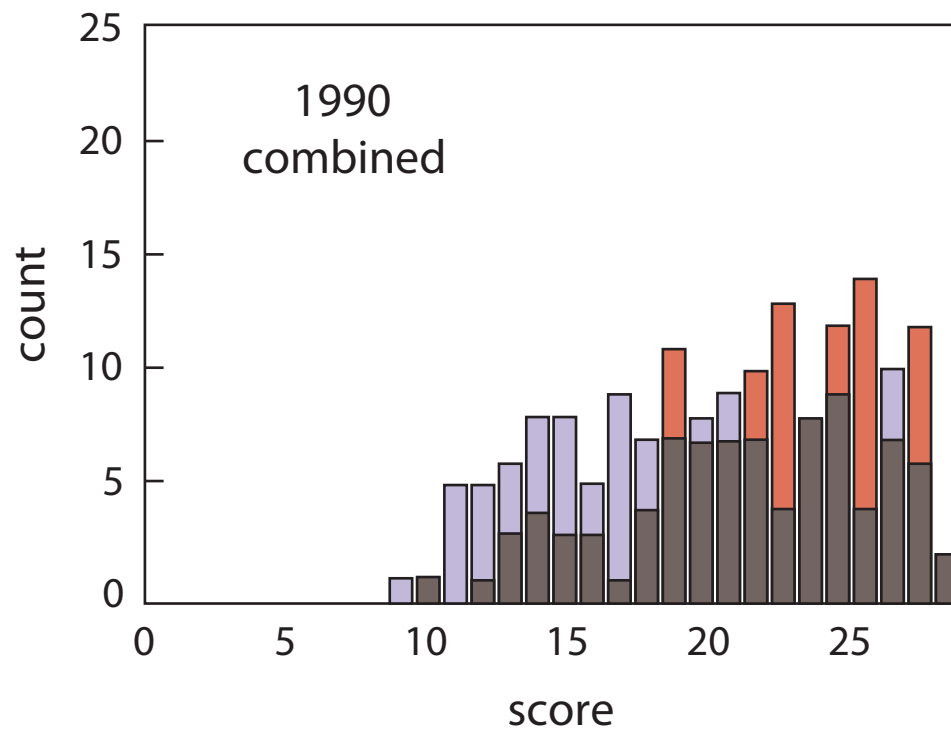
# Education

education is not just information transfer

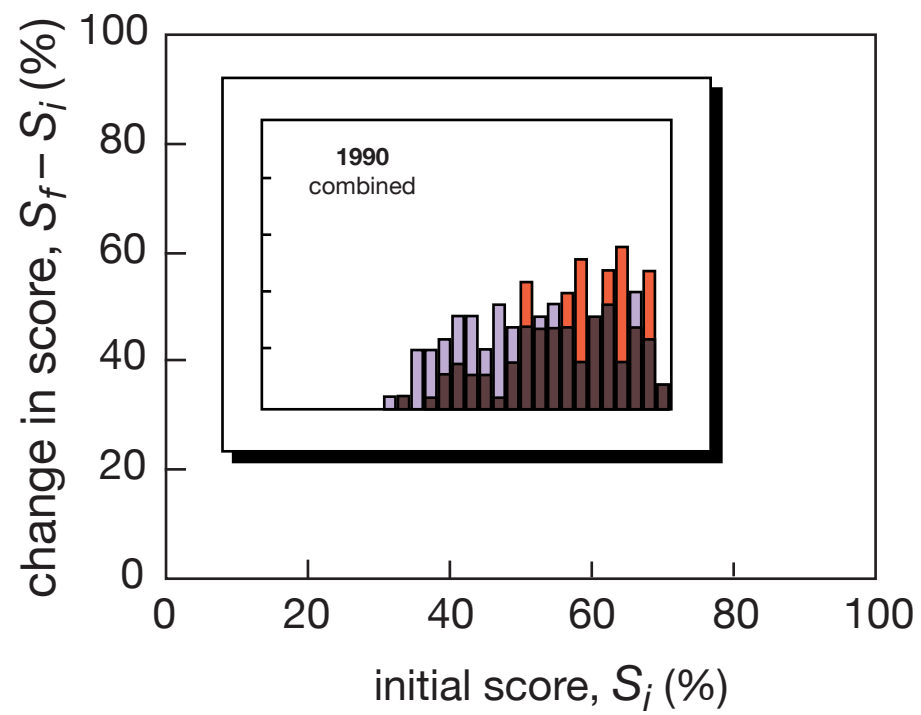


# Education

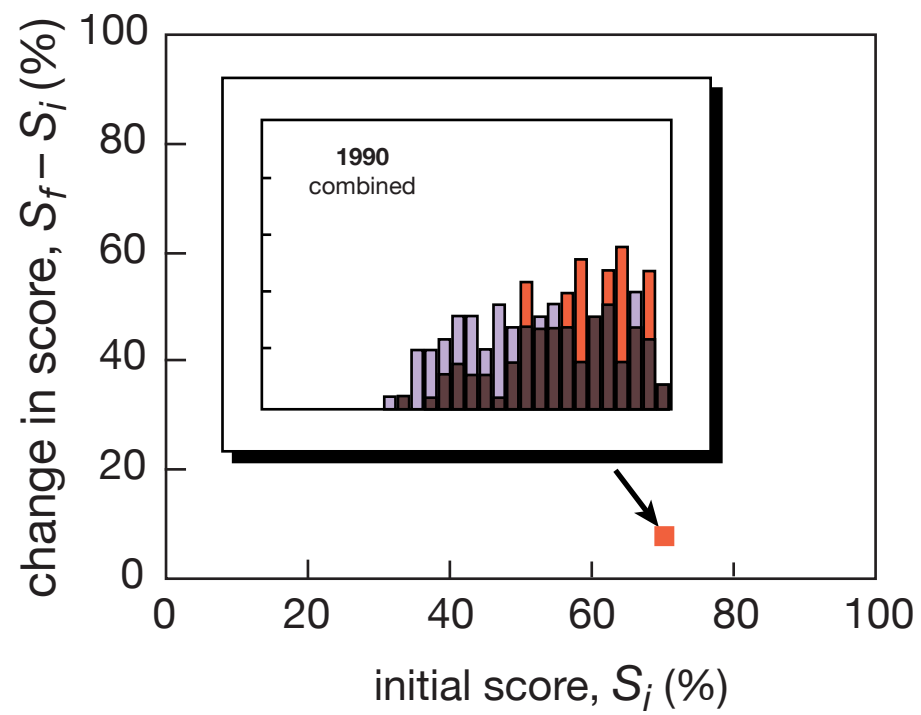
education is not just information transfer



# Education

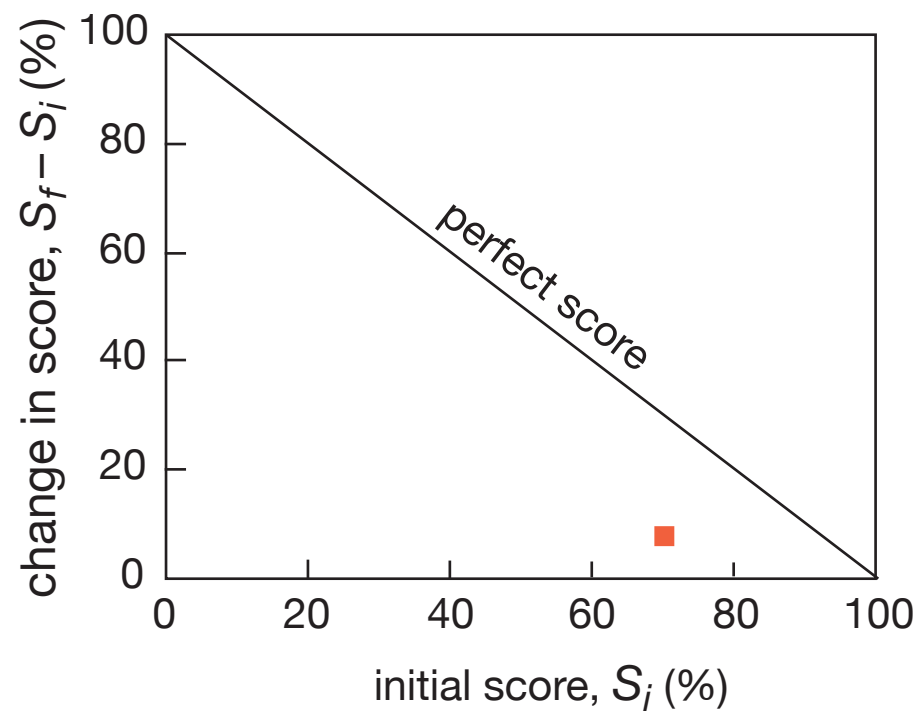


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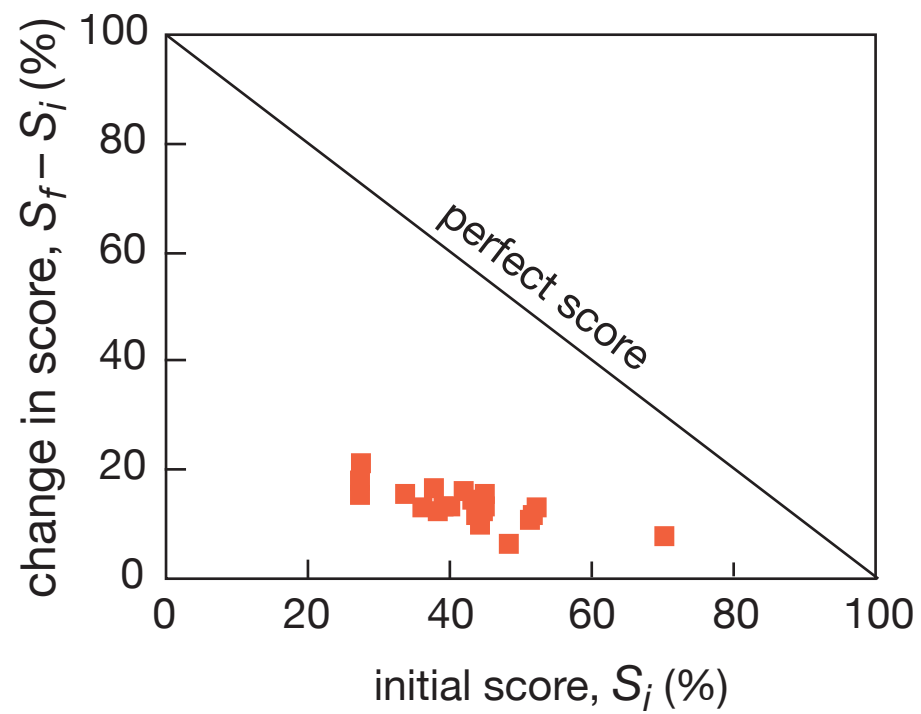




# Education



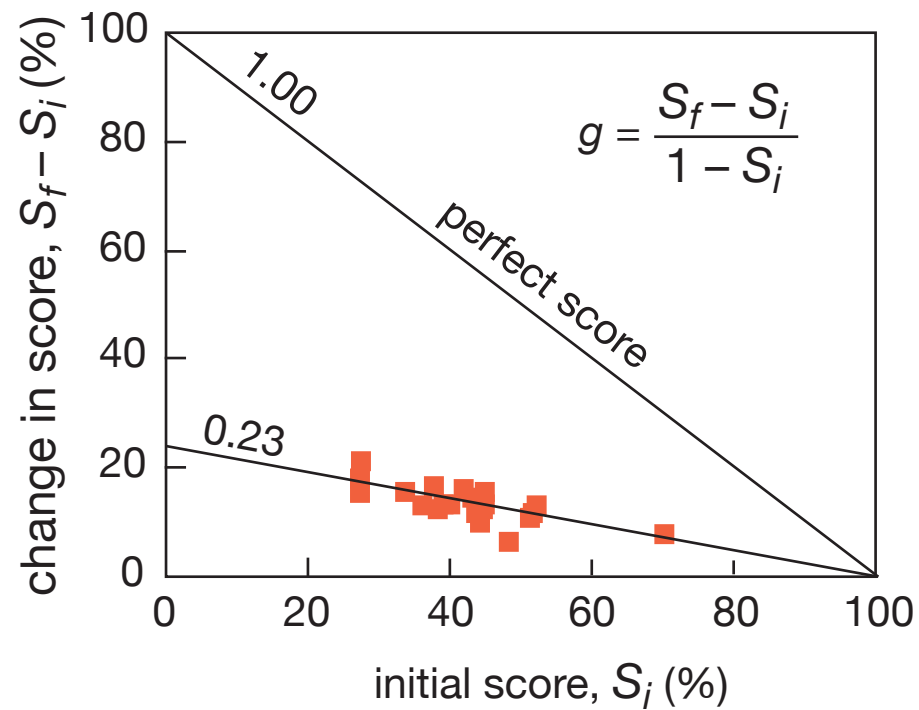
# Education



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

# Education

only one quarter of maximum gain realized

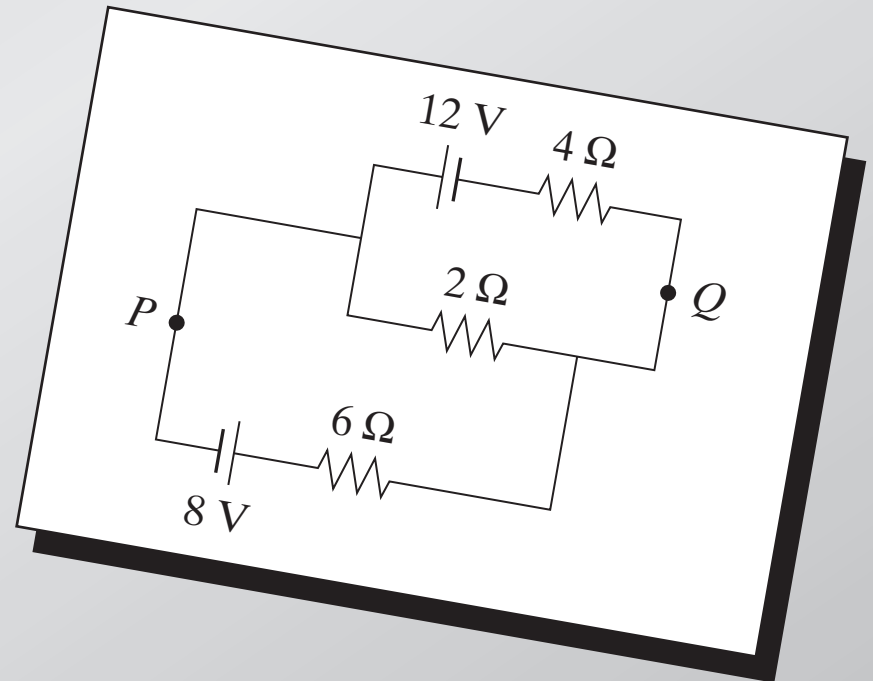






# Education

conventional problems misleading



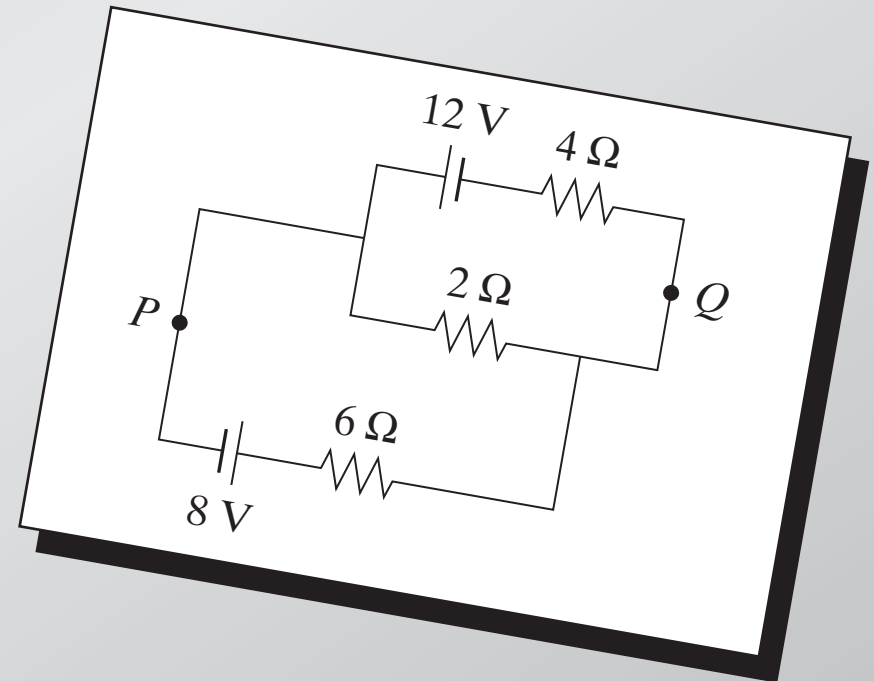
# Education

conventional problems misleading

Calculate:

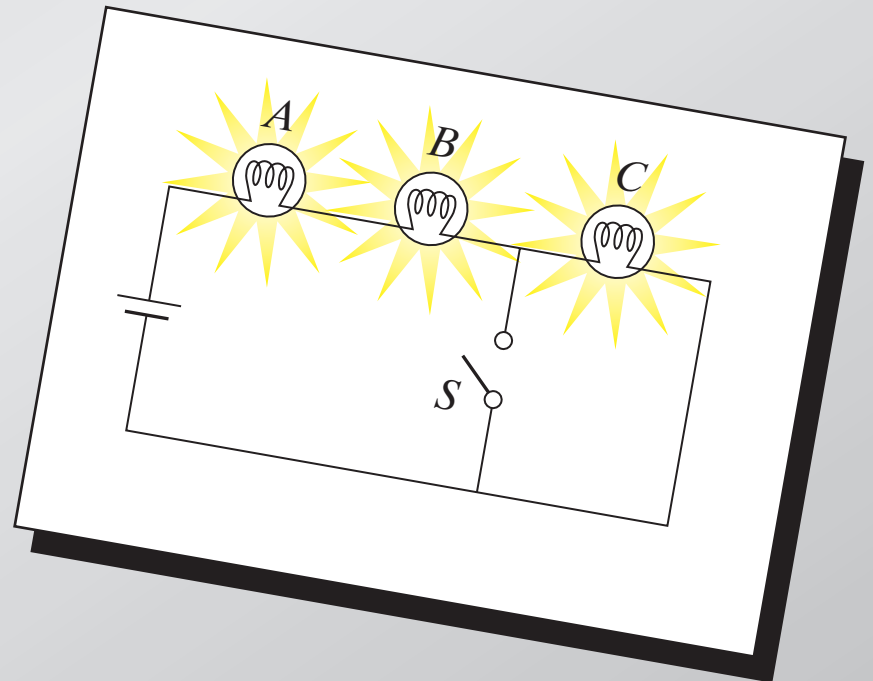
(a) current in 2- $\Omega$  resistor

(b) potential difference  
between  $P$  and  $Q$



# Education

are the basic principles understood?

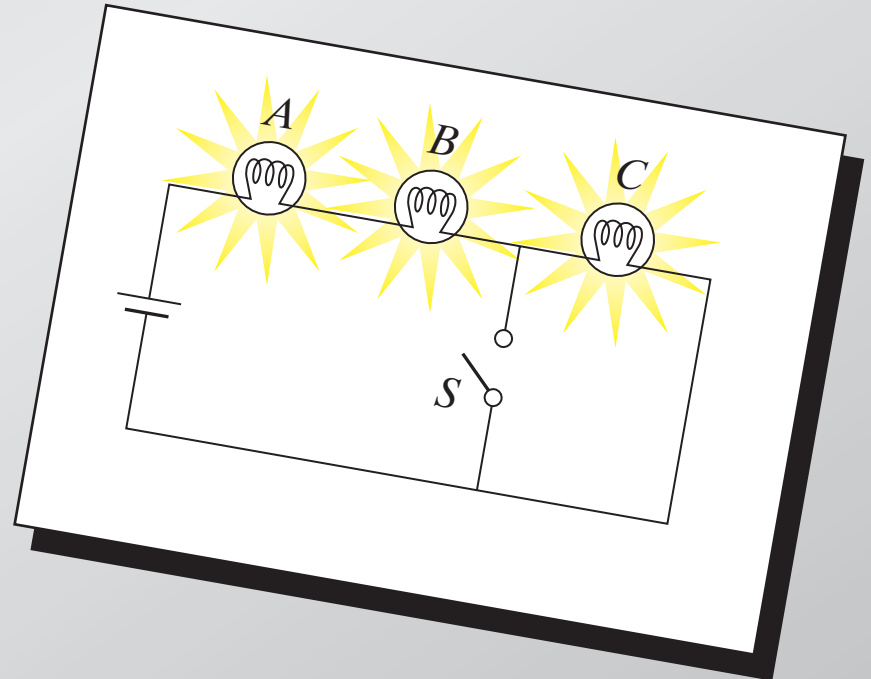


# Education

are the basic principles understood?

When  $S$  is closed, what happens to:

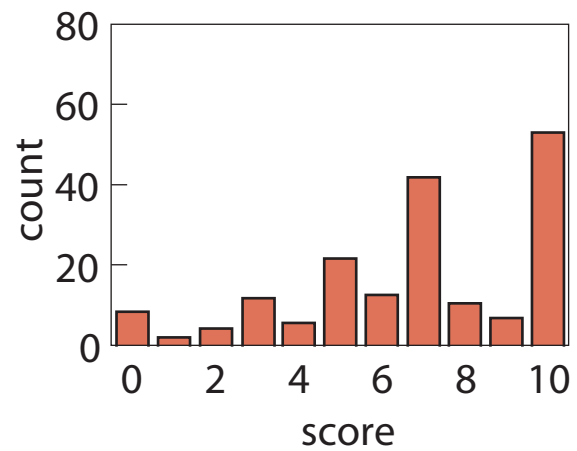
- (a) intensities of  $A$  and  $B$ ?
- (b) intensity of  $C$ ?
- (c) current through battery?
- (d) potential difference across  
 $A$ ,  $B$ , and  $C$ ?
- (e) the total power dissipated?



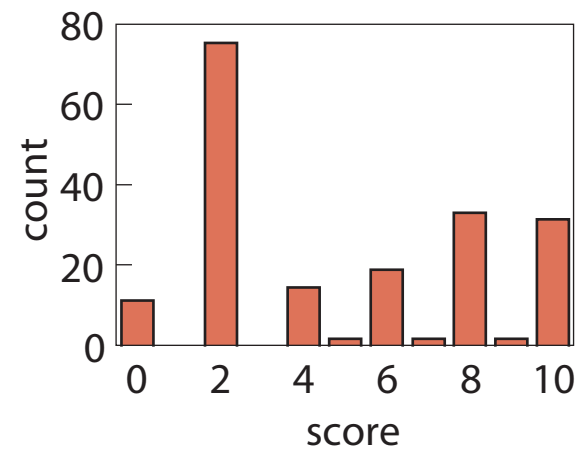


# Education

**conventional**

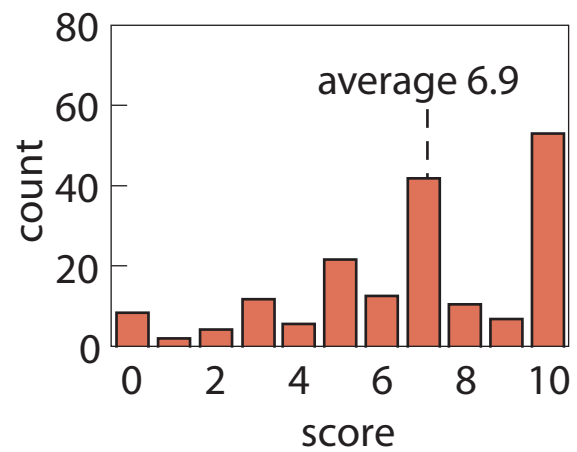


**conceptual**

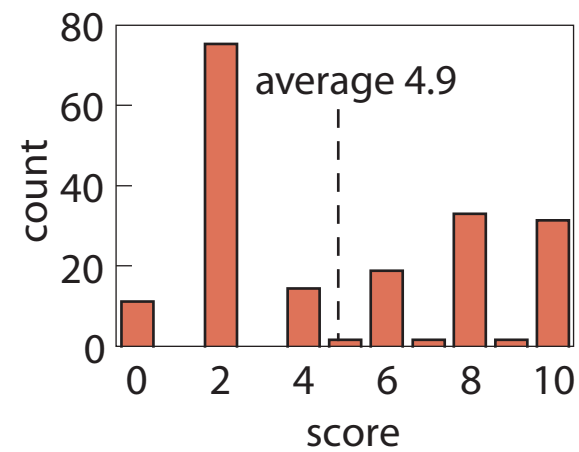


# Education

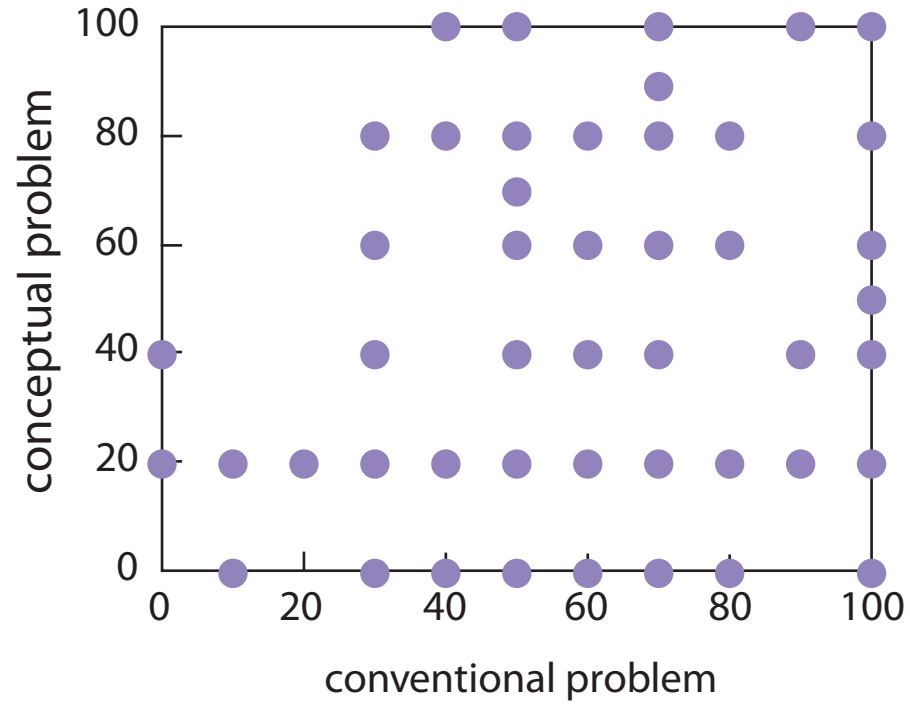
**conventional**



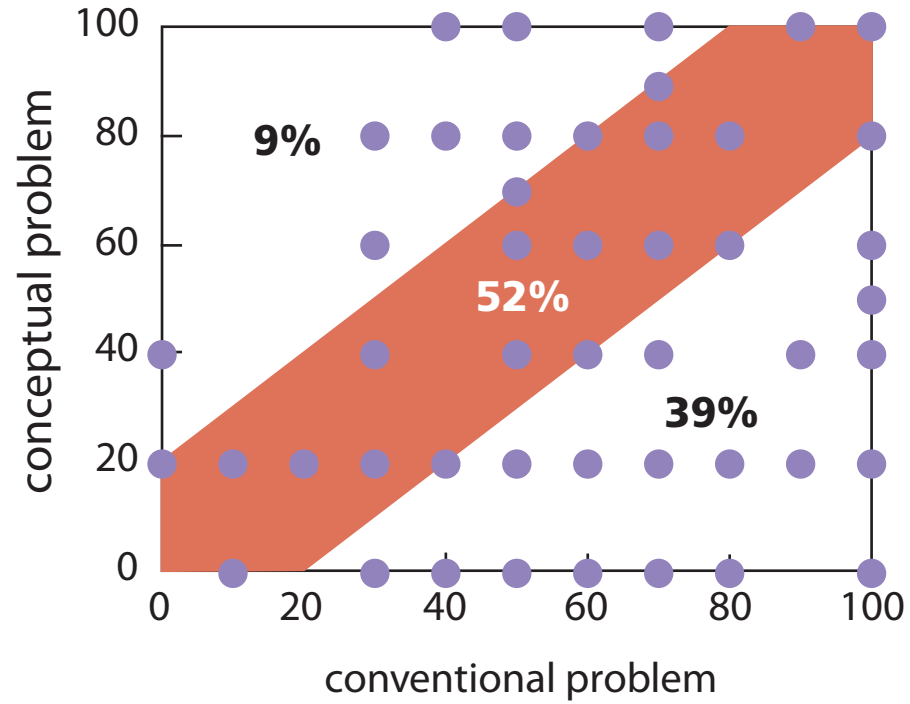
**conceptual**



# Education



# Education





So what should we do?



# Peer Instruction

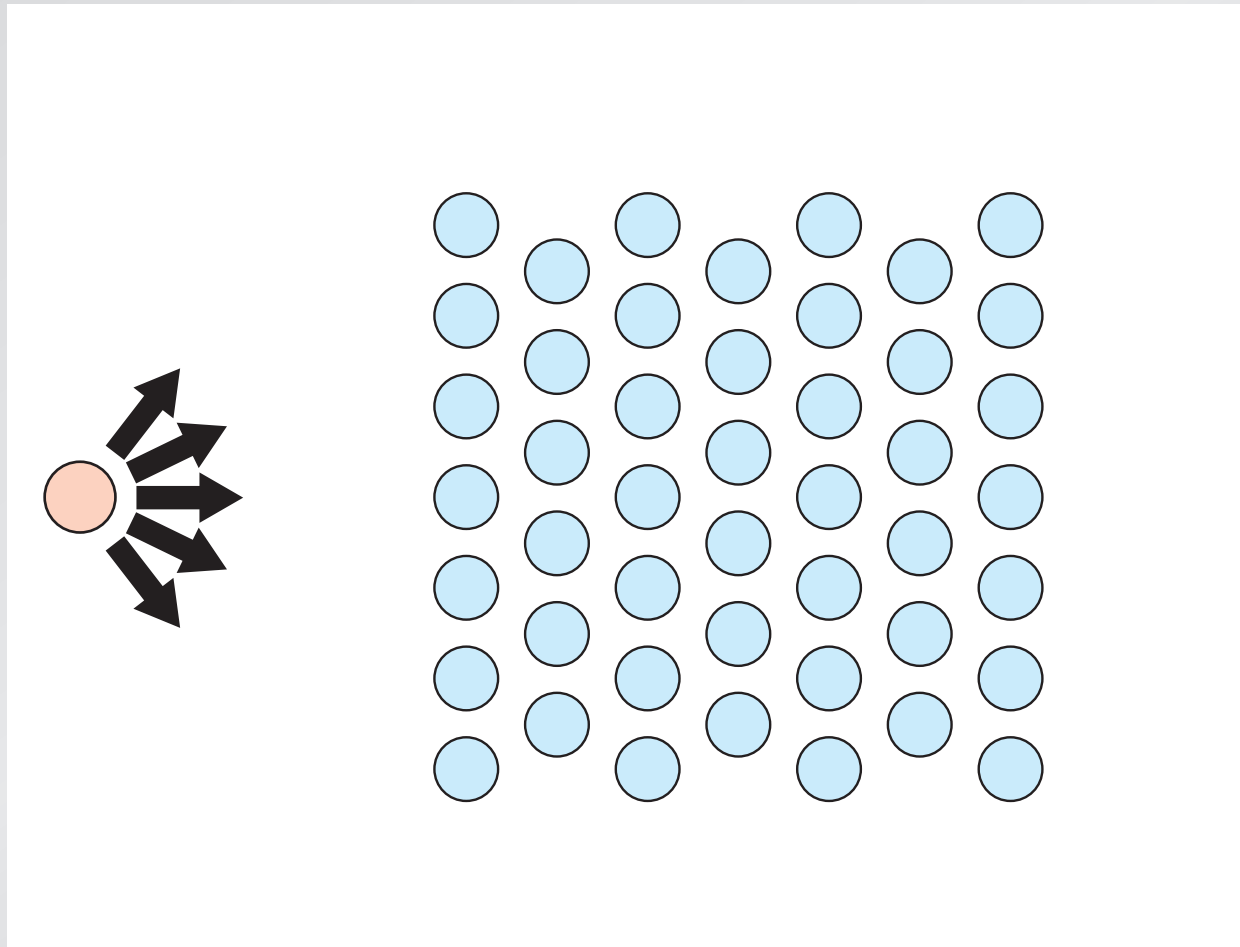
**Give students more responsibility for gathering information...**

# Peer Instruction

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

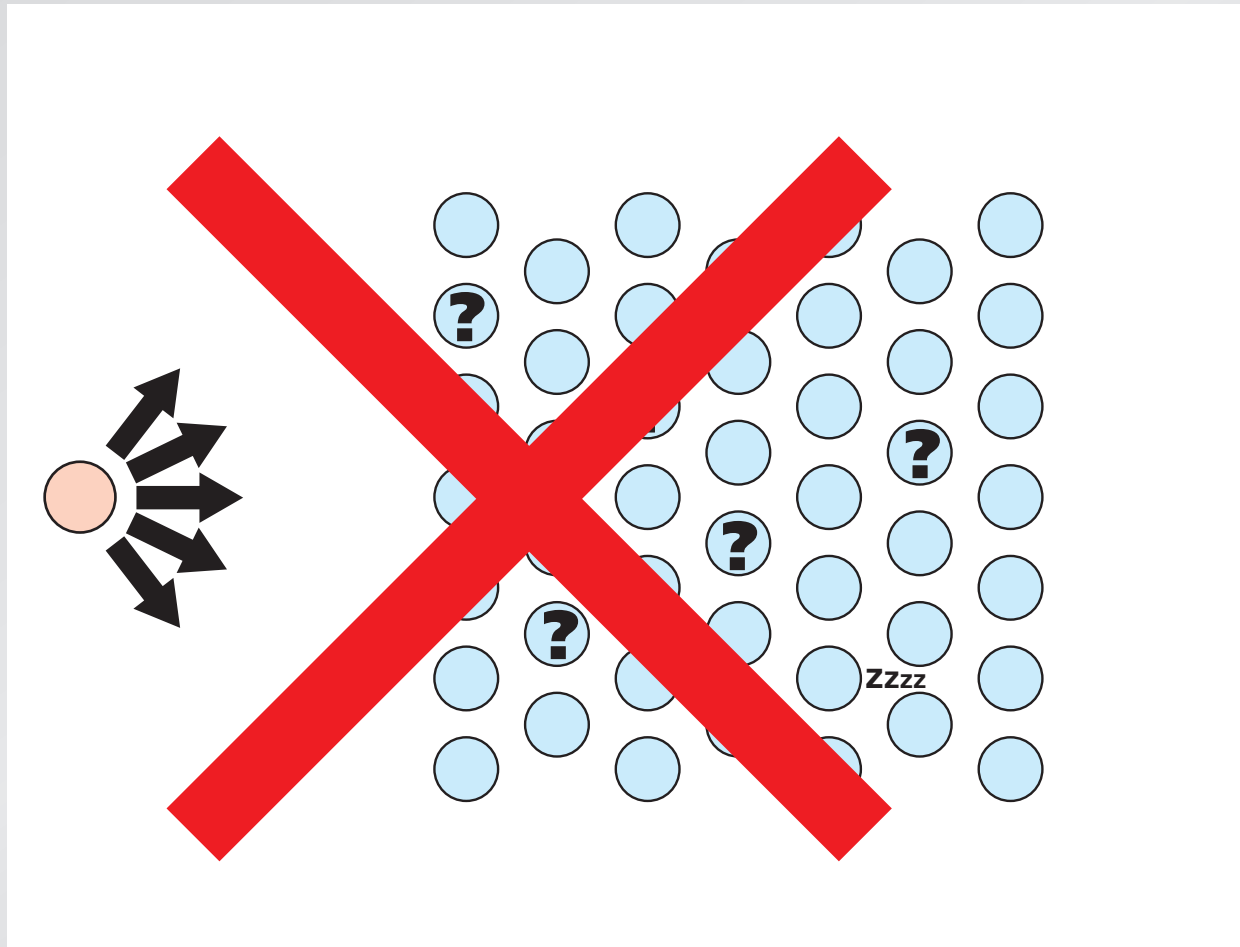
# Peer Instruction

## 1. Recognize the inefficacy of the lecture method



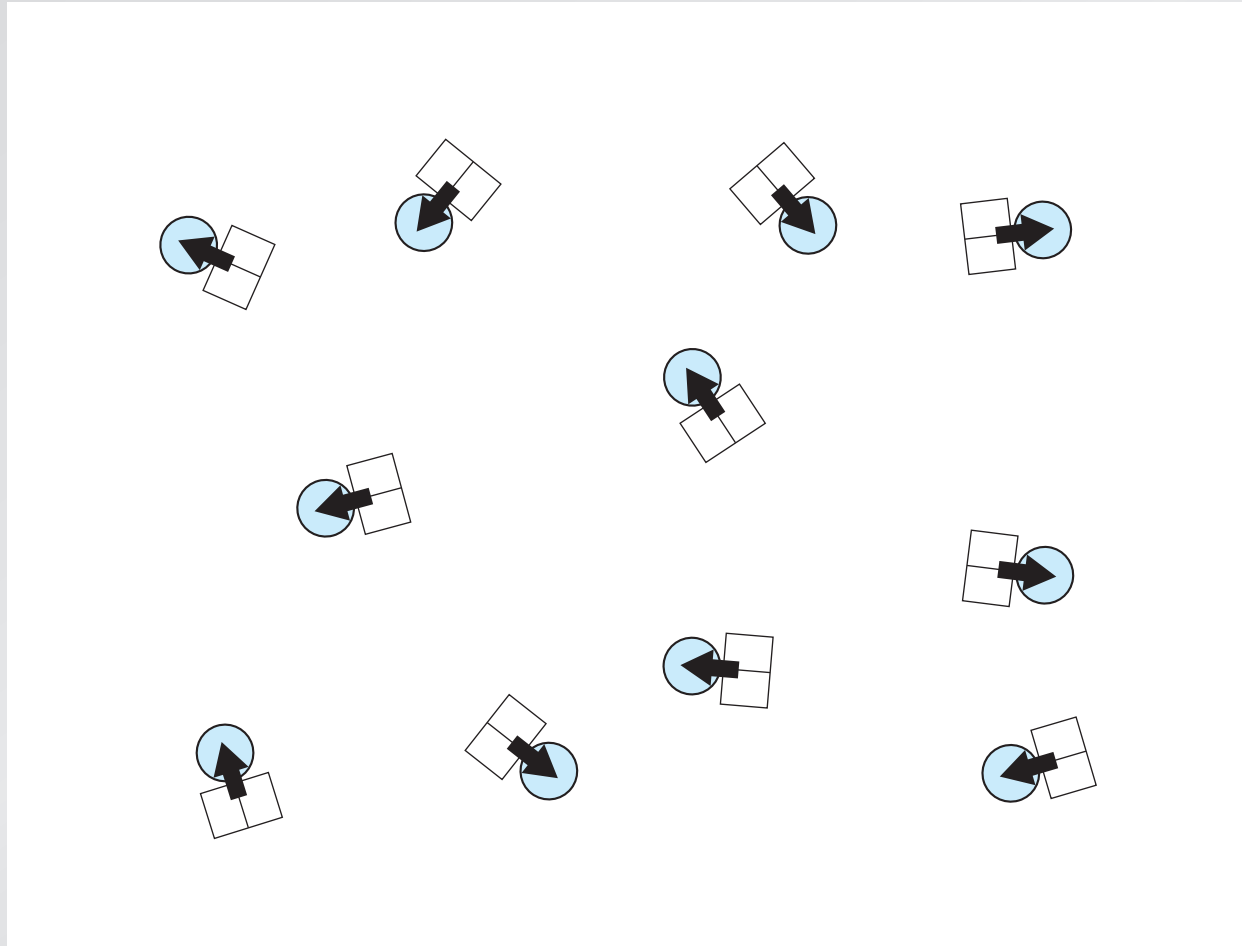
# Peer Instruction

## 1. Recognize the inefficacy of the lecture method



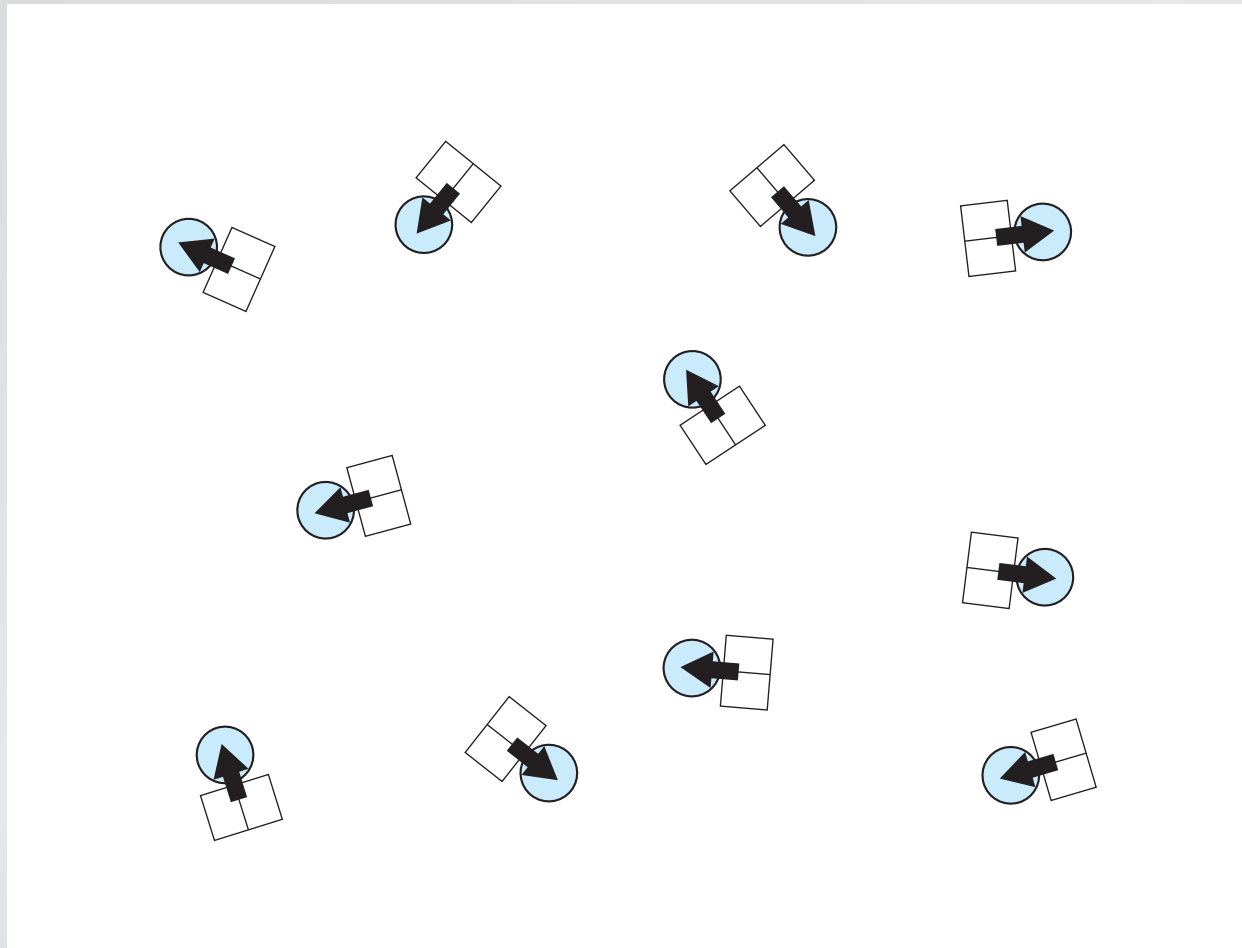
# Peer Instruction

## 2. Move first exposure to material out of classroom



# Peer Instruction

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...assign reading!

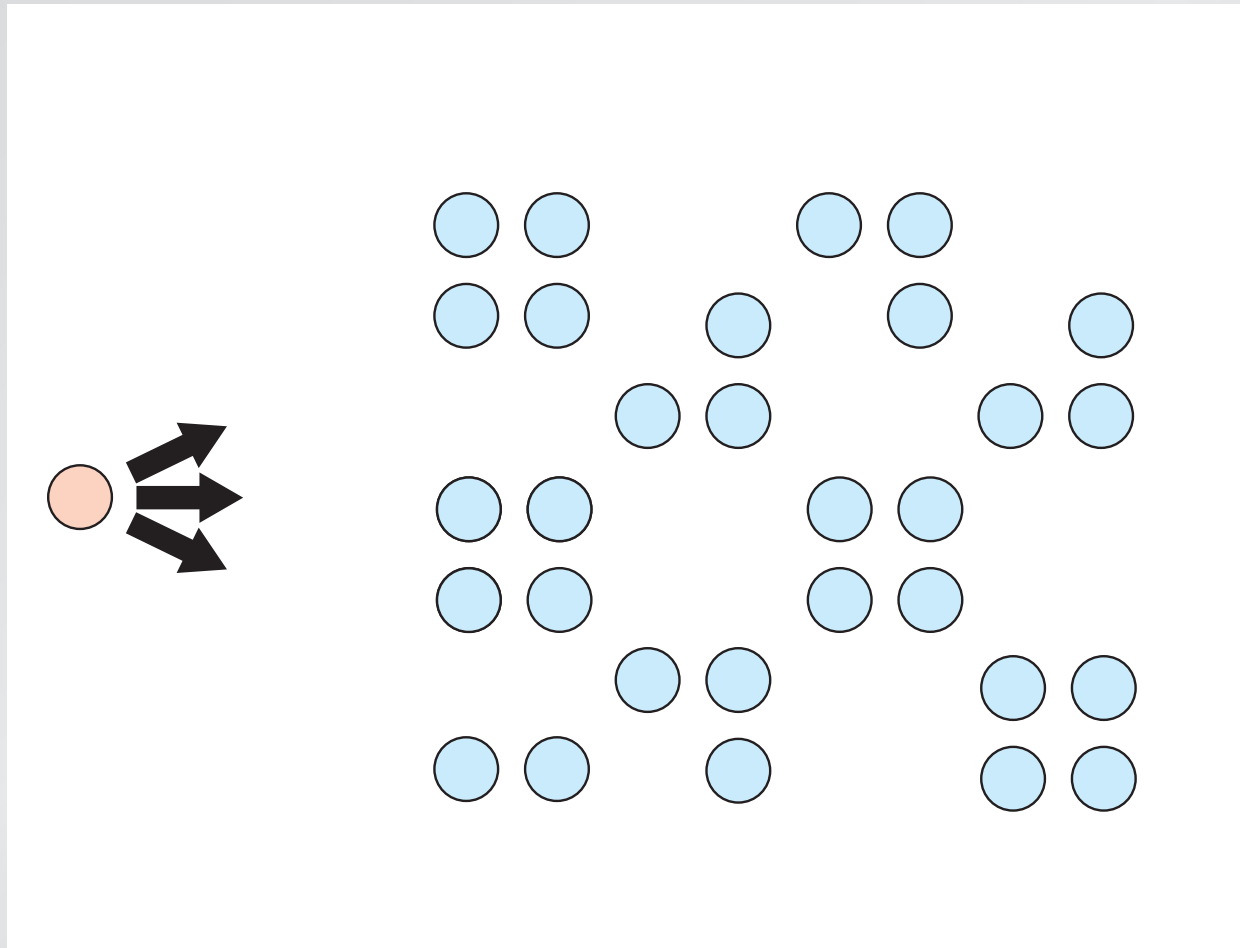


# Peer Instruction

**3. Use class period to deepen and broaden understanding**

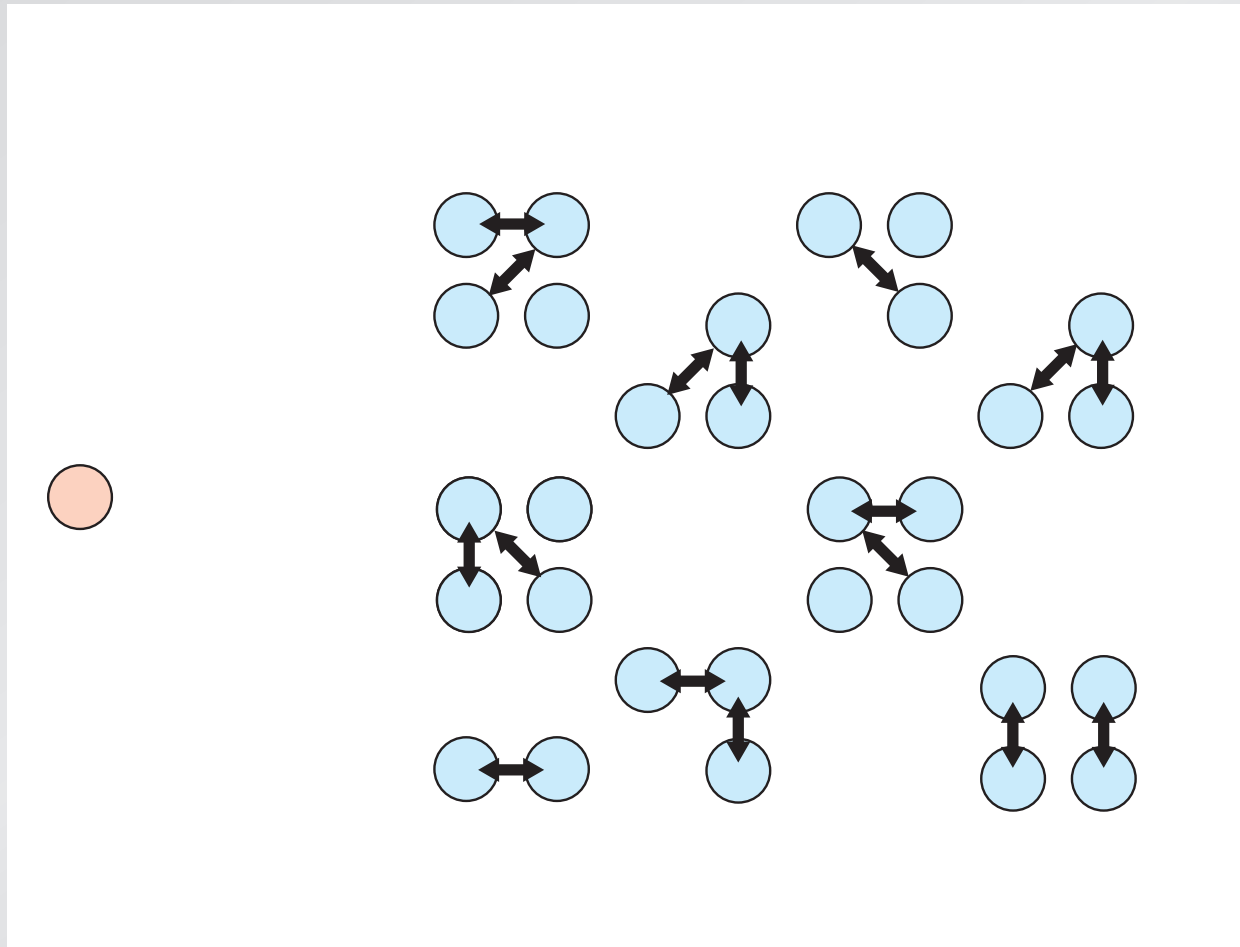
# Peer Instruction

...by painting the big picture...



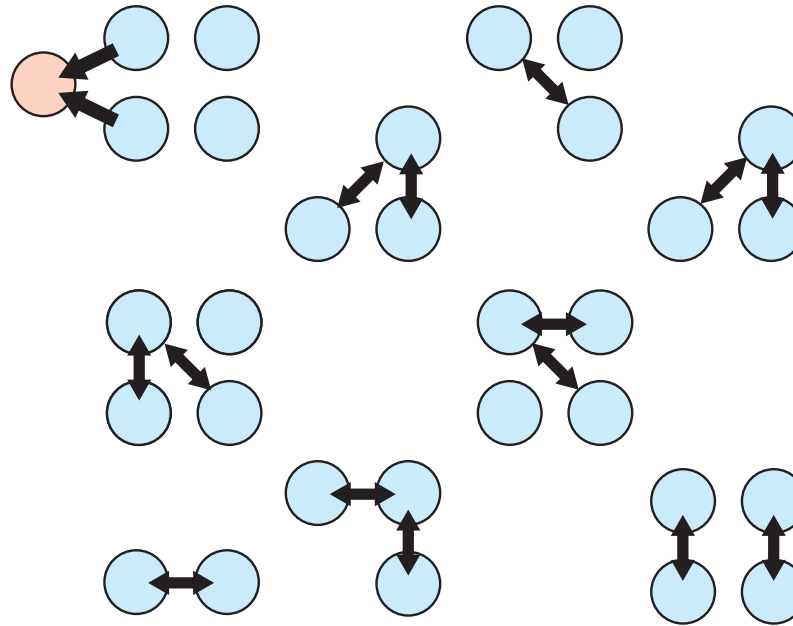
# Peer Instruction

...and giving your students time to think and discuss



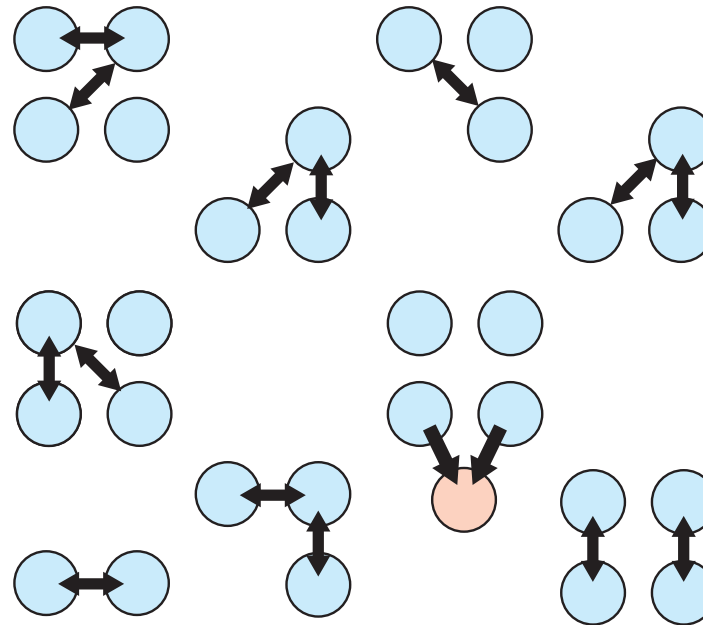
# Peer Instruction

Better yet: Learn from your students...



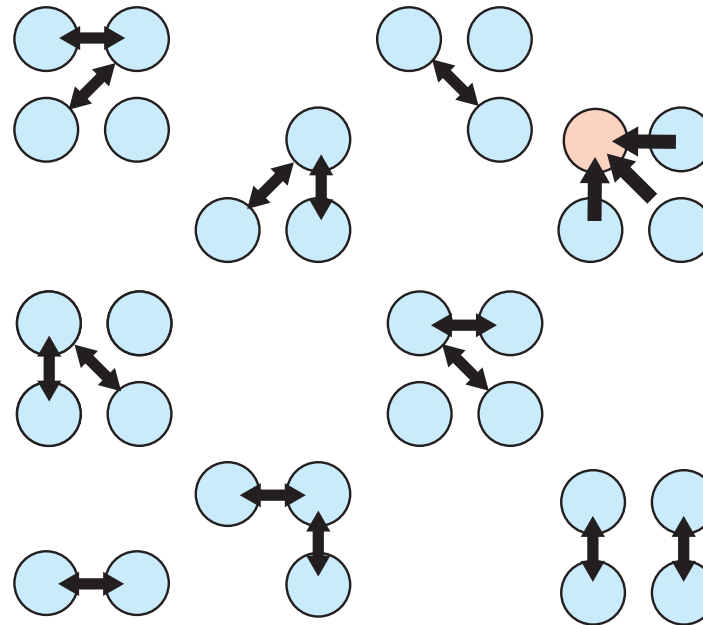
# Peer Instruction

Better yet: Learn from your students...



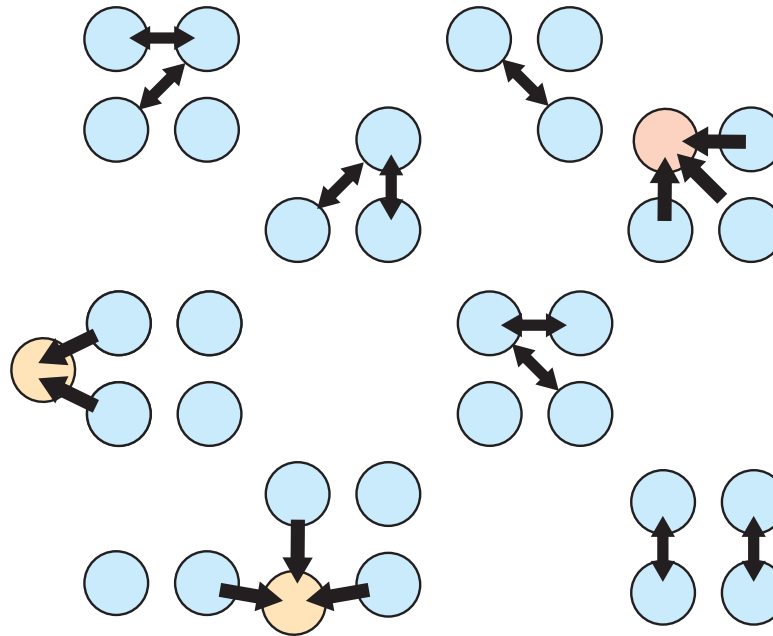
# Peer Instruction

Better yet: Learn from your students...



# Peer Instruction

...bring in your Teaching Assistants too!

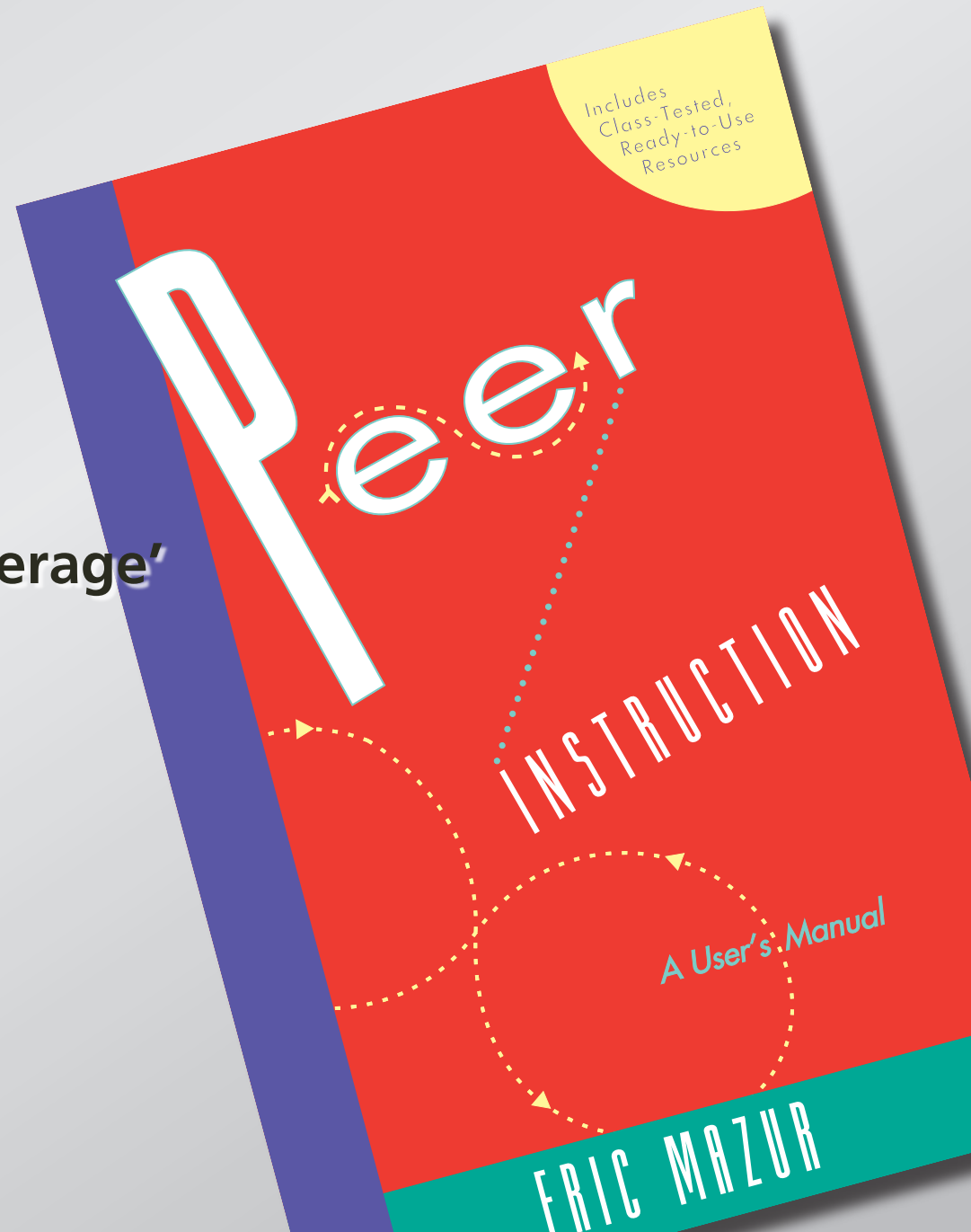




# Peer Instruction

## Main features:

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



# Peer Instruction

**ConcepTest:**

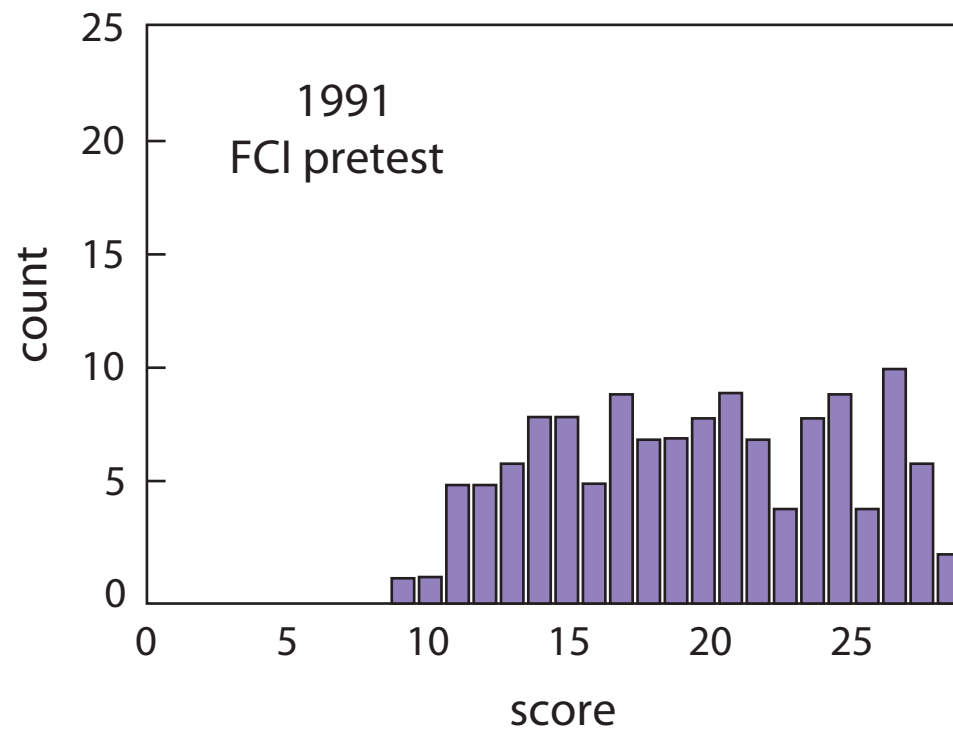
- 1. Question**
- 2. Thinking**
- 3. Individual answer**
- 4. Peer discussion**
- 5. Revised/Group answer**
- 6. Explanation**

# Results

is it any good?

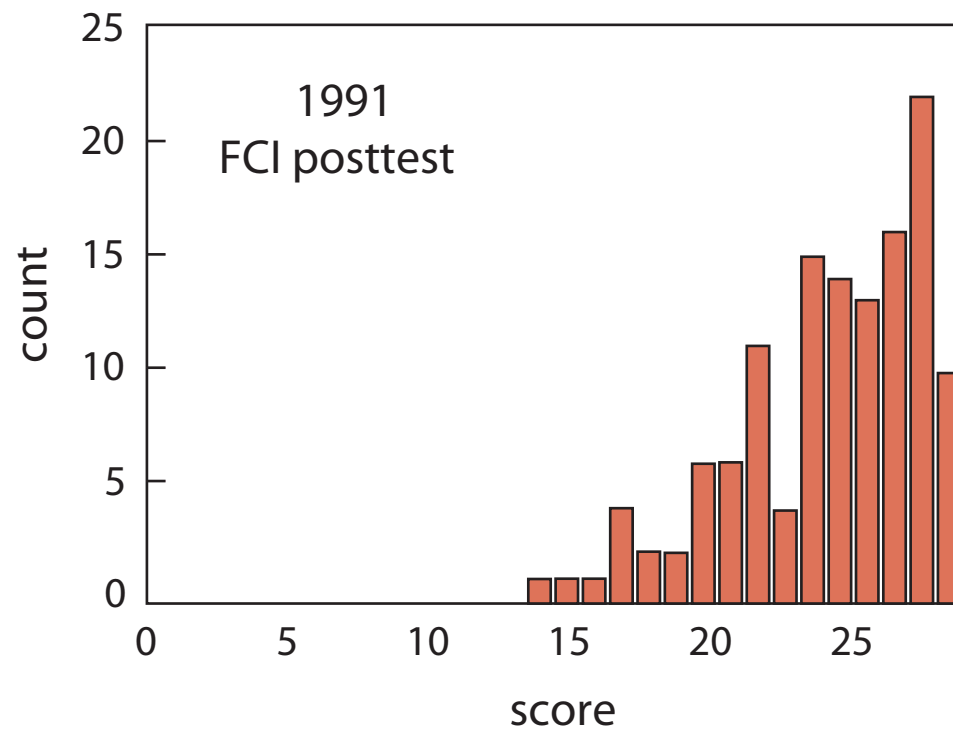
# Results

first year of implementing PI



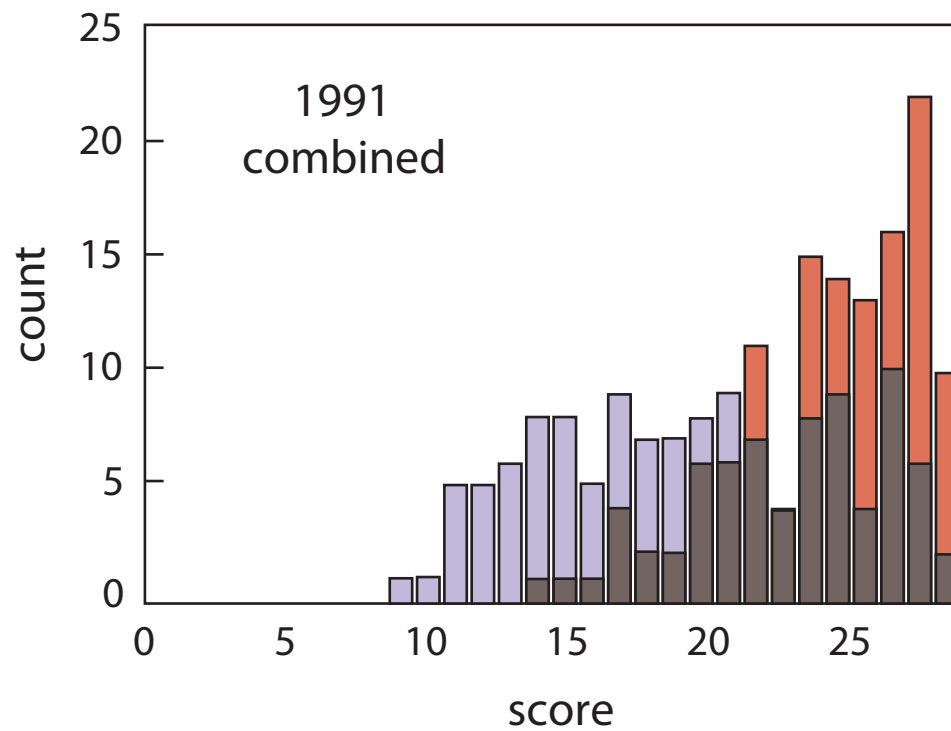
# Results

first year of implementing PI

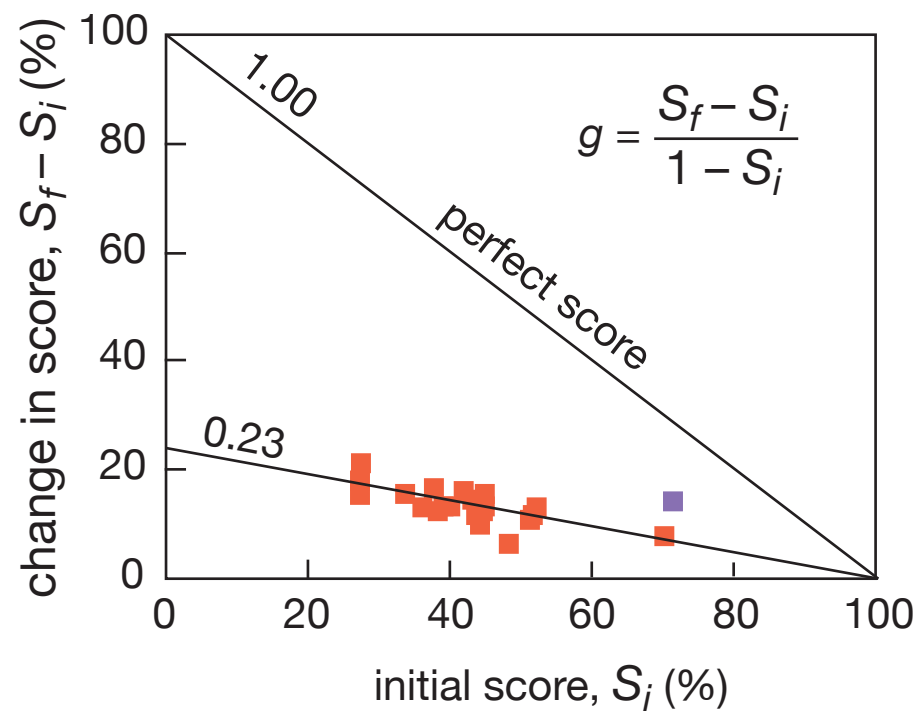


# Results

## first year of implementing PI

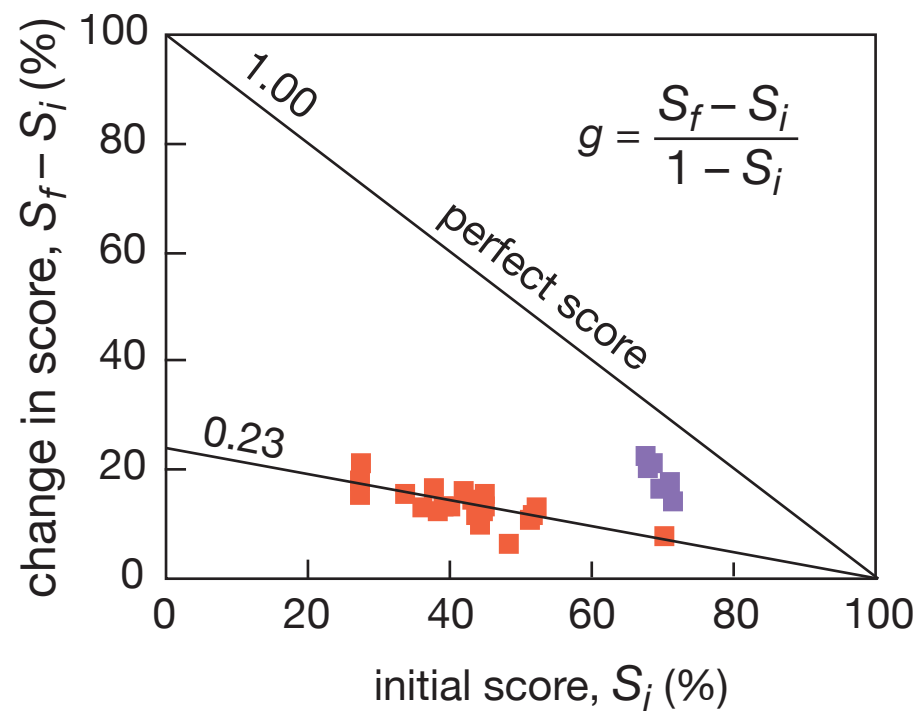


# Results

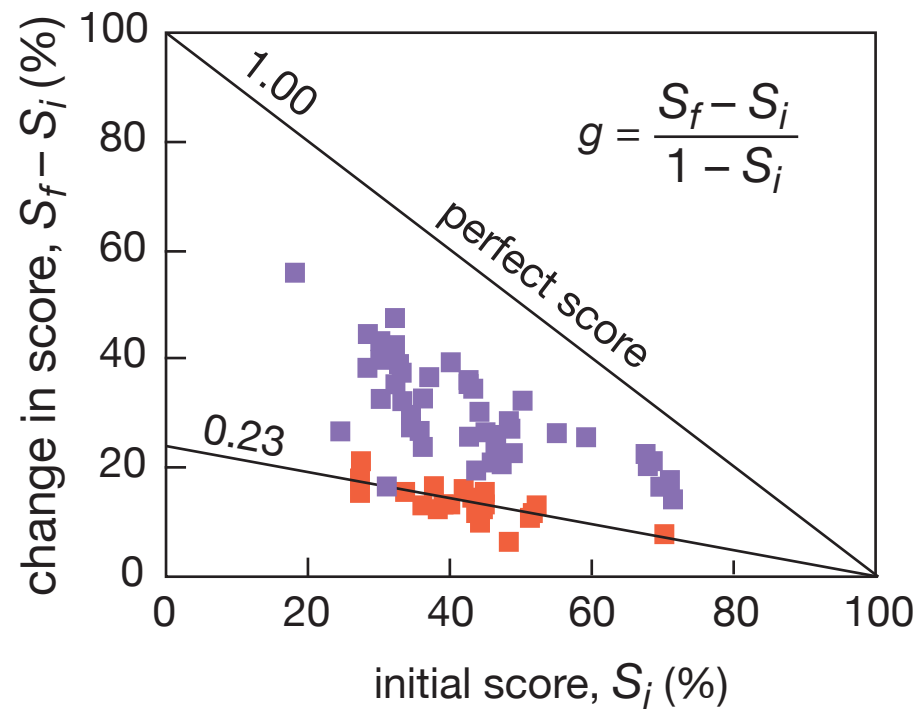




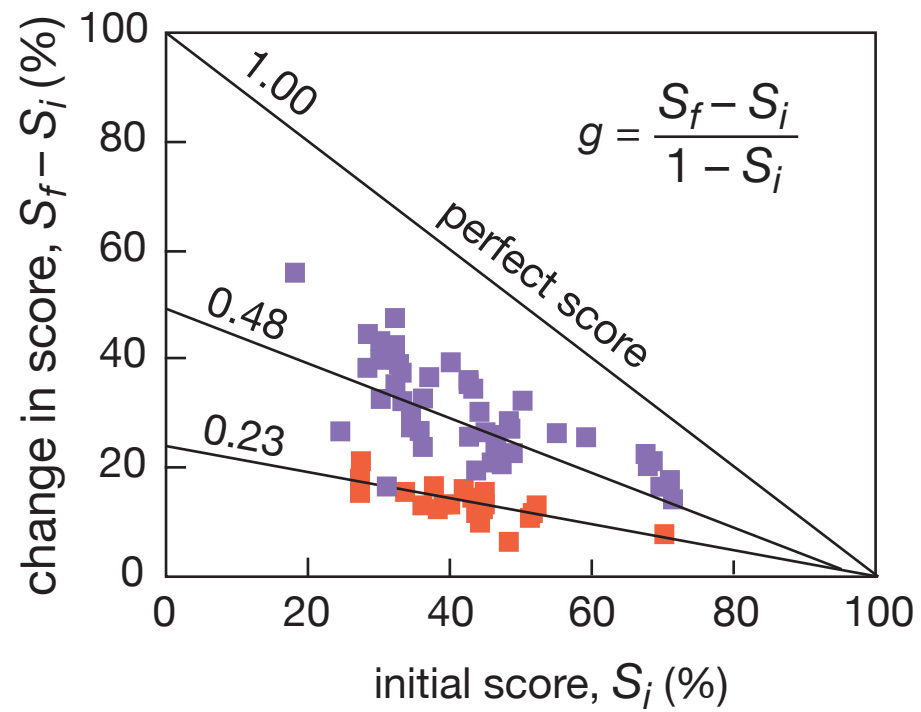
# Results



# Results



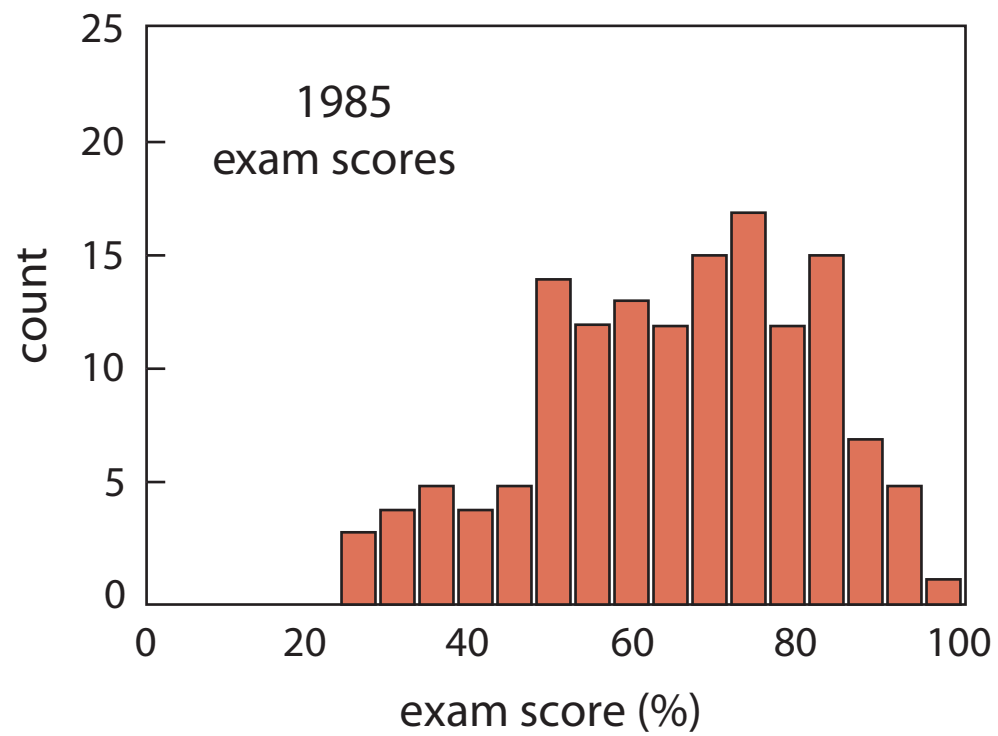
# Results



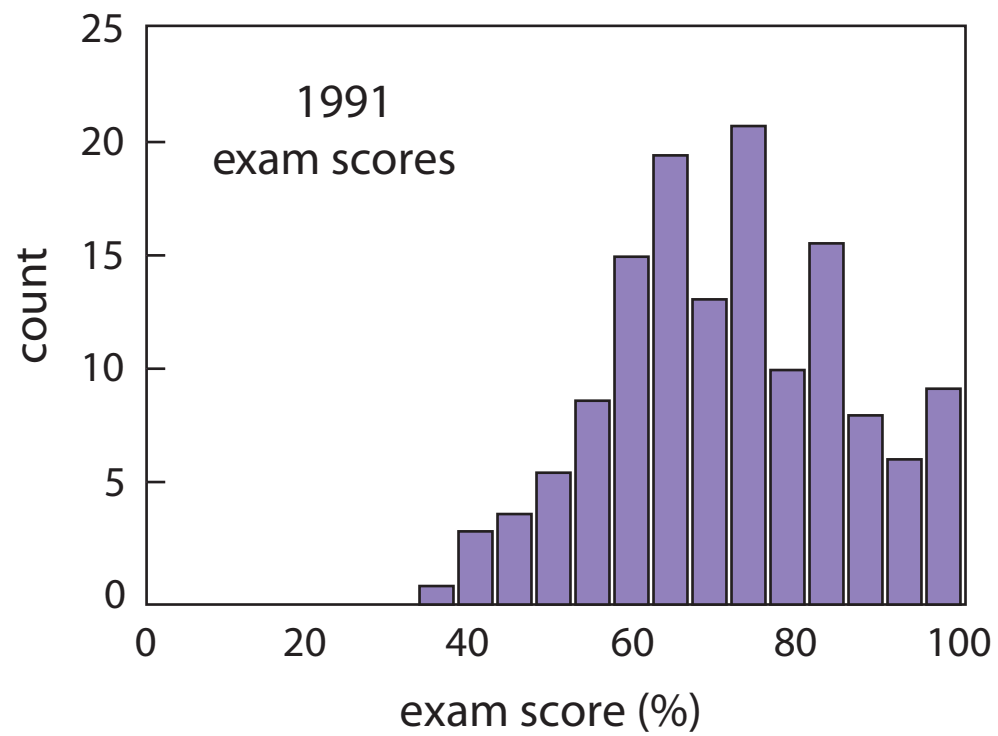
# Results

**what about problem solving?**

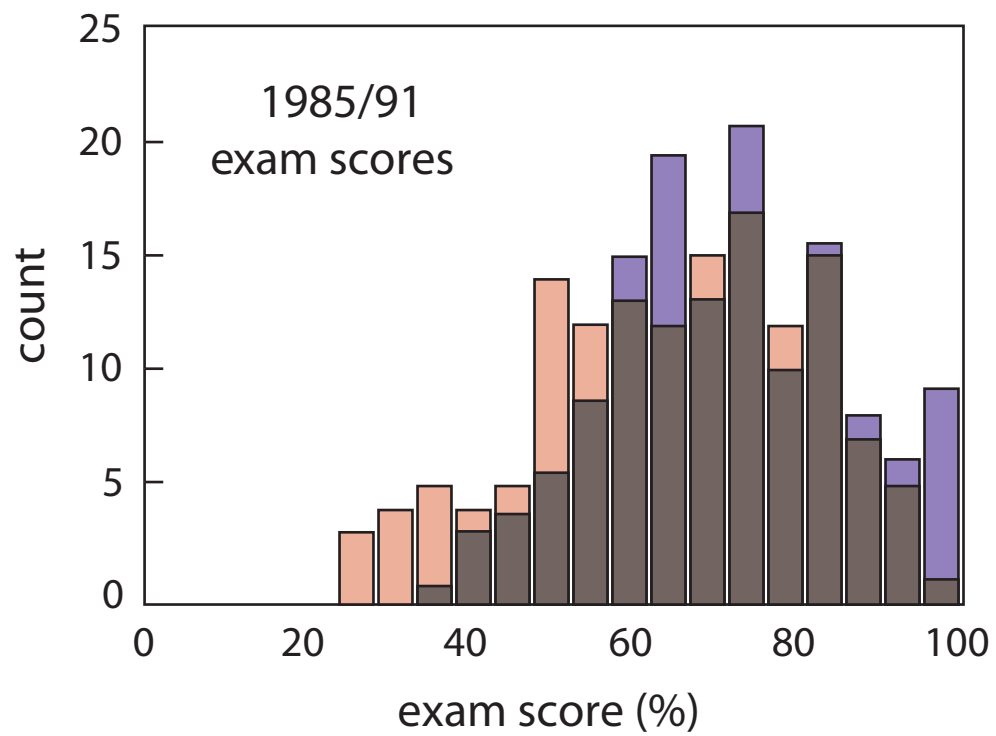
# Results



# 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!)**



# 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

# Conclusion

**A little reorganization goes a long way!**

**Funding:**

**National Science Foundation**

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