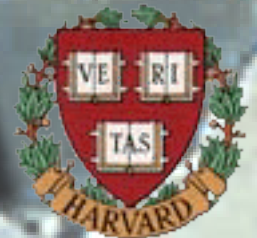


# Understanding or Memorization: Are we teaching the right thing?



NSBP and NSHP 2007 Joint Annual Conference  
Boston, MA, 23 February 2007



# Outline

- Education



# Outline

- Education
- Peer Instruction



# Outline

- Education
- Peer Instruction
- Results

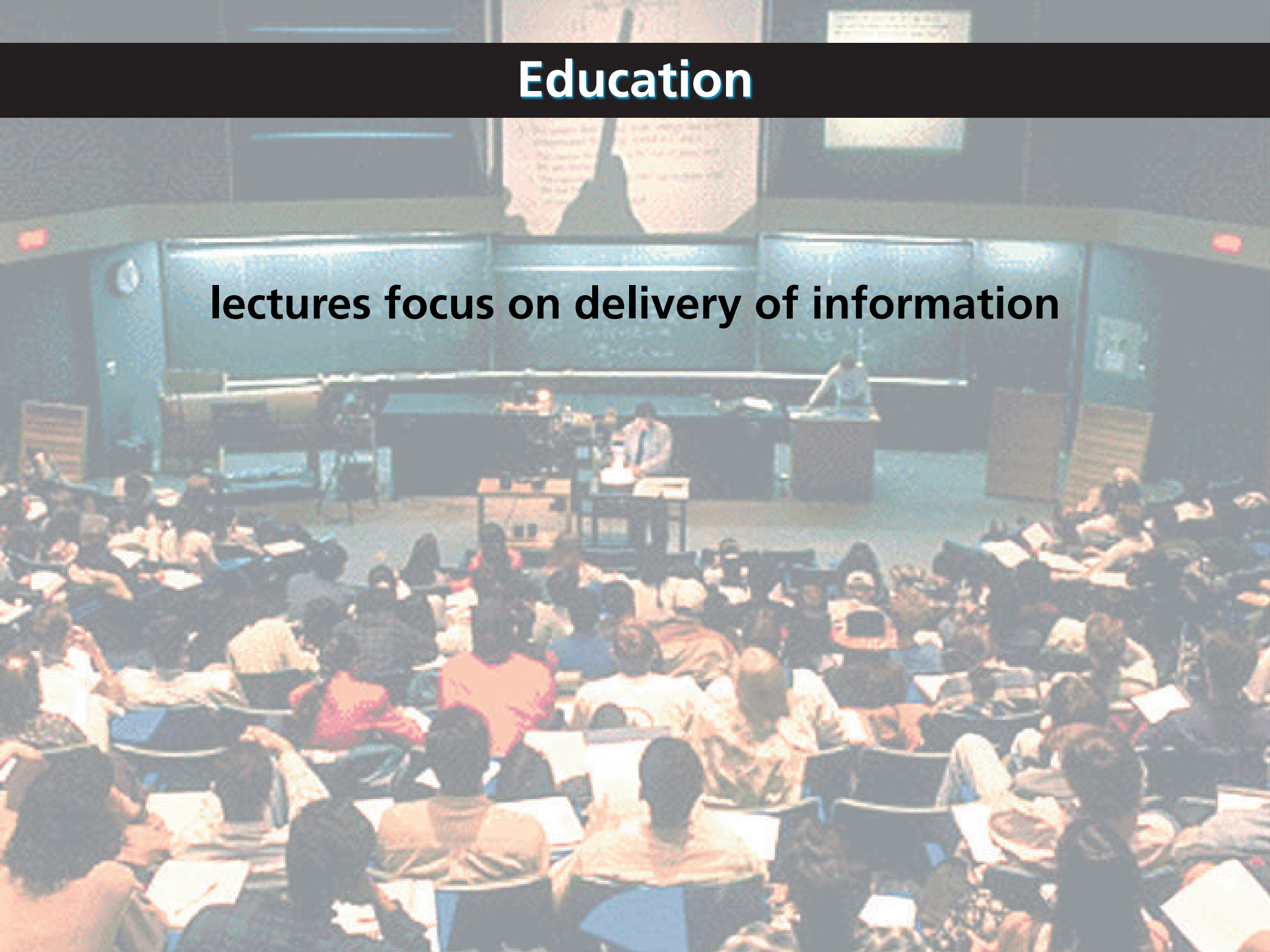


# Education



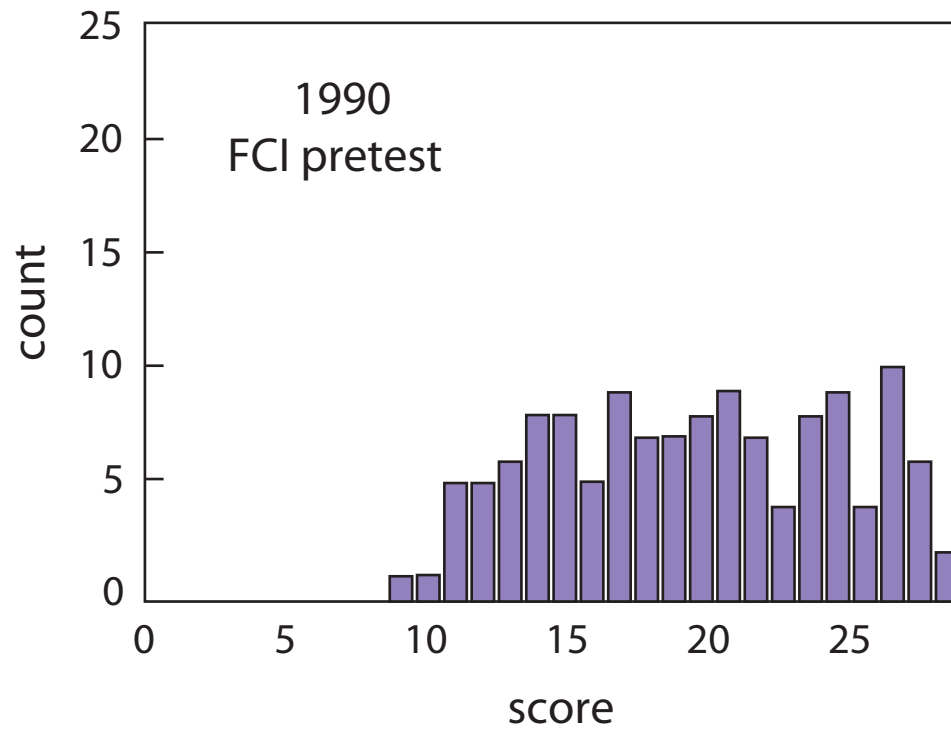
# Education

lectures focus on delivery of information



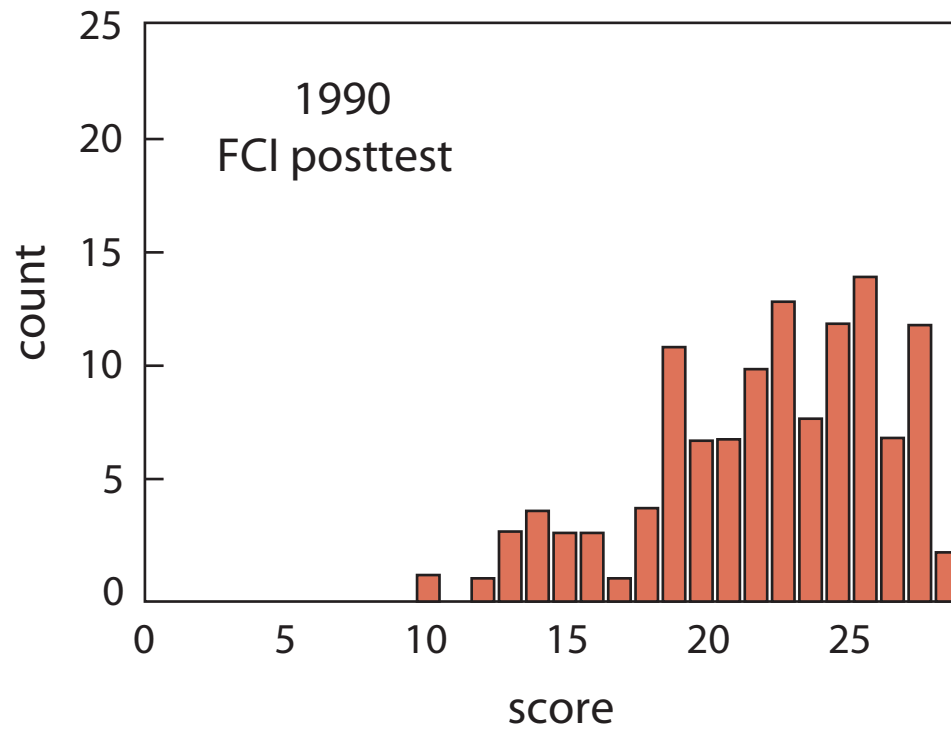
# Education

education is not just information transfer



# Education

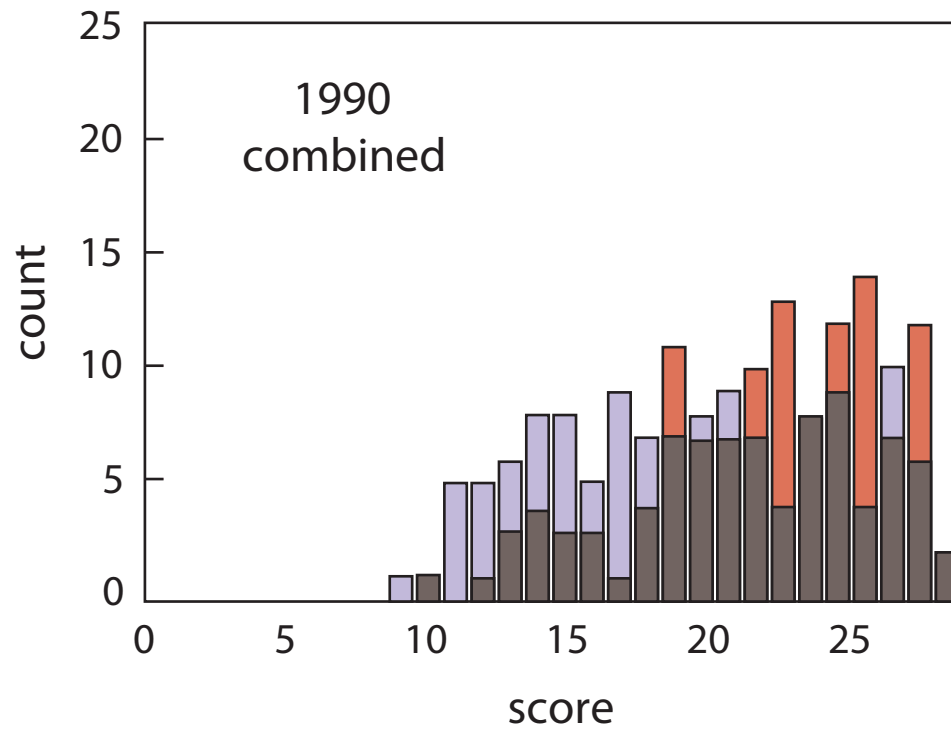
education is not just information transfer



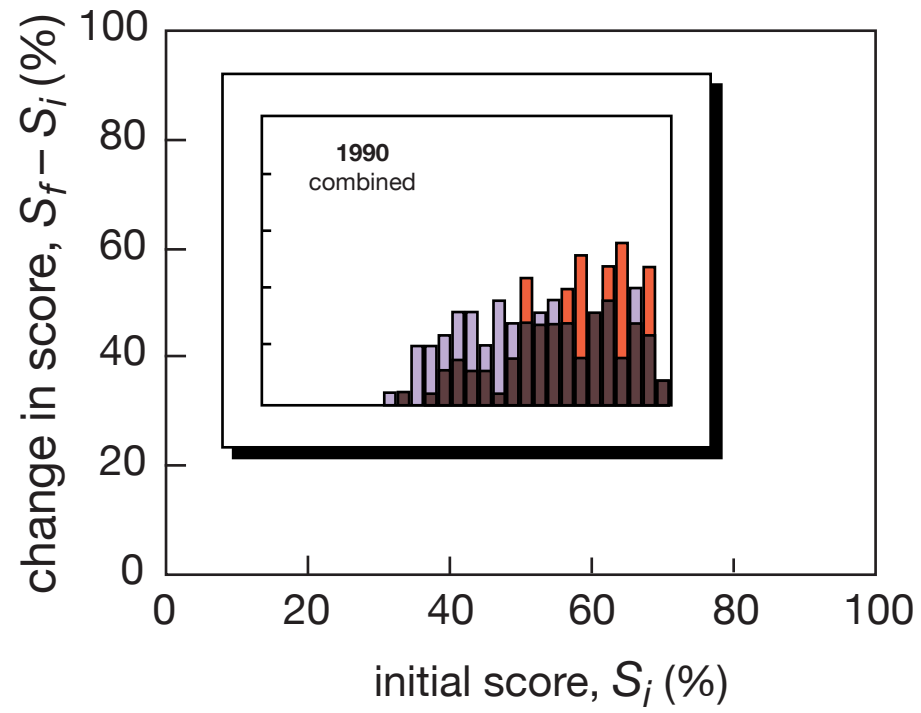


# Education

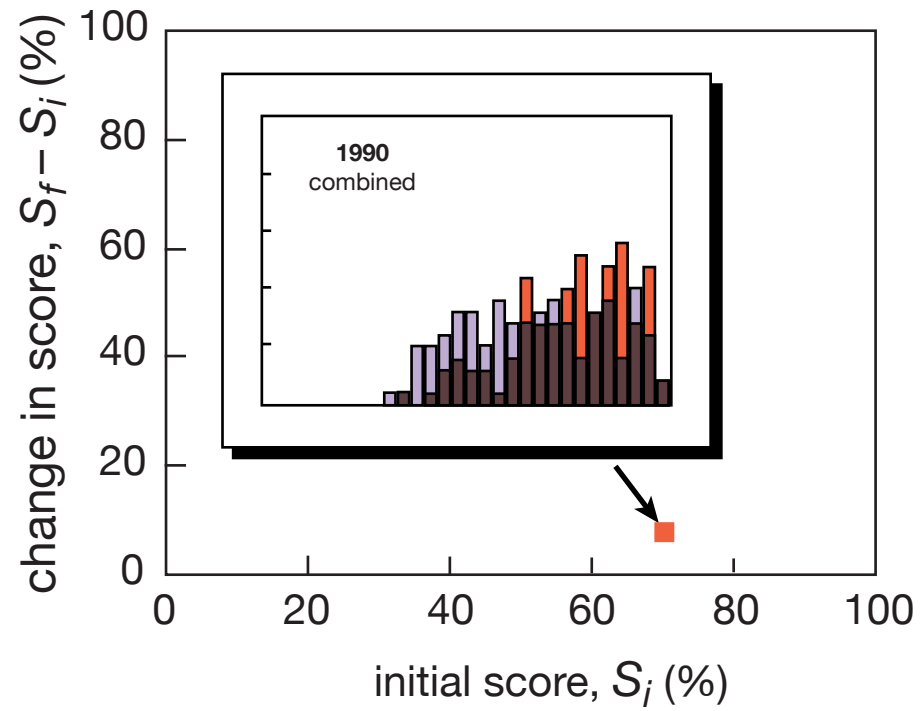
education is not just information transfer



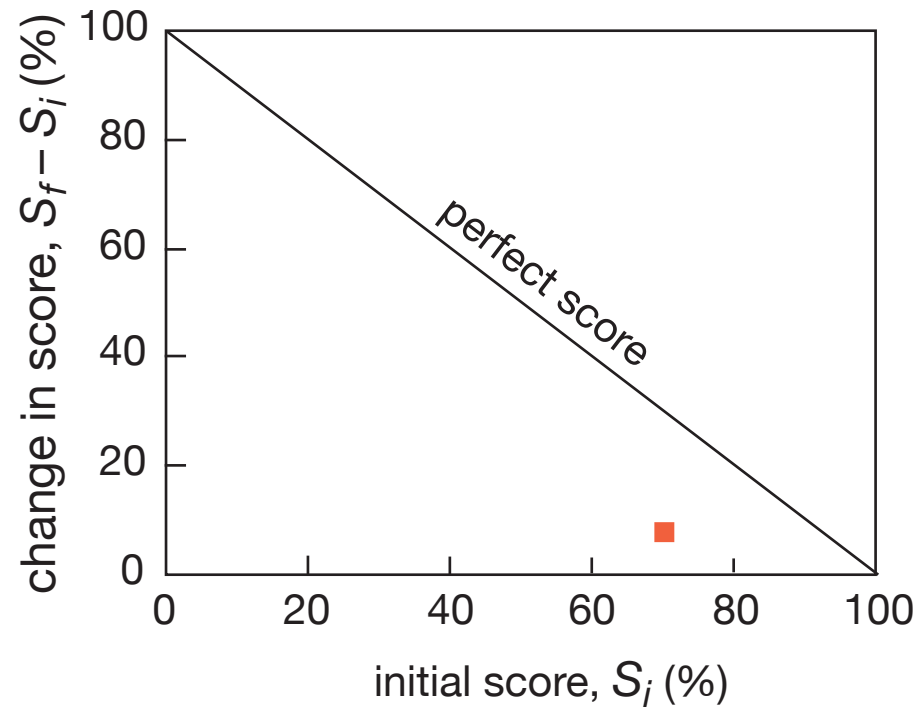
# Education



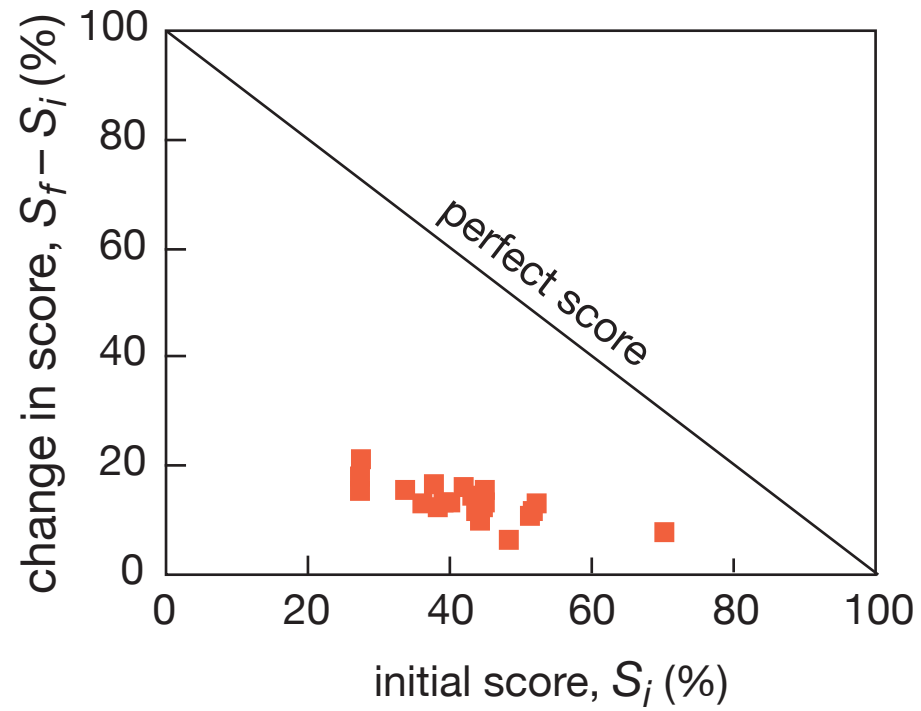
# Education



# Education

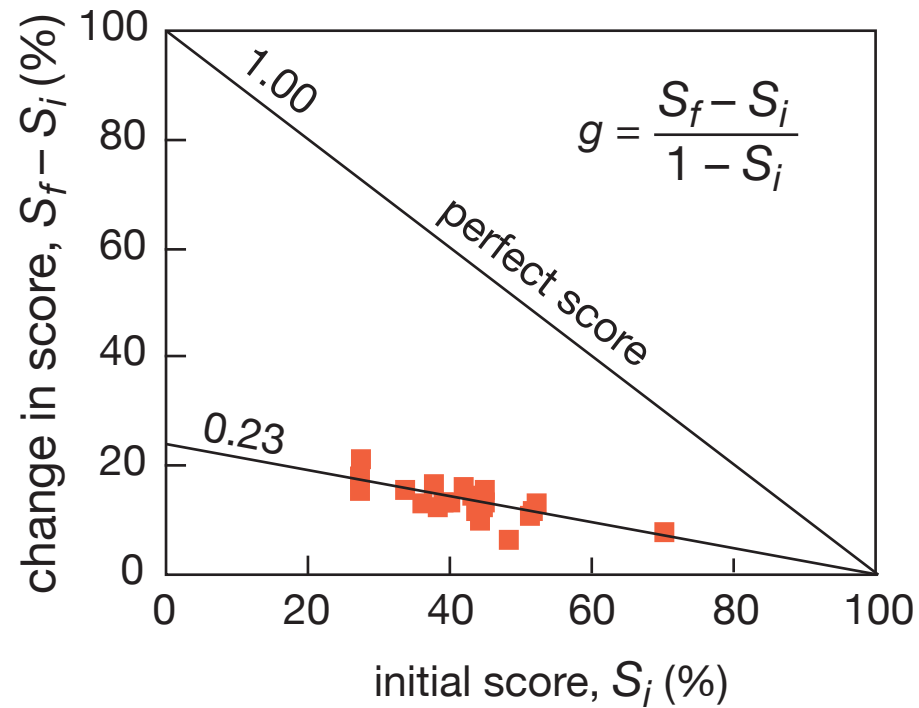


# Education



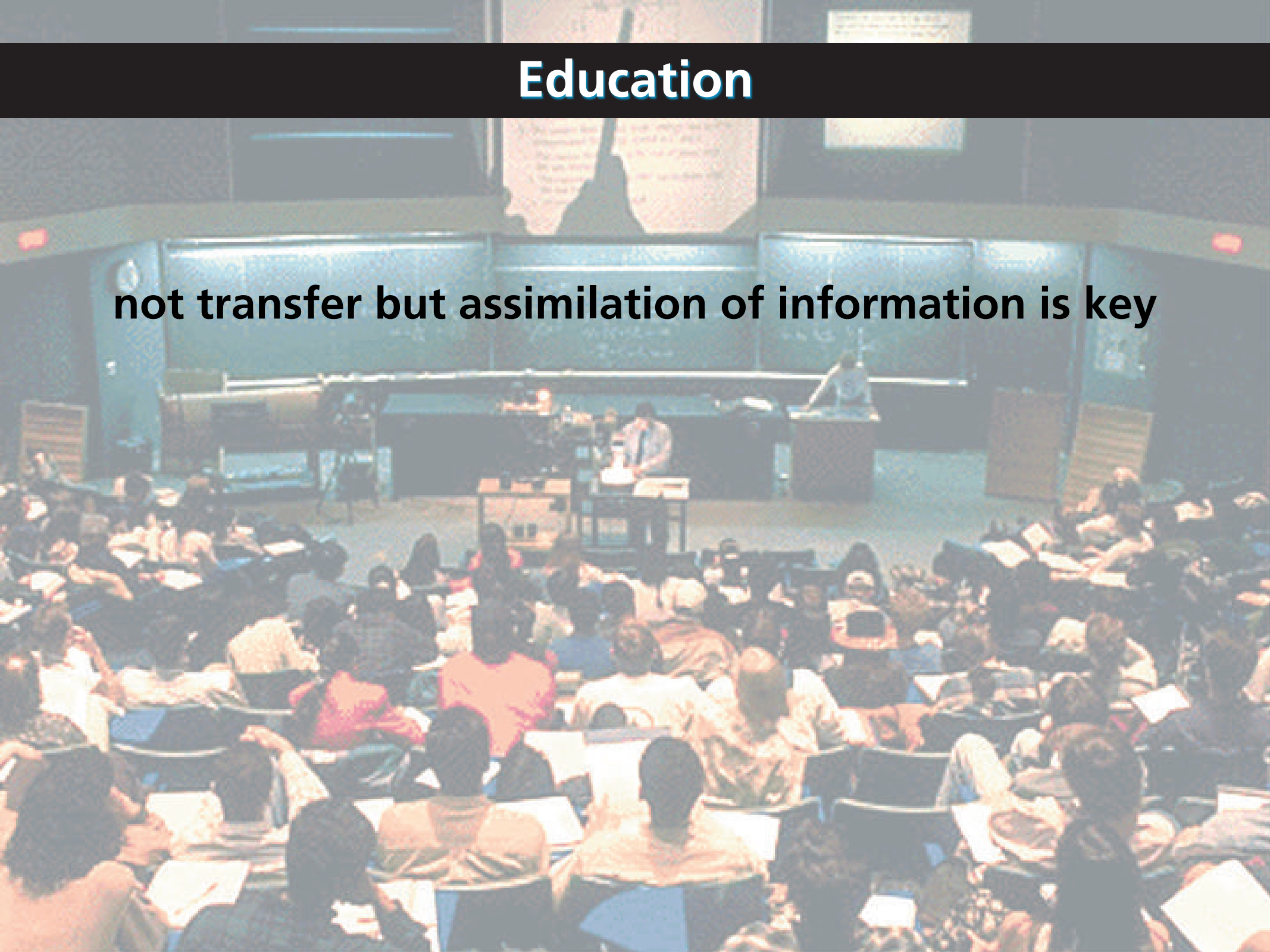
# Education

only one quarter of maximum gain realized



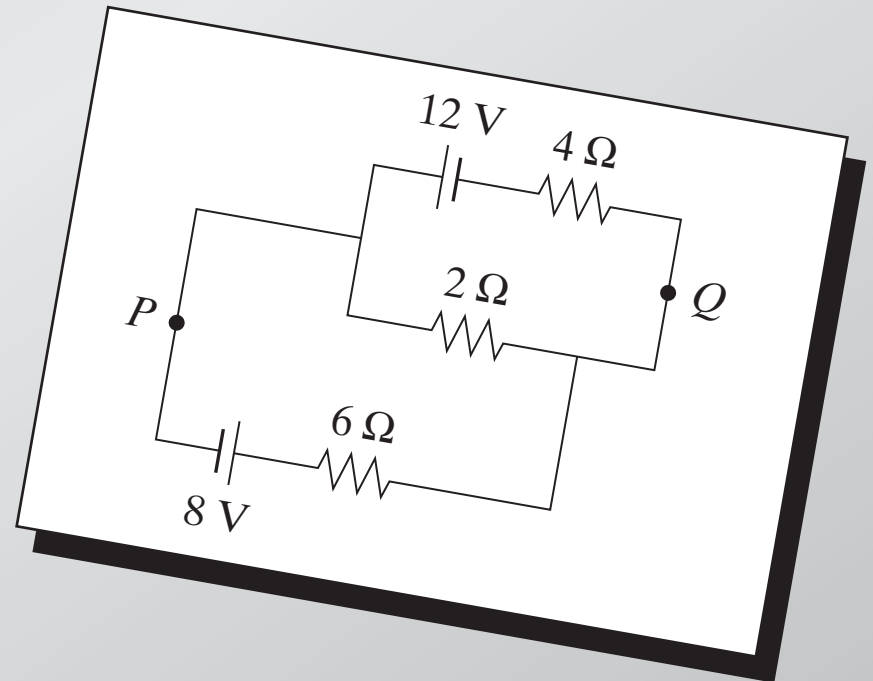
# Education

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



# Education

conventional problems misleading





# Education

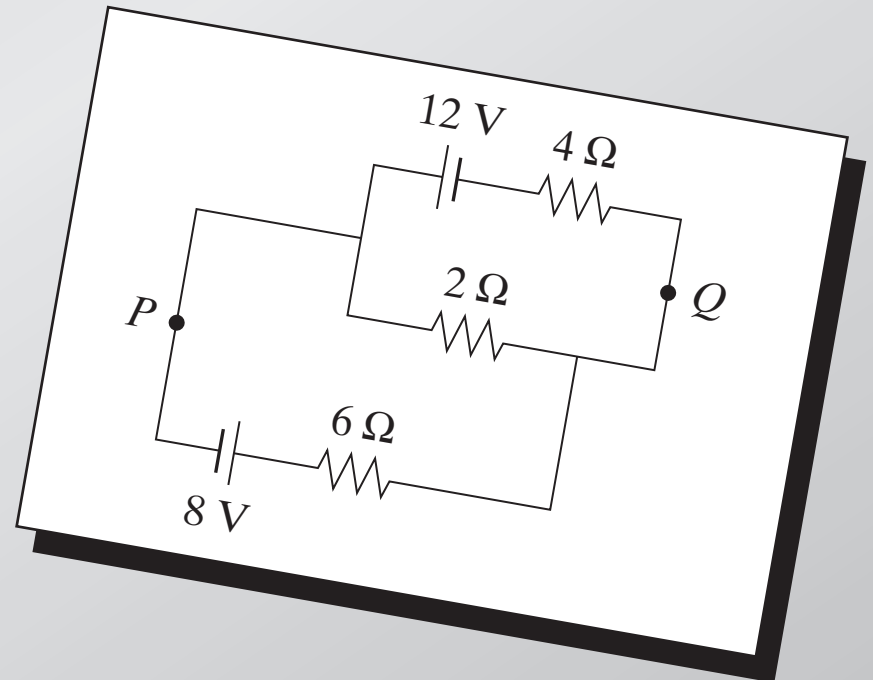
conventional problems misleading

Calculate:

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

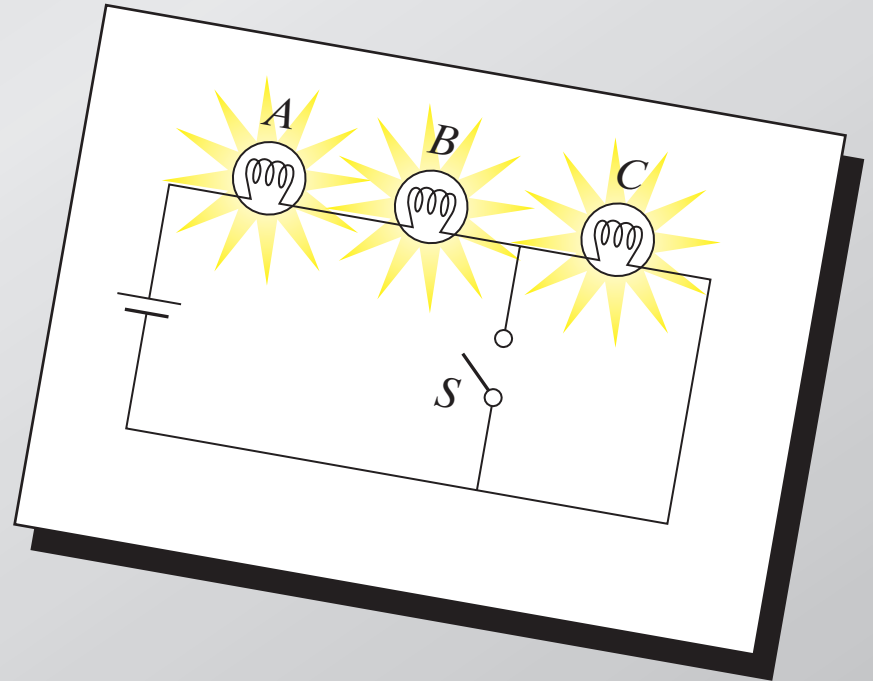
(b) potential difference

between  $P$  and  $Q$



# Education

are the basic principles understood?

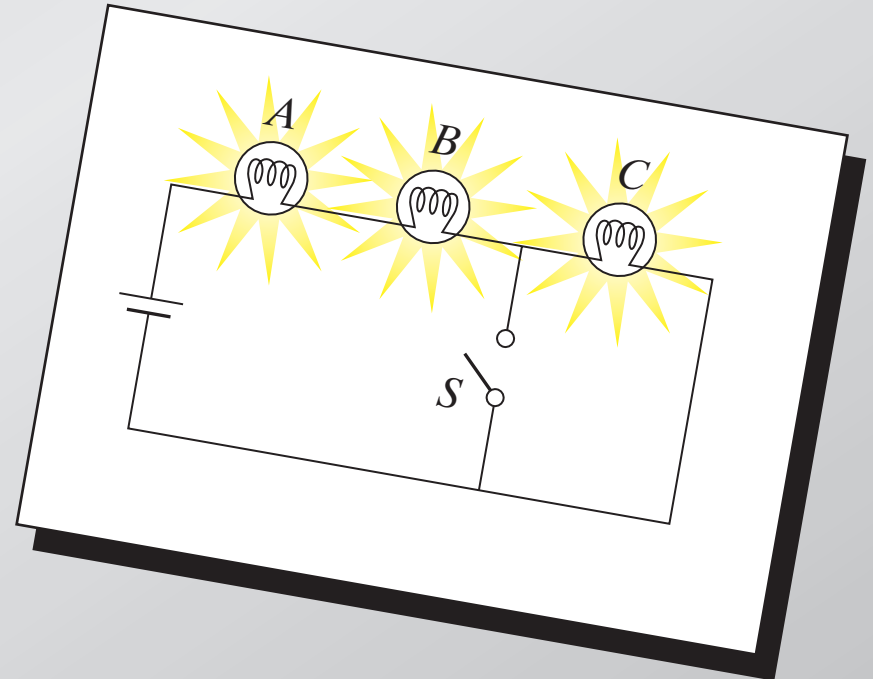


# Education

are the basic principles understood?

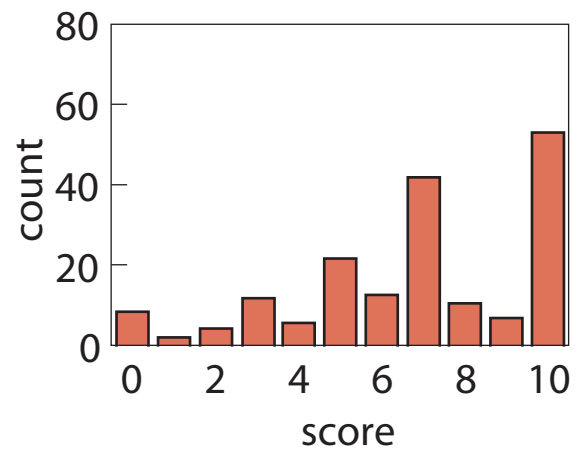
When  $S$  is closed, what happens to:

- (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?

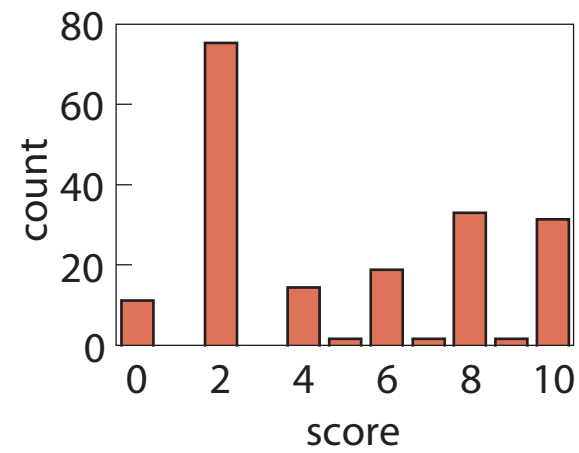


# Education

## conventional

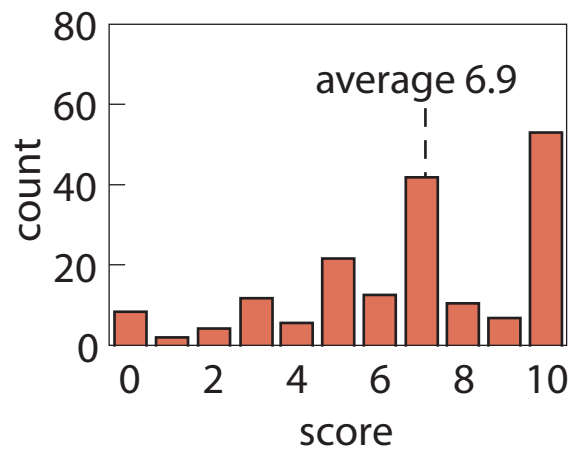


## conceptual

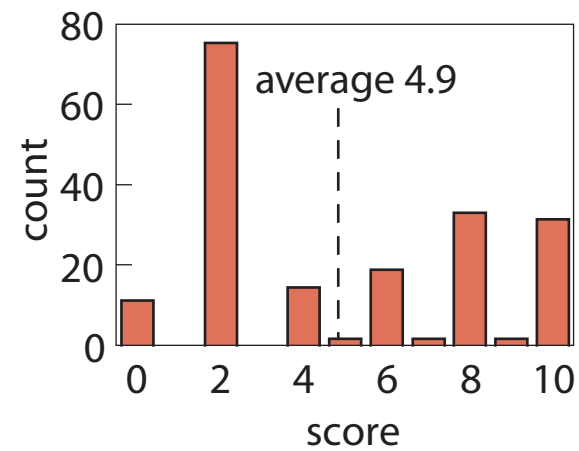


# Education

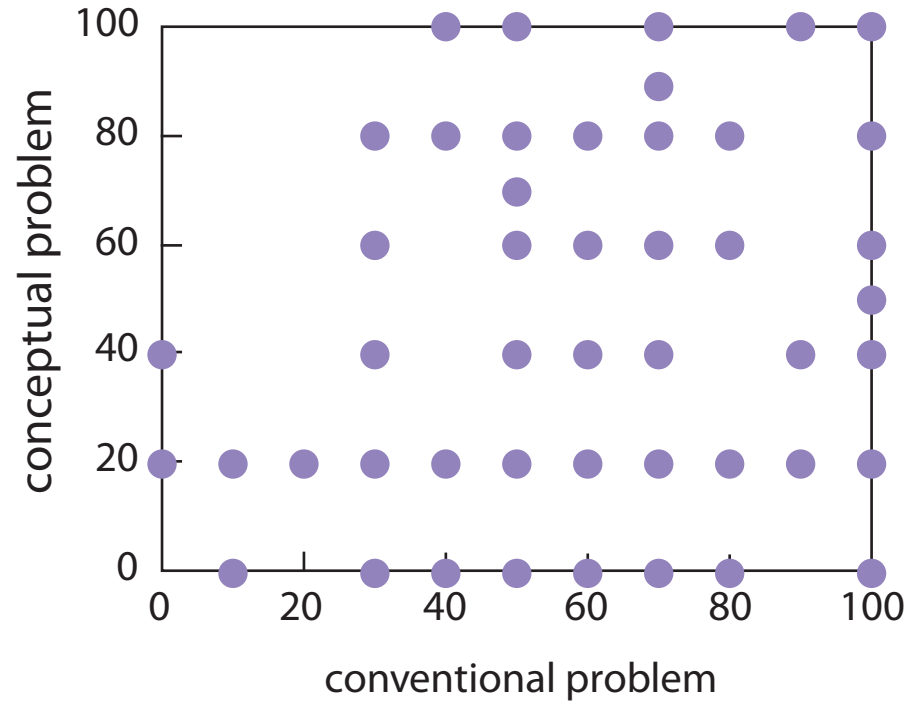
## conventional



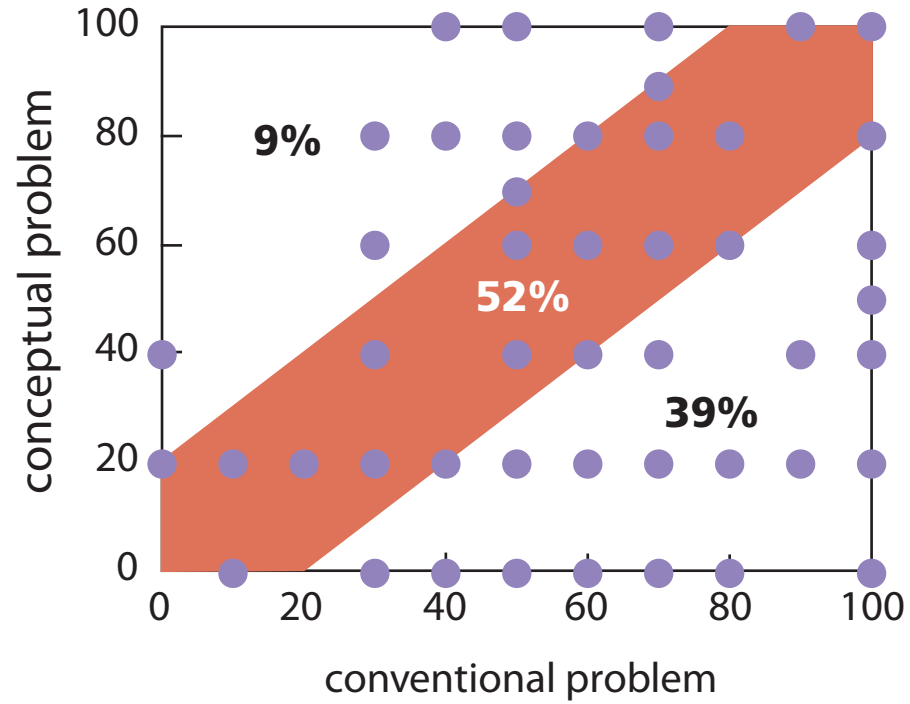
## conceptual



# Education



# Education





So what should we do?



# Peer Instruction

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

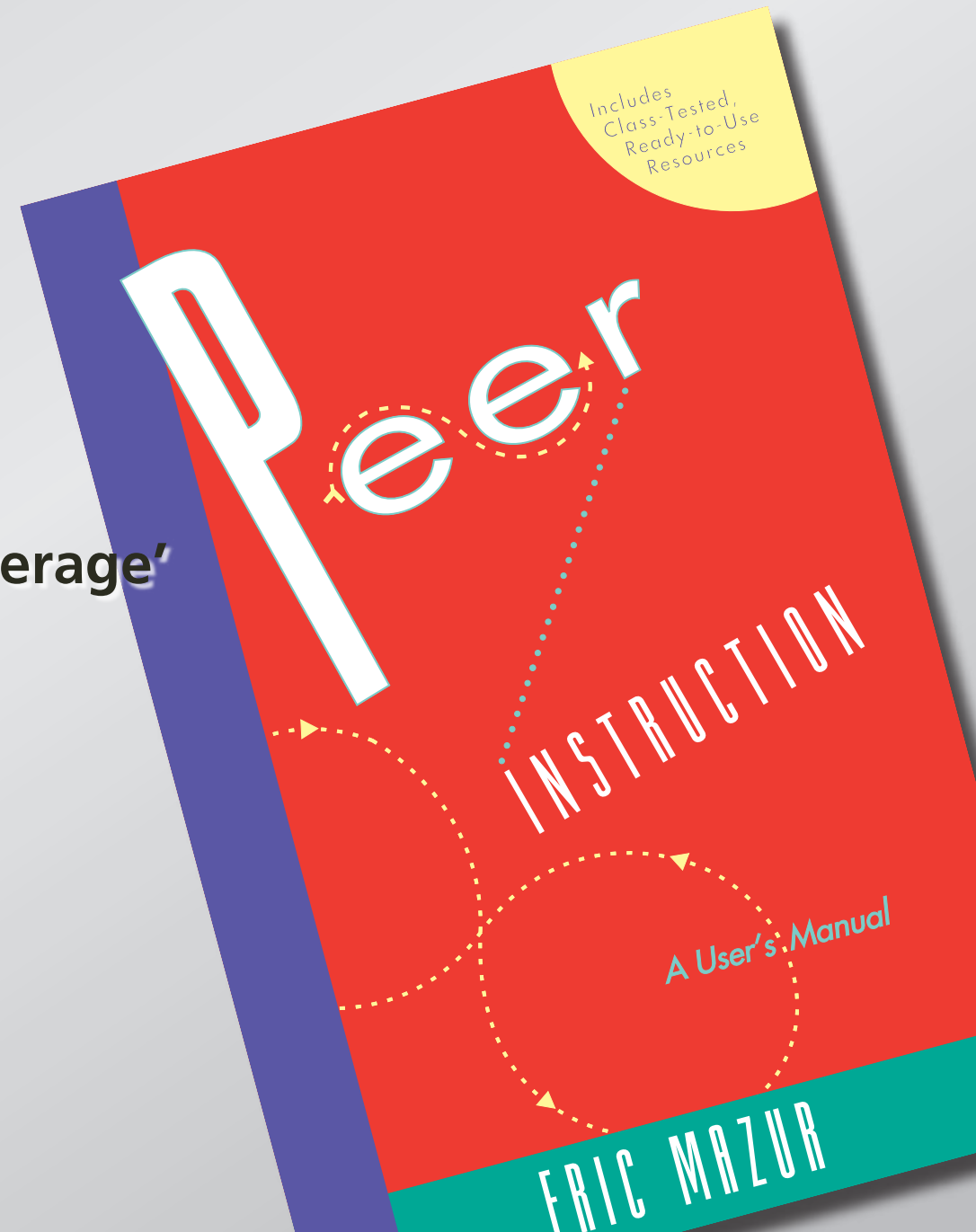
# Peer Instruction

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

# Peer Instruction

## Main features:

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



# Peer Instruction

**ConcepTest:**

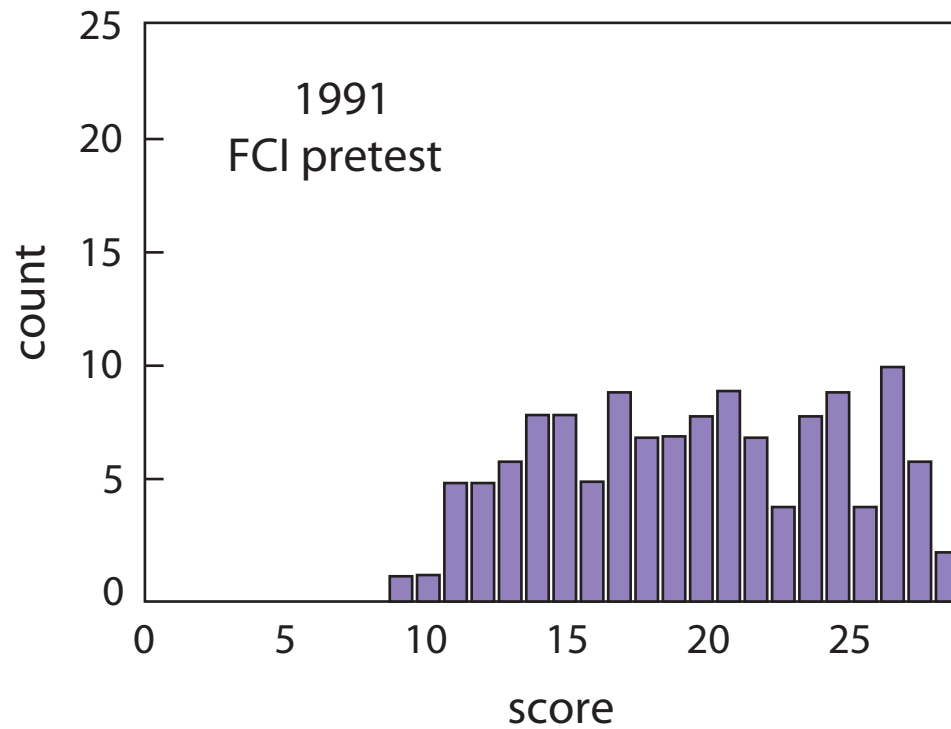
- 1. Question**
- 2. Thinking**
- 3. Individual answer**
- 4. Peer discussion**
- 5. Revised/Group answer**
- 6. Explanation**

# Results

**is it any good?**

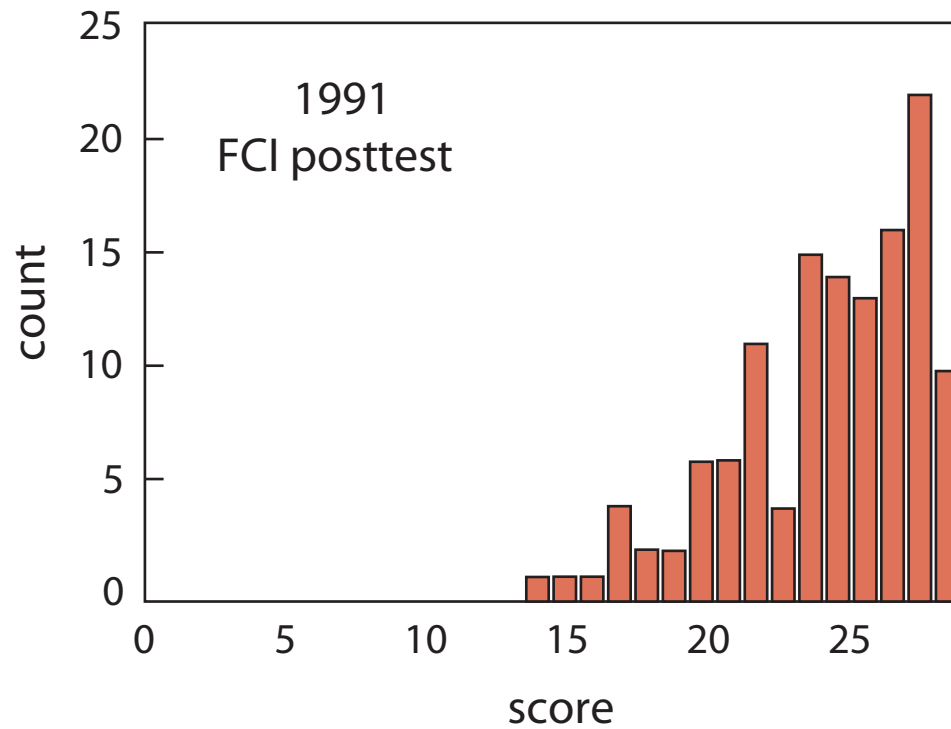
# Results

## first year of implementing PI



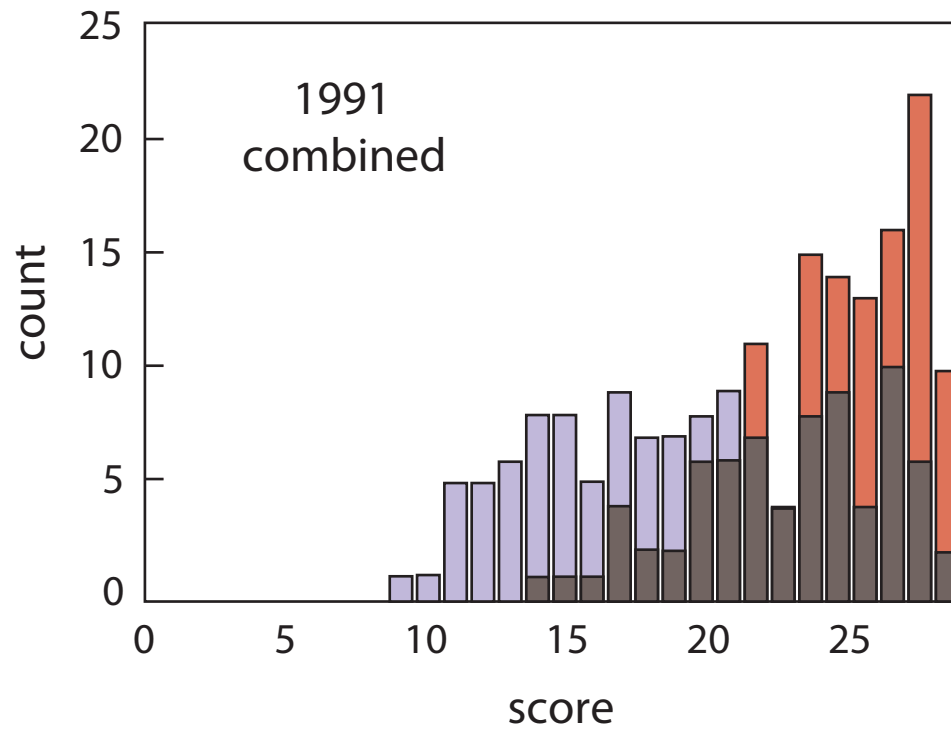
# Results

## first year of implementing PI



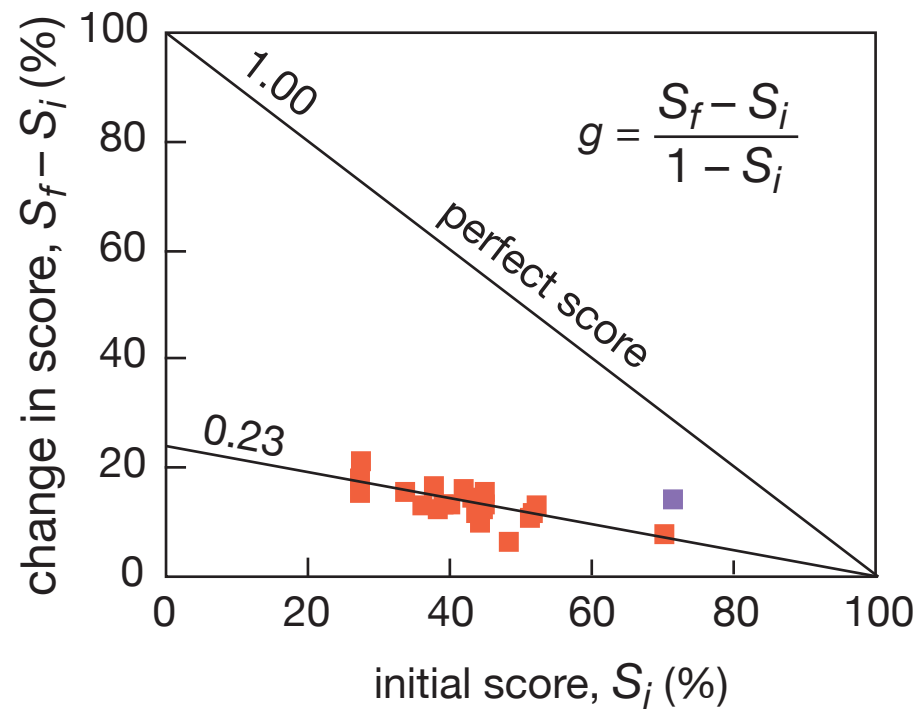
# Results

## first year of implementing PI

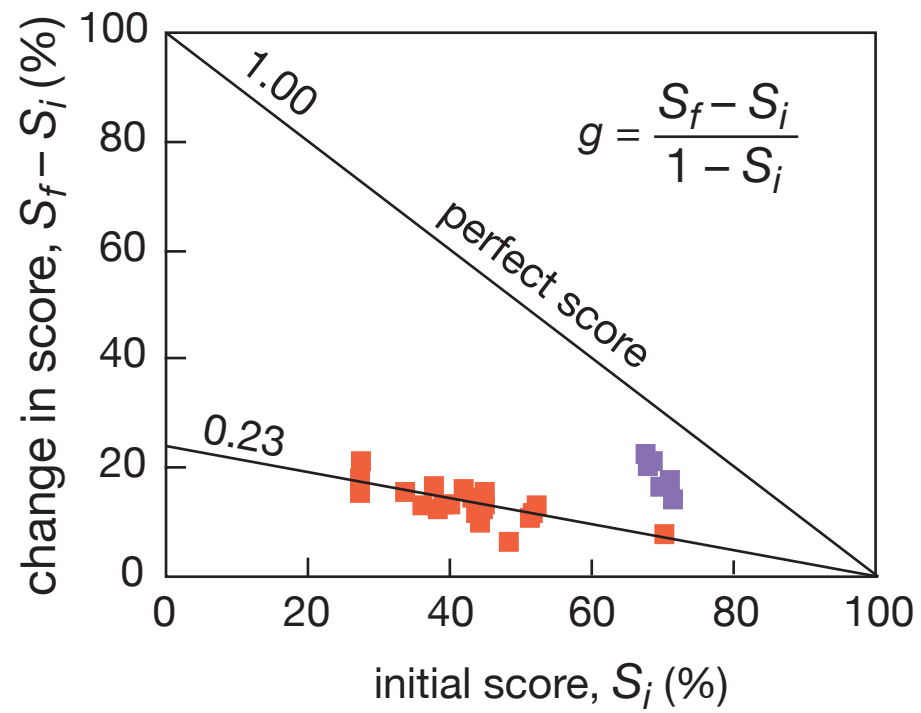




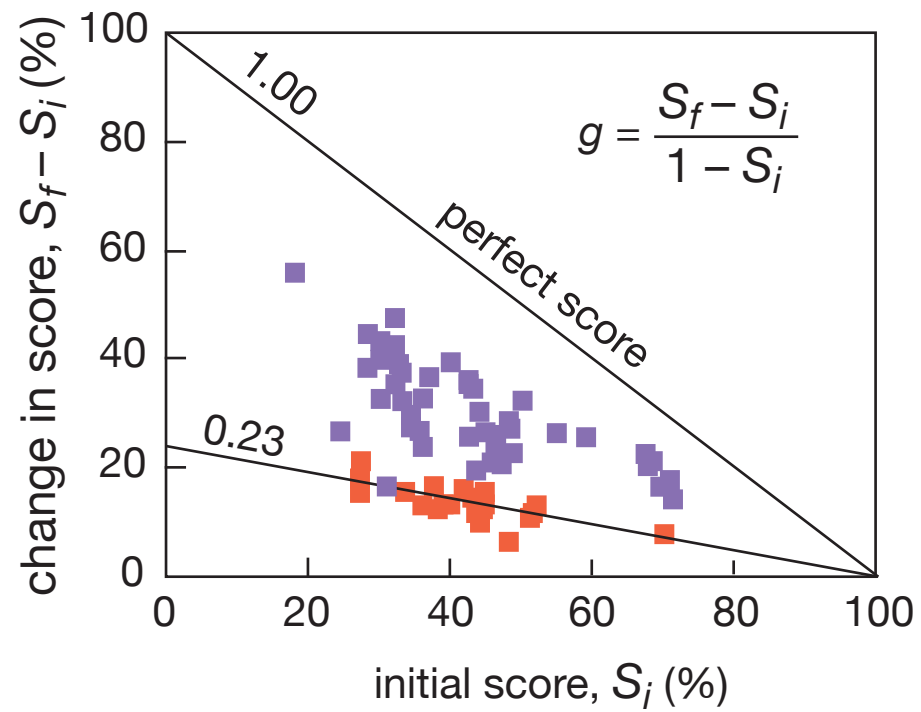
# Results



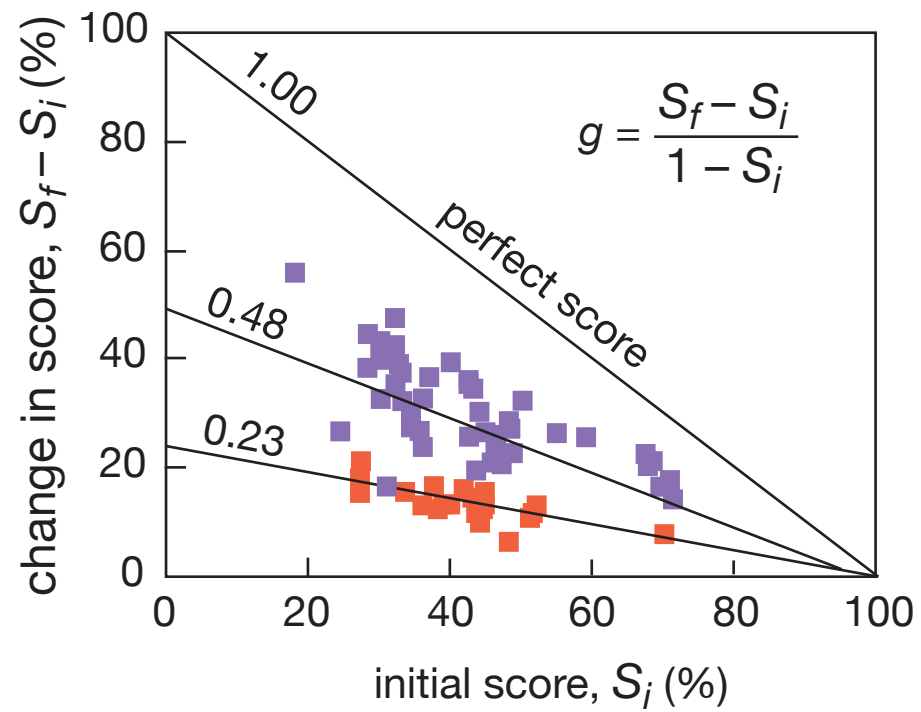
# Results



# Results



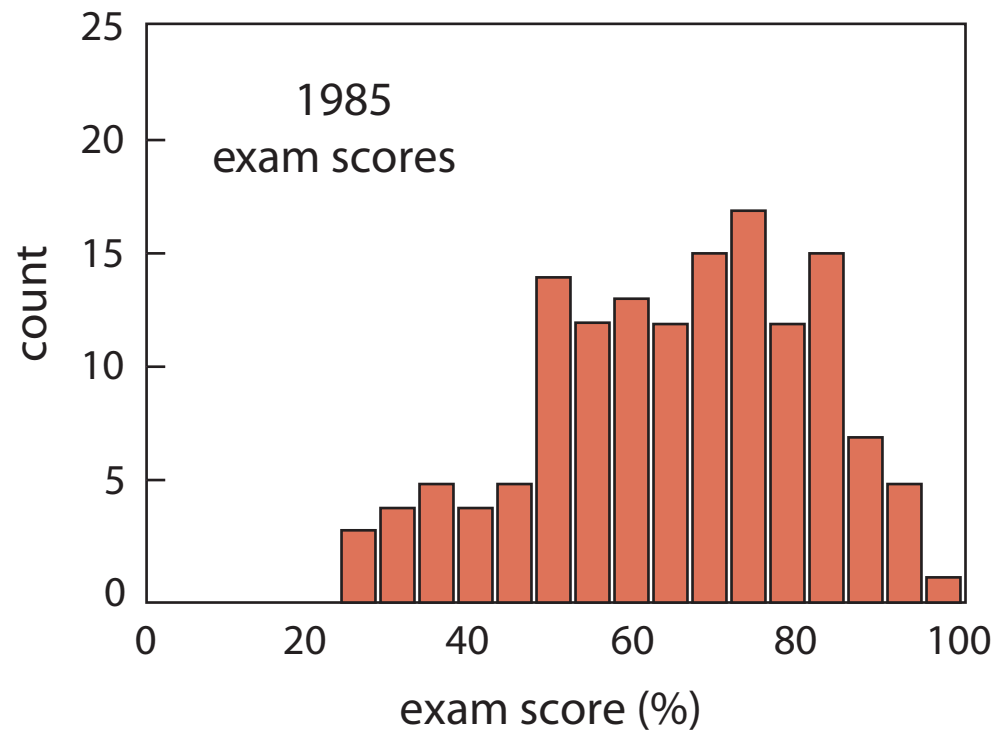
# Results



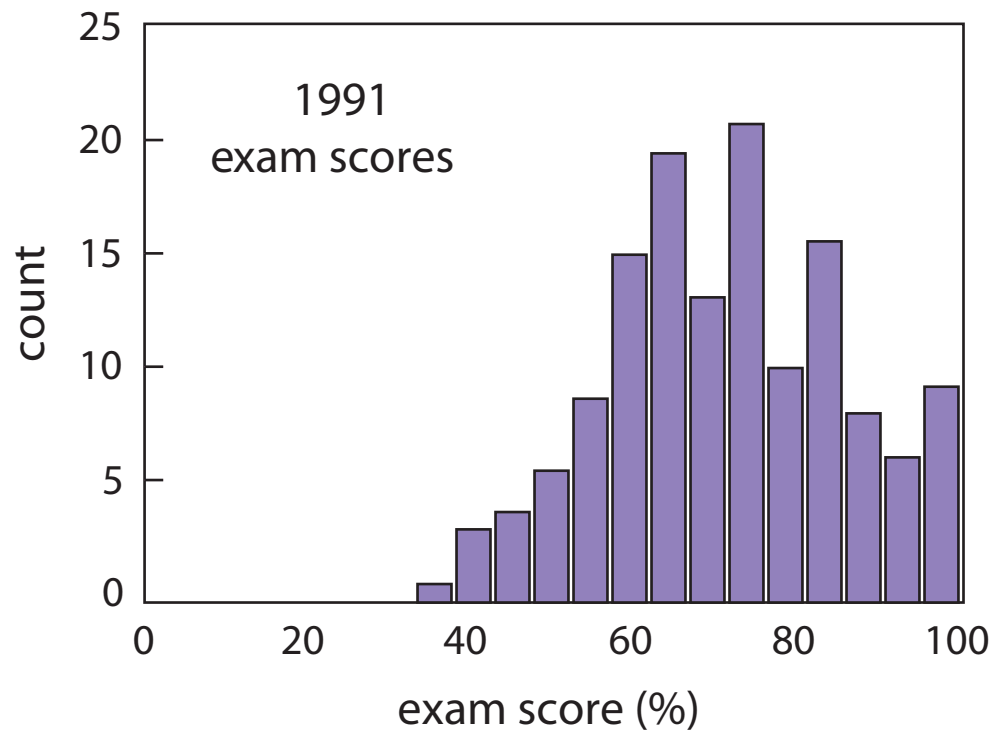
# Results

**what about problem solving?**

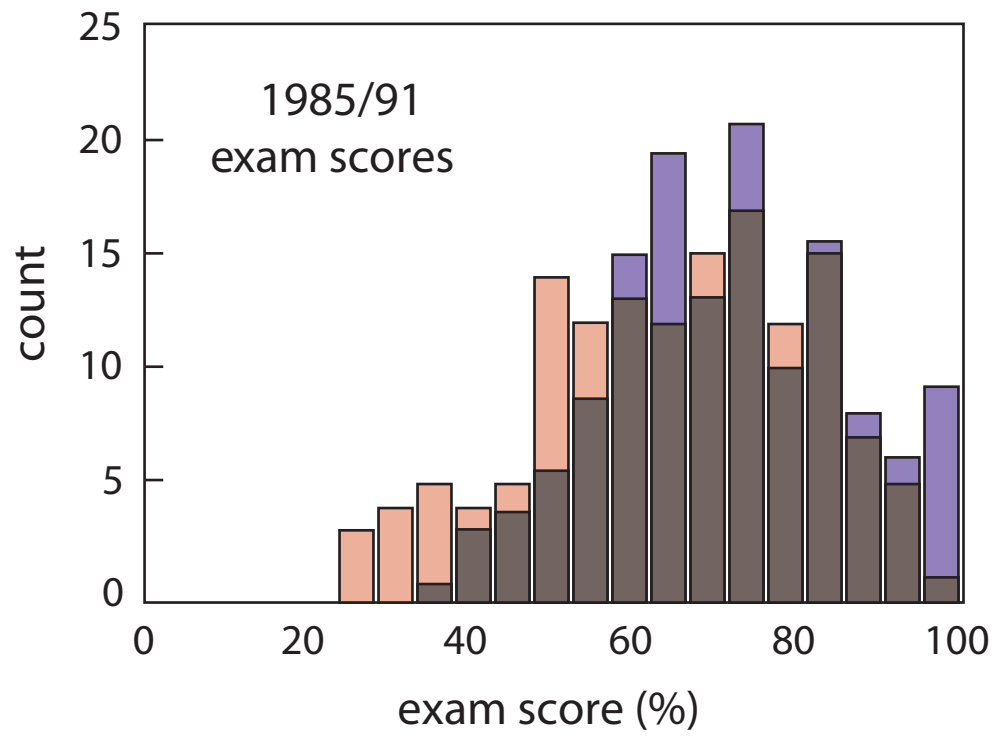
# Results



# Results



# Results





# Summary

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

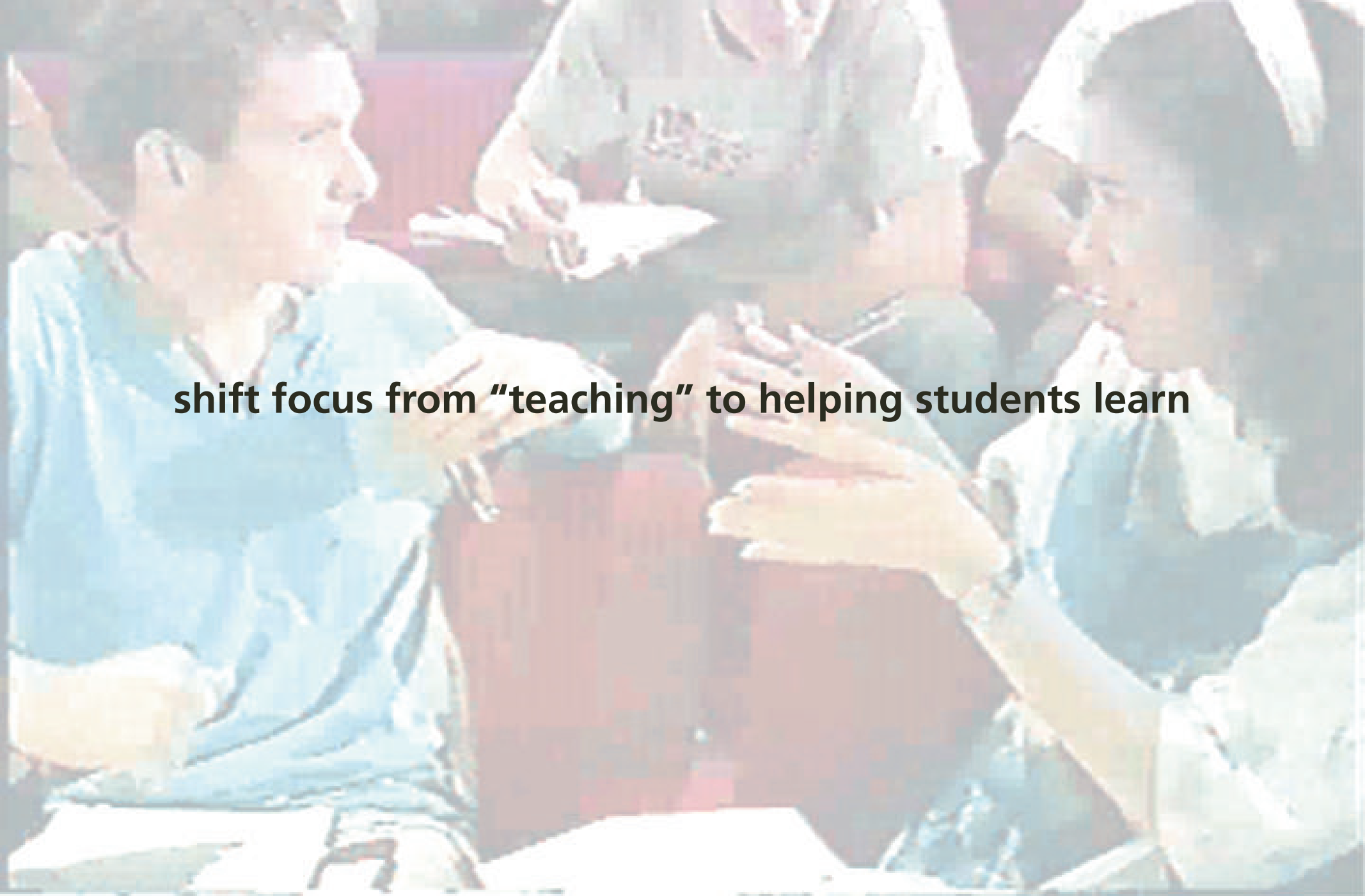
# Summary

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

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

# My message

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



**Funding:**

**National Science Foundation**

**for a copy of this presentation:**

**<http://mazur-www.harvard.edu>**