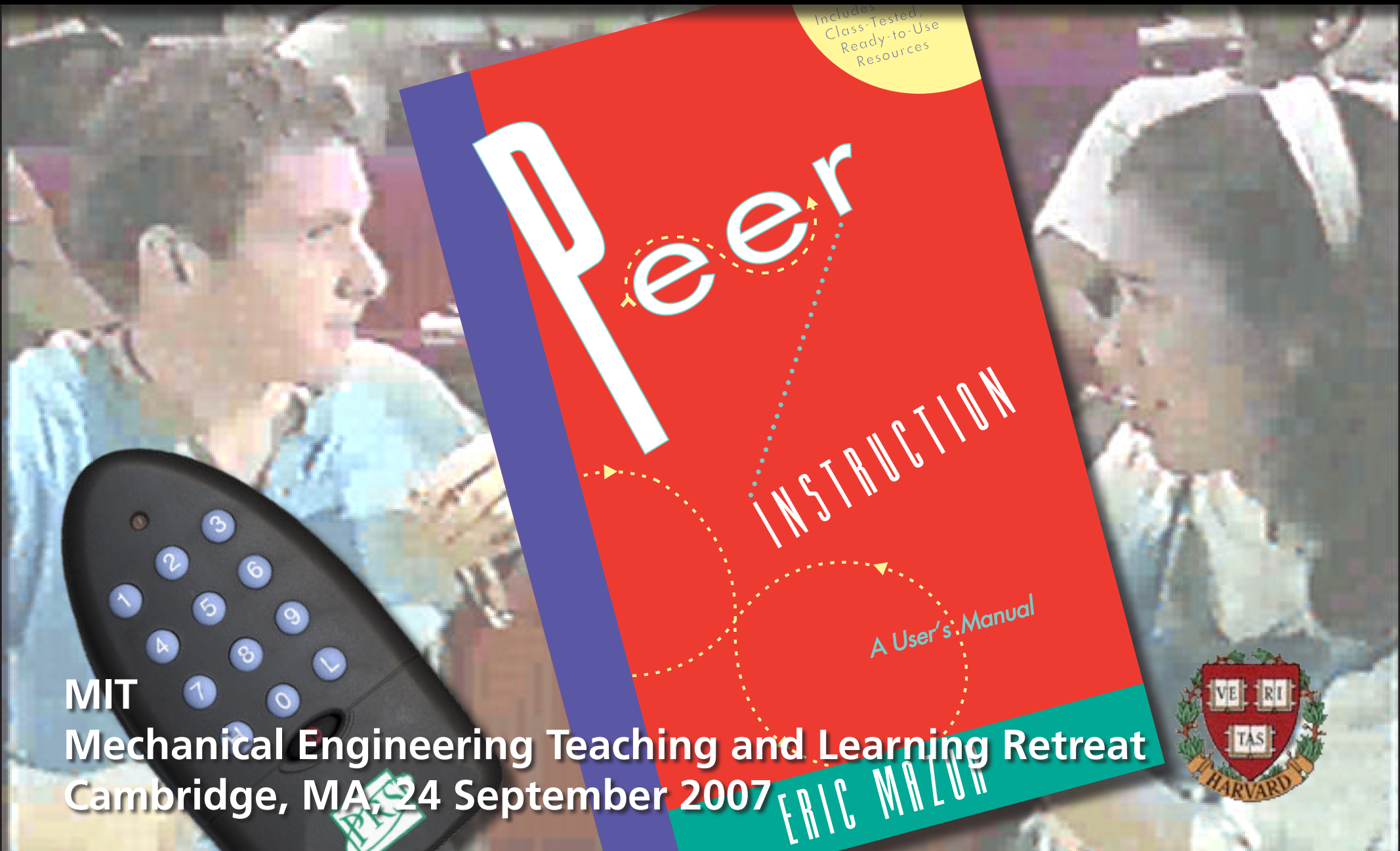
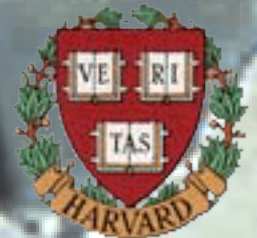


# Interactive teaching: Turning a large classroom into a seminar



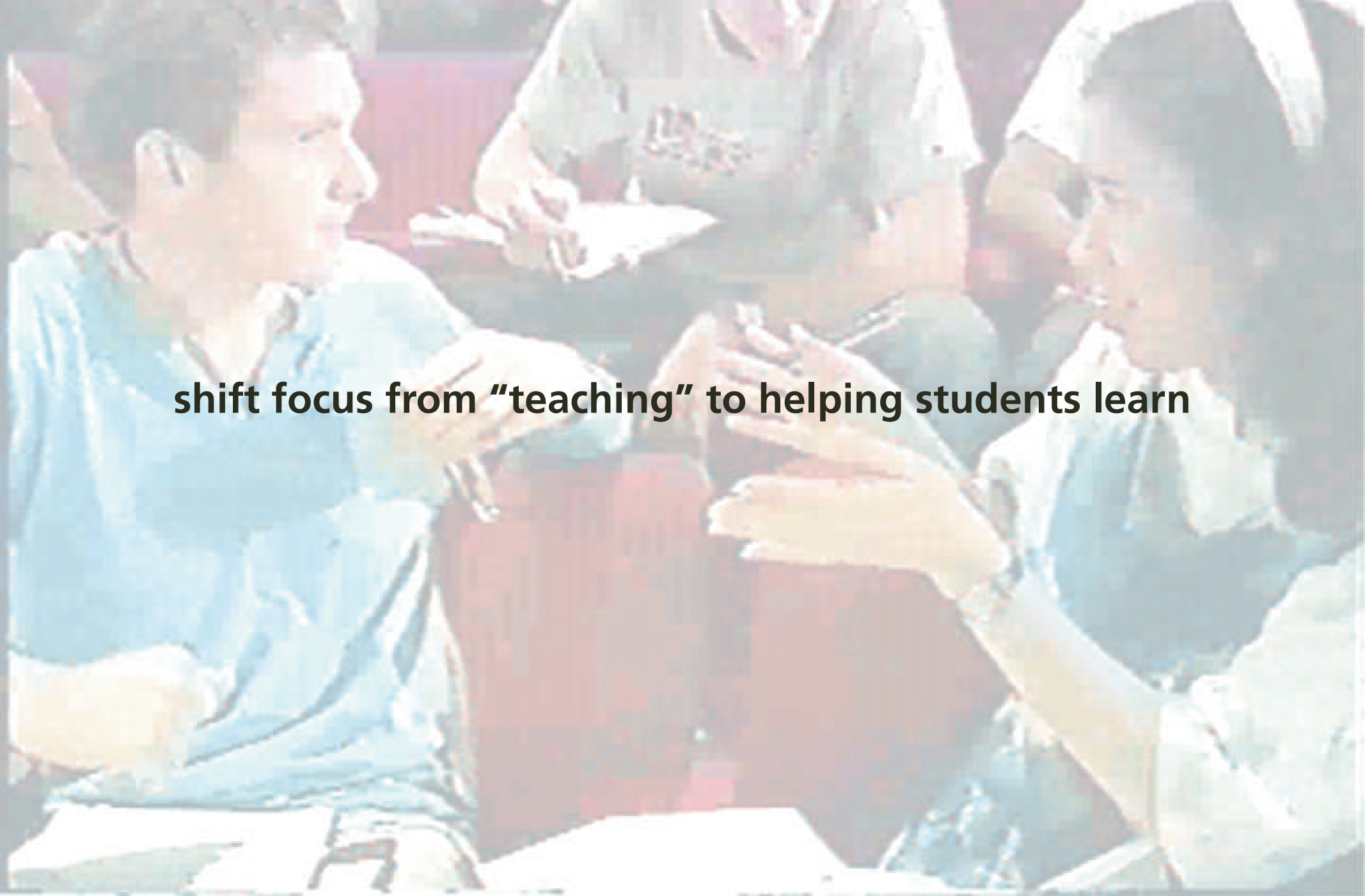
MIT

Mechanical Engineering Teaching and Learning Retreat  
Cambridge, MA, 24 September 2007



# My message

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



# Outline

- Education



# Outline

- Education
- Peer Instruction



# Outline

- Education
- Peer Instruction
- Results

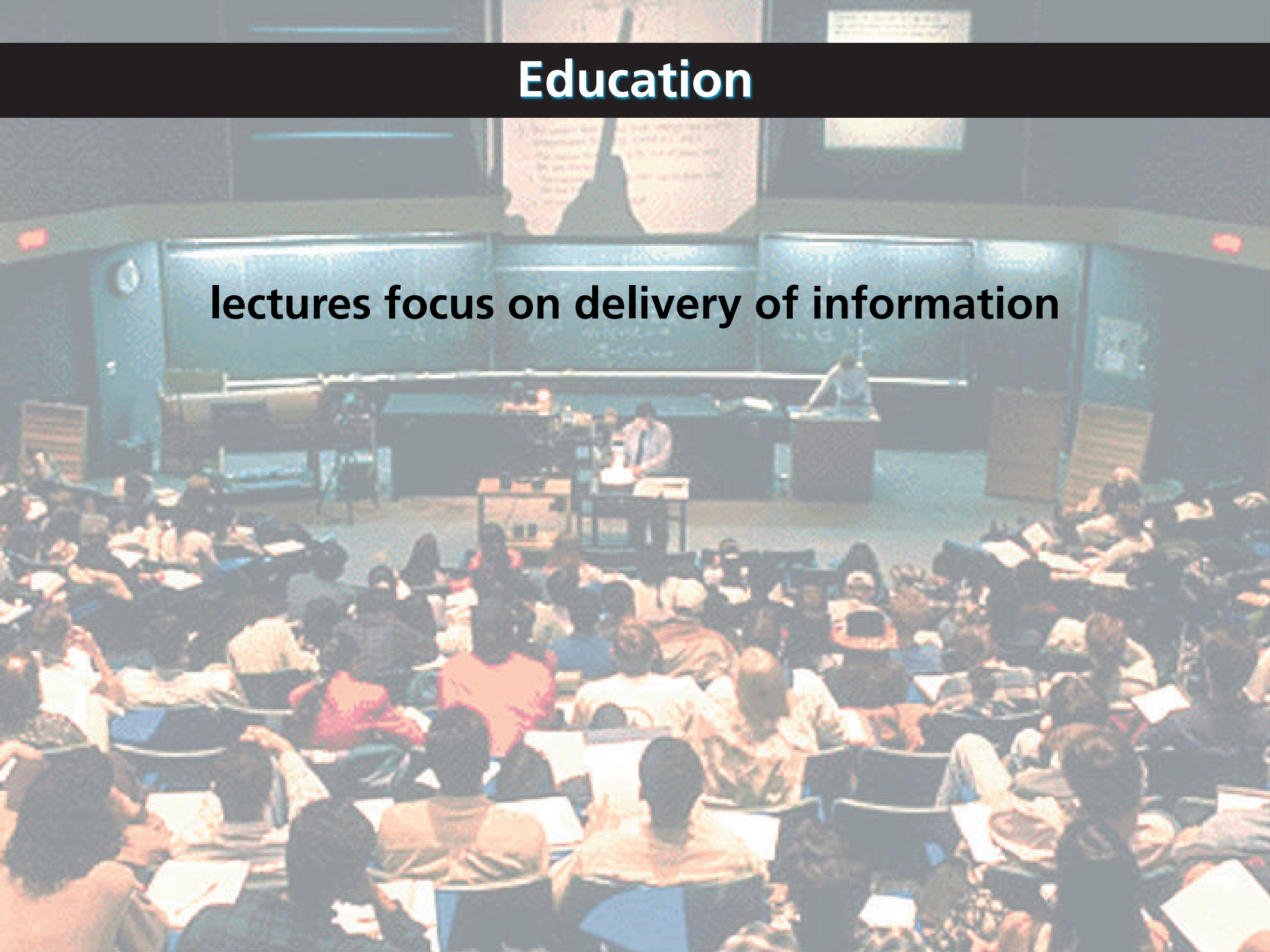


# Education



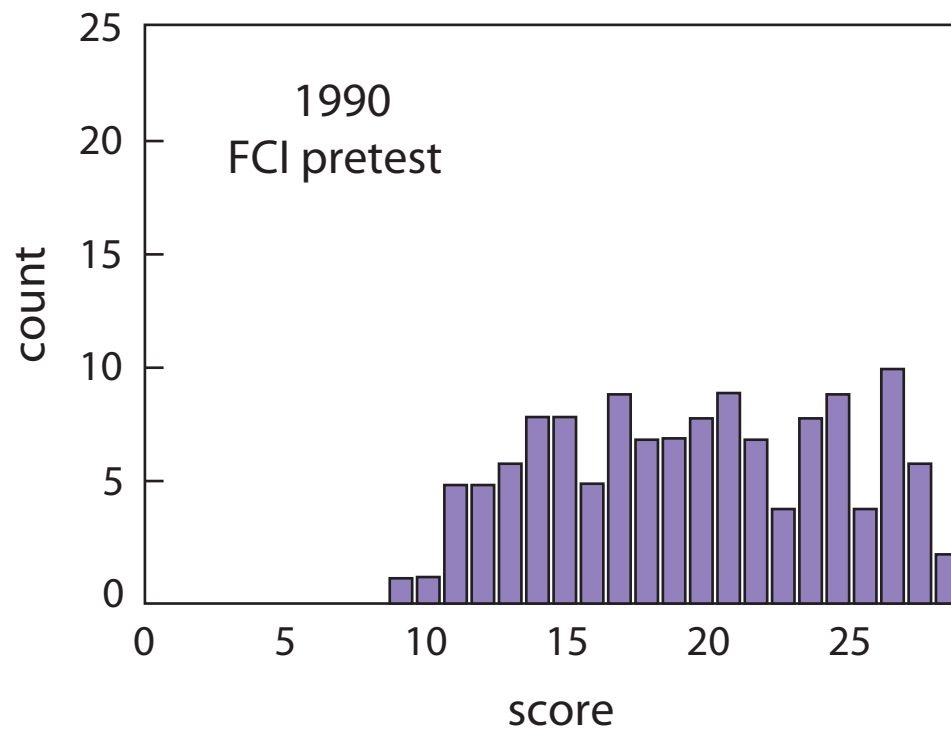
# Education

lectures focus on delivery of information



# Education

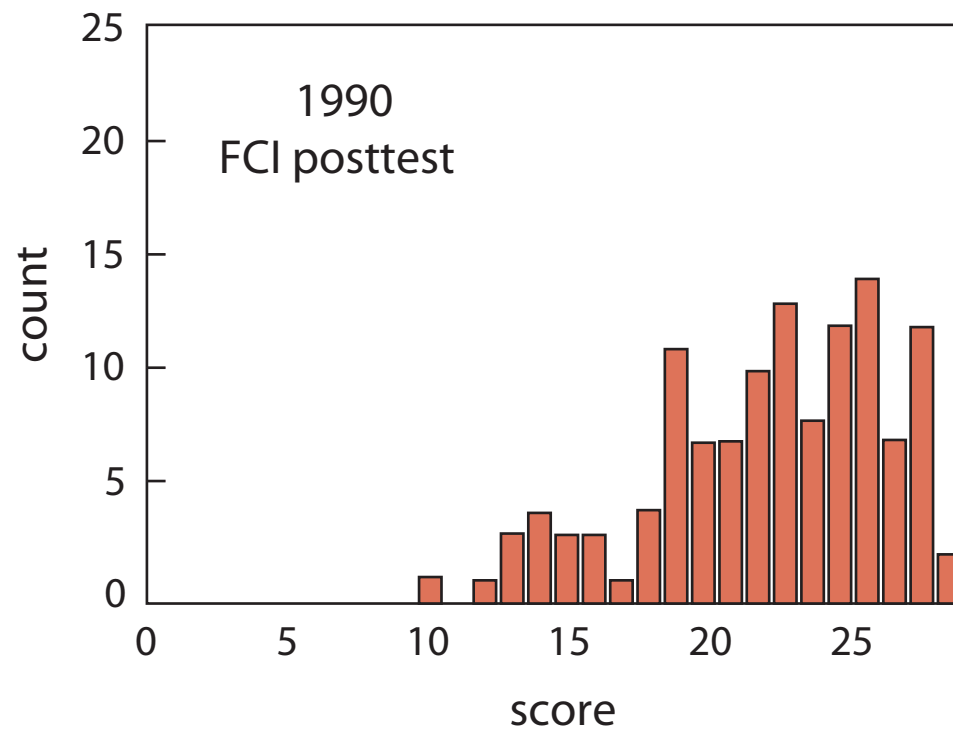
education is not just information transfer





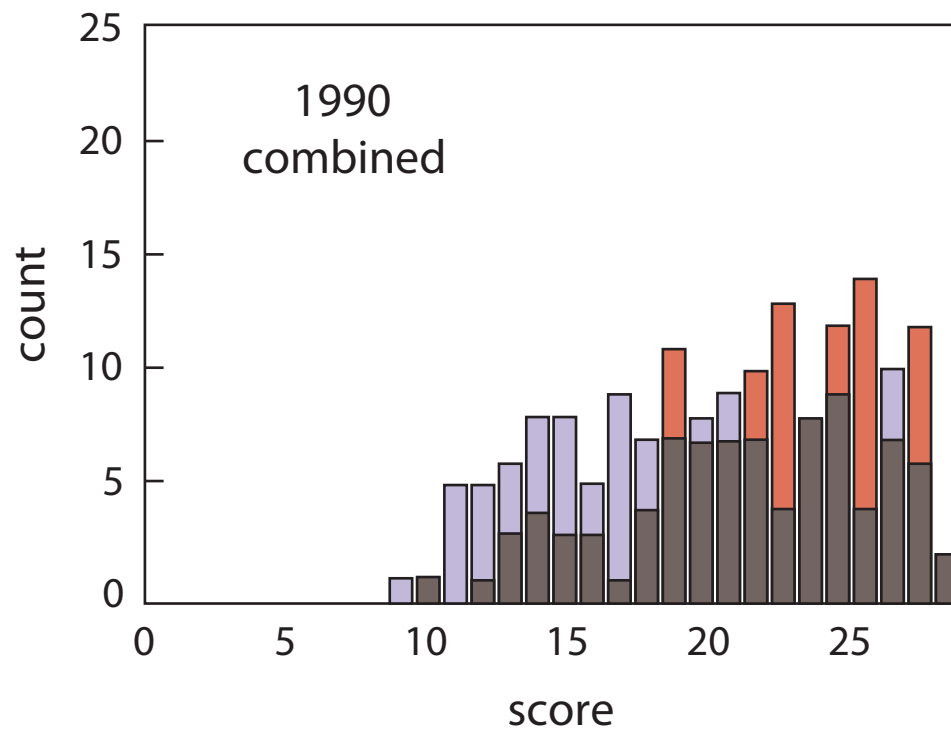
# Education

education is not just information transfer

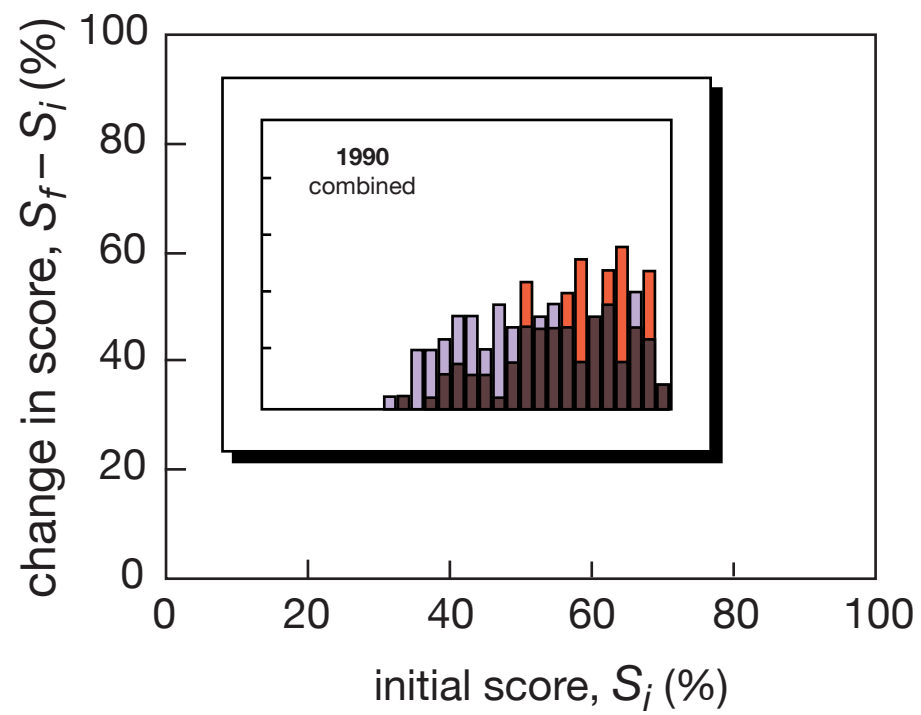


# Education

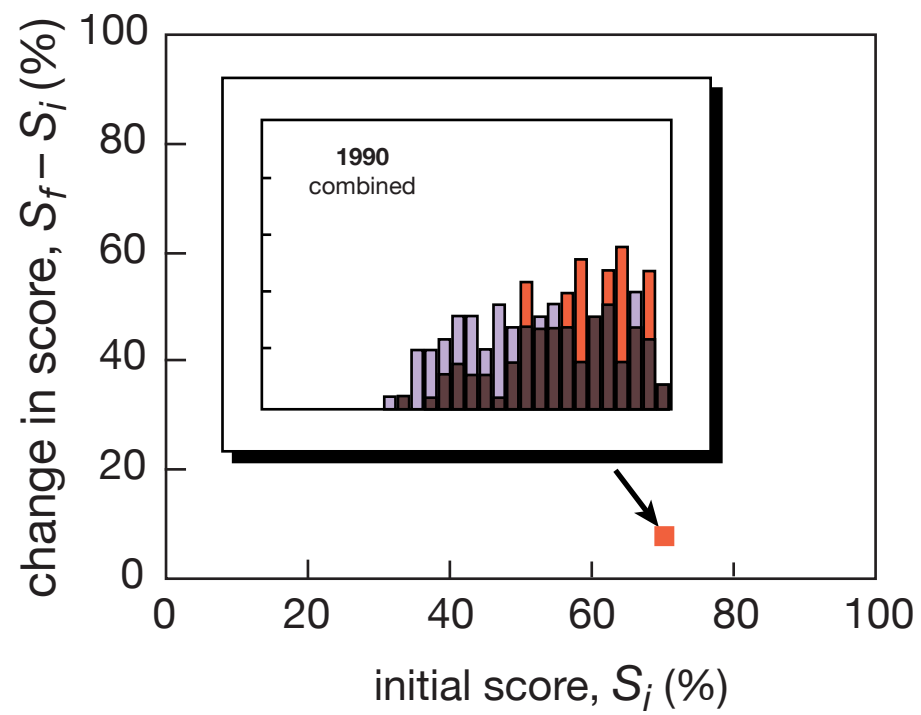
education is not just information transfer



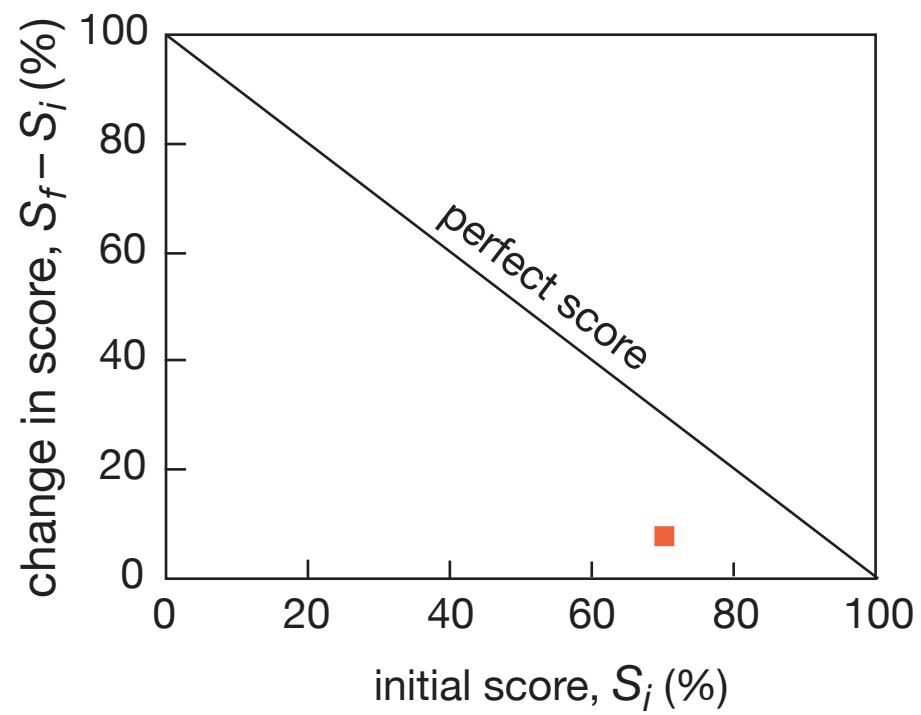
# Education



# Education

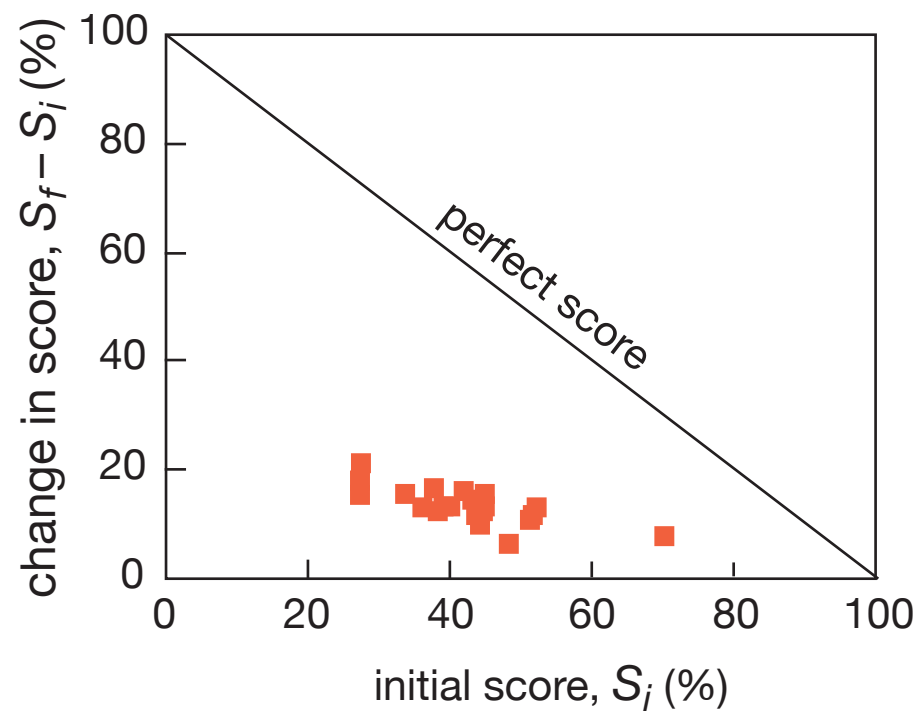


# Education





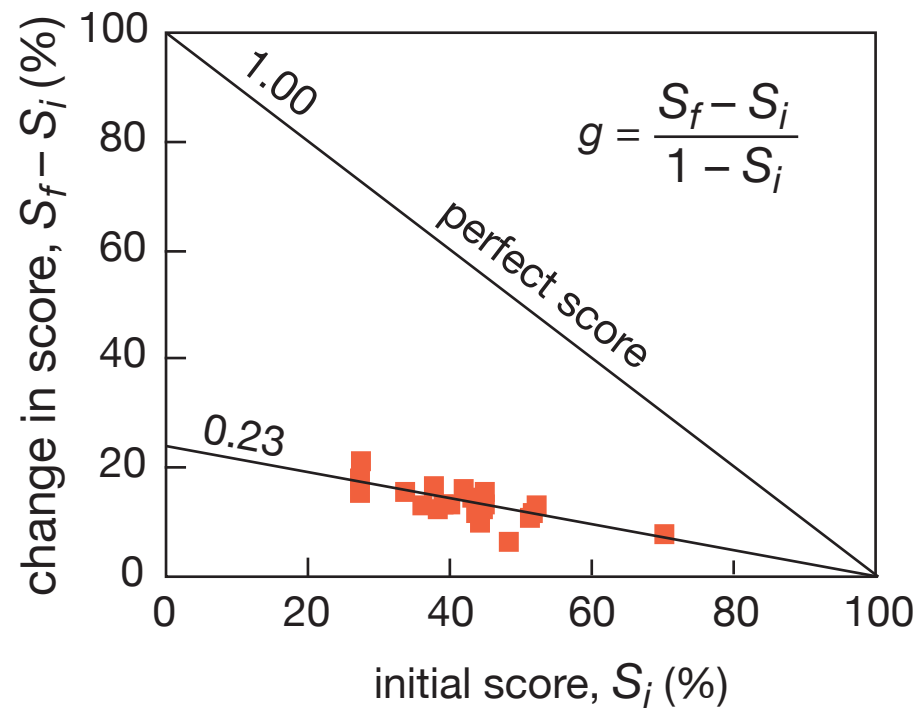
# Education



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

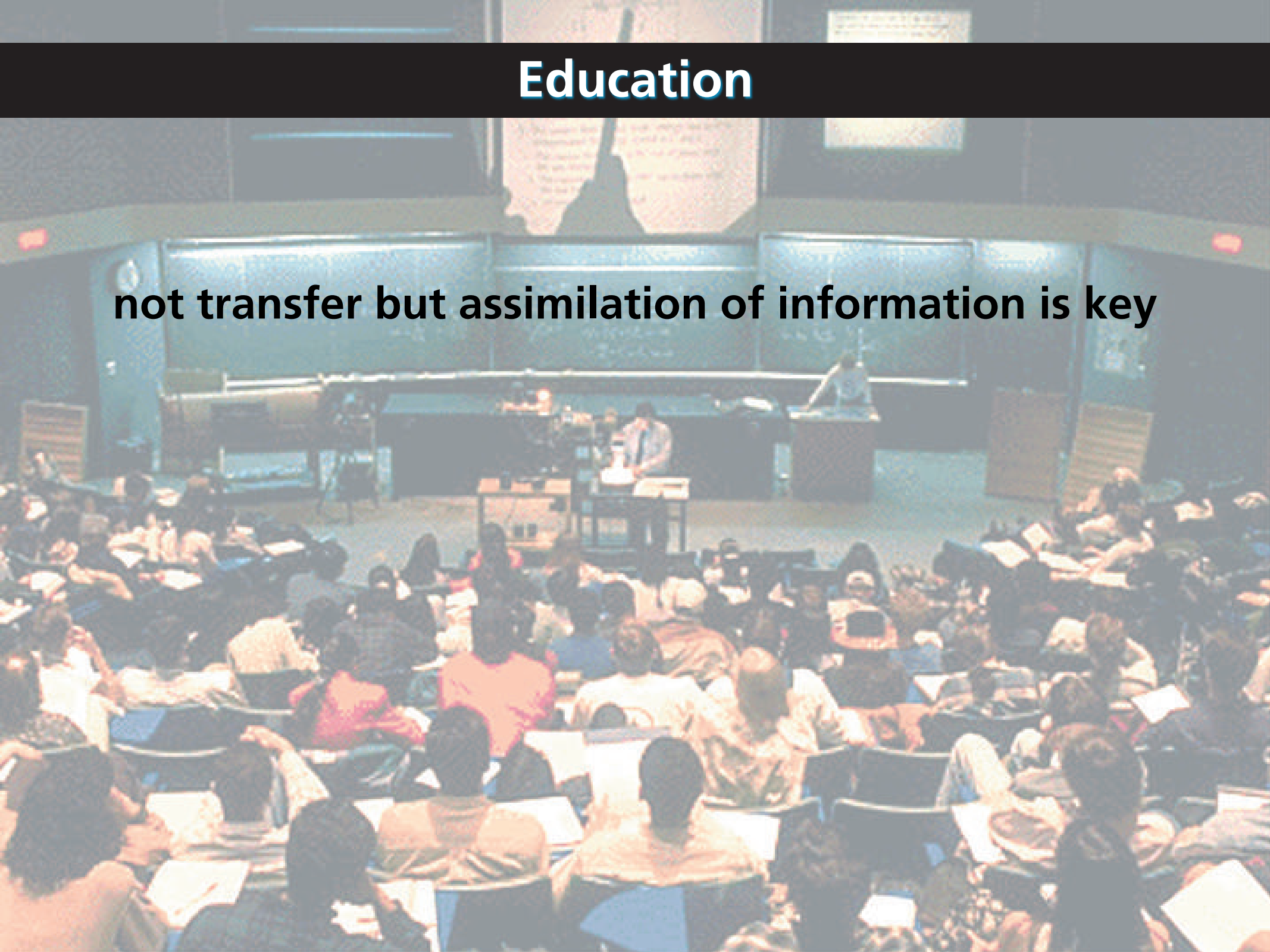
# Education

only one quarter of maximum gain realized



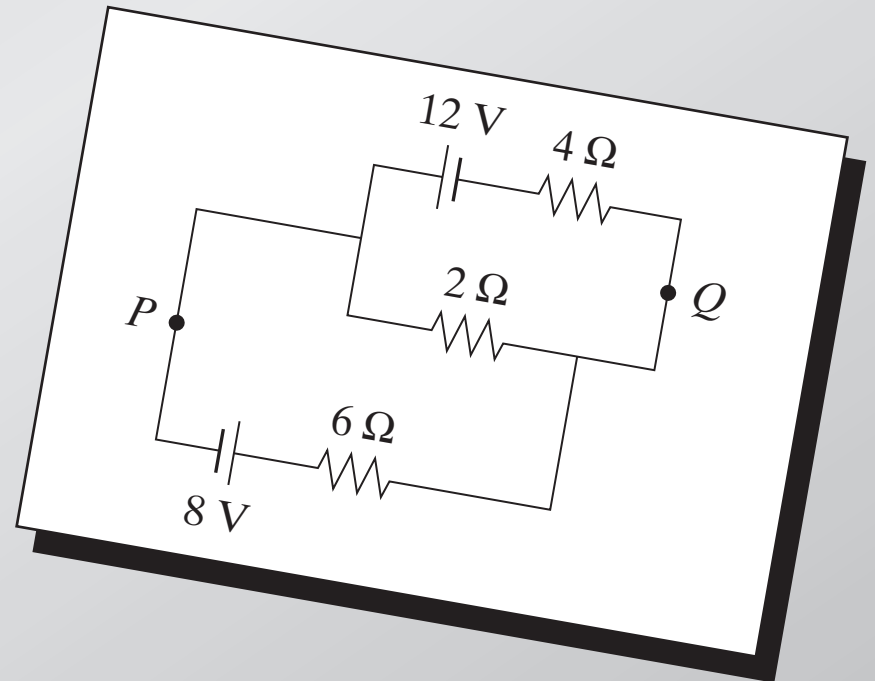
# Education

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



# Education

conventional problems misleading



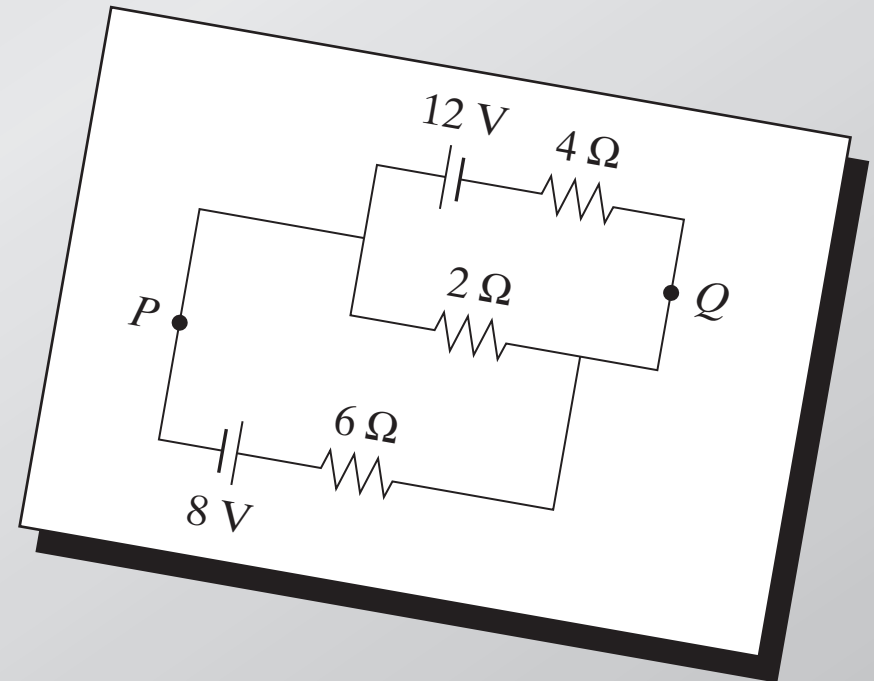
# Education

conventional problems misleading

Calculate:

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

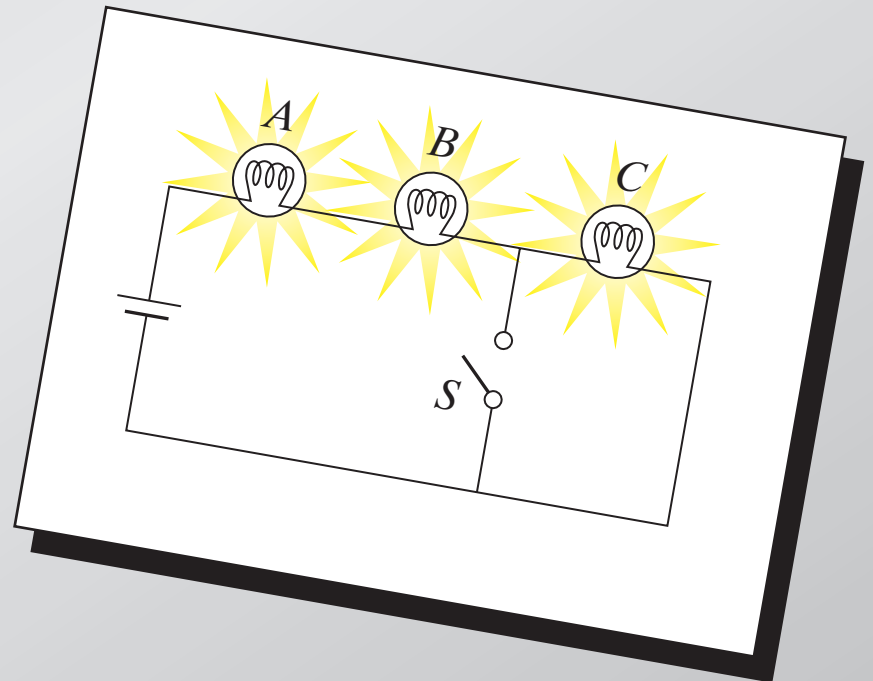
(b) potential difference  
between  $P$  and  $Q$





# Education

are the basic principles understood?

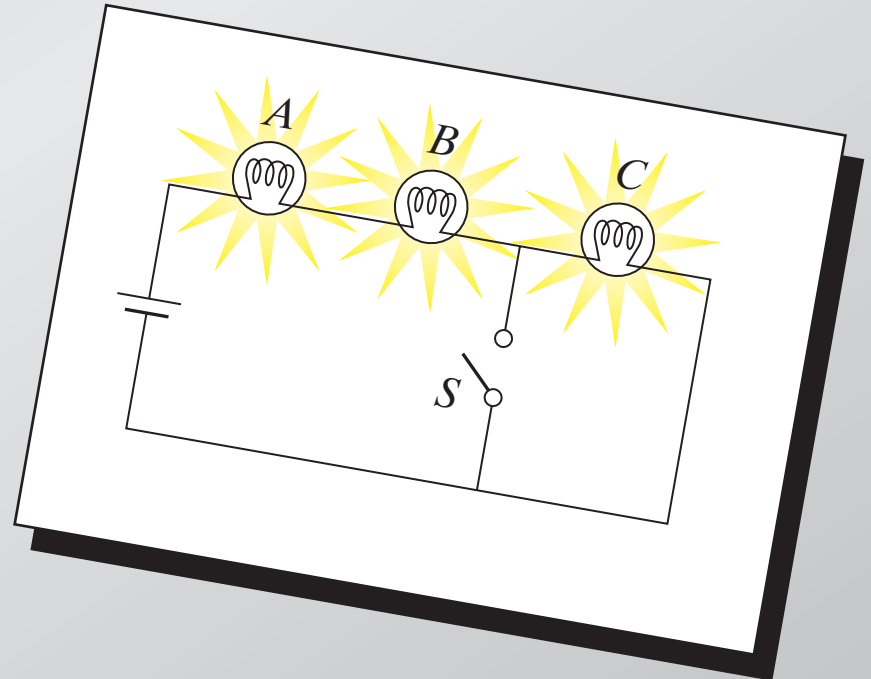


# Education

are the basic principles understood?

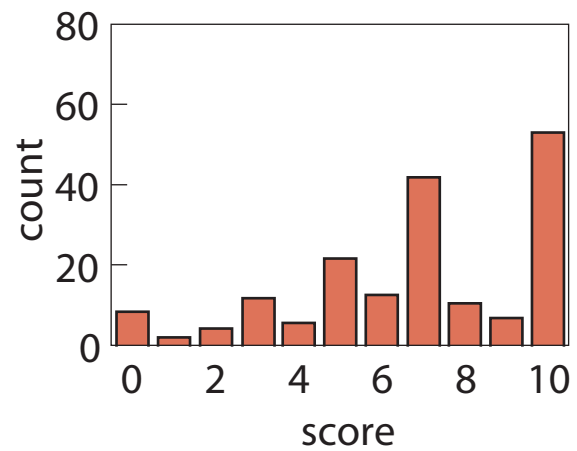
When  $S$  is closed, what happens to:

- (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?

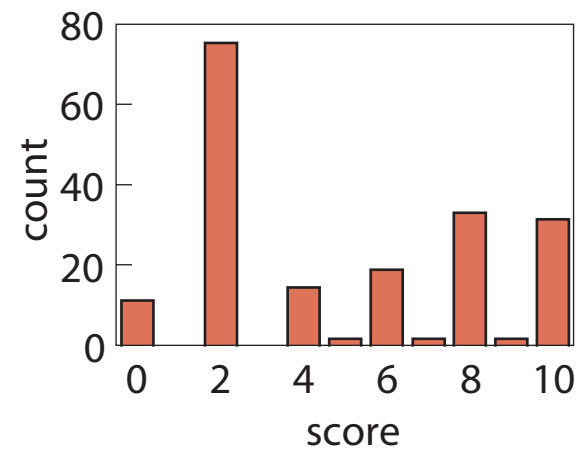


# Education

**conventional**

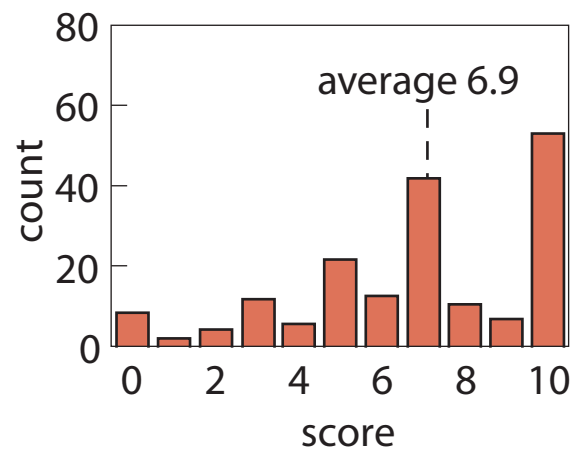


**conceptual**

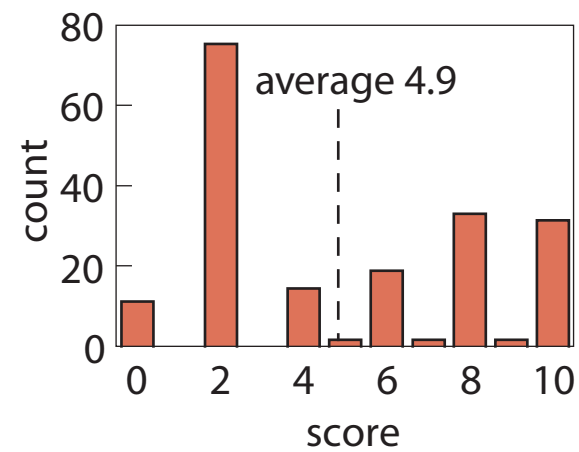


# Education

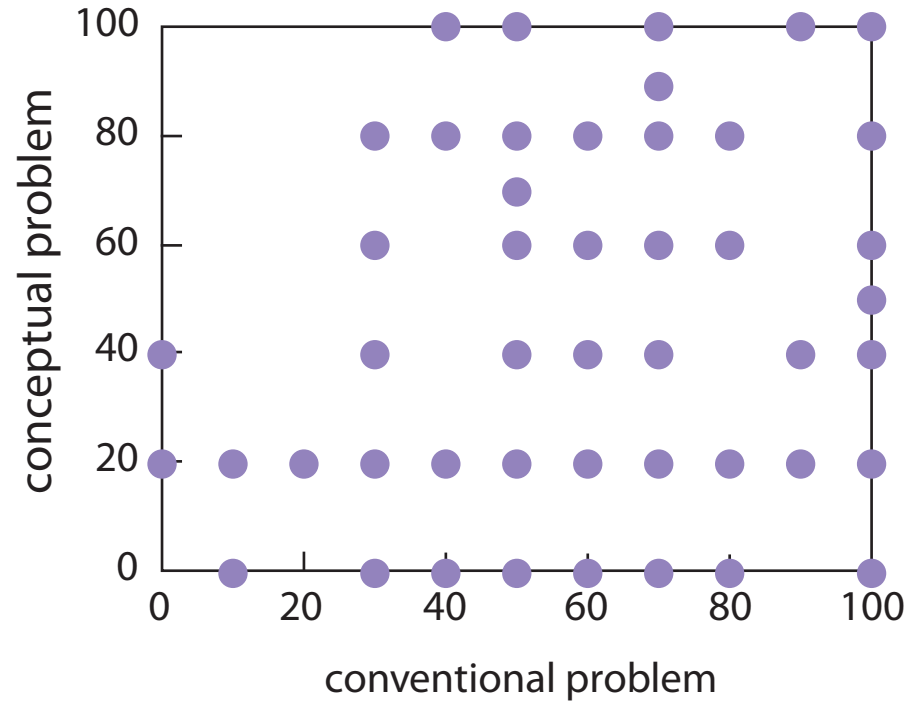
**conventional**



**conceptual**

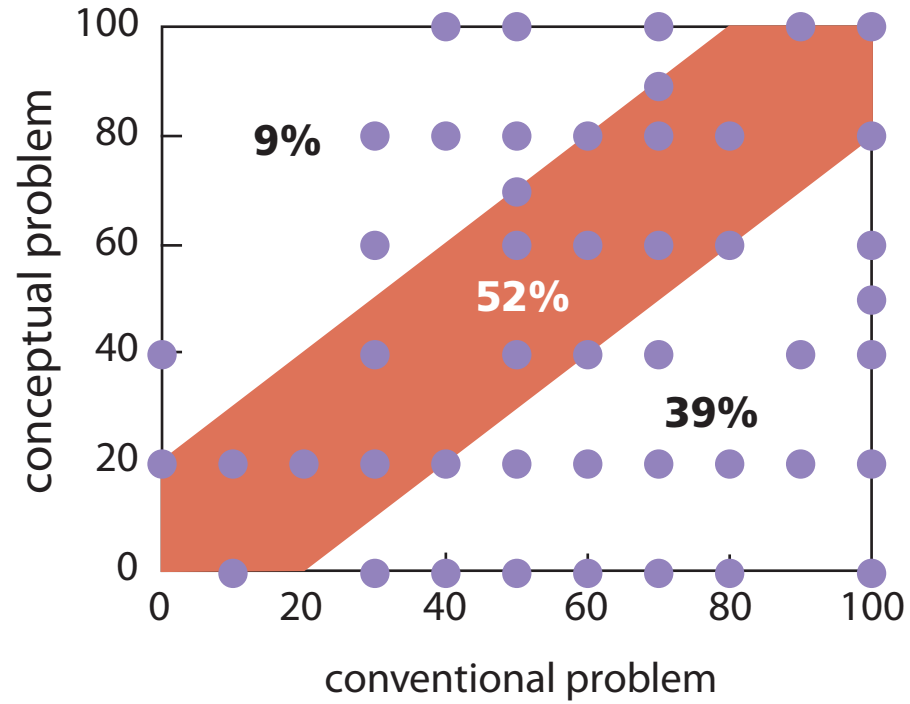


# Education





# Education



So what should we do?



# Peer Instruction

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

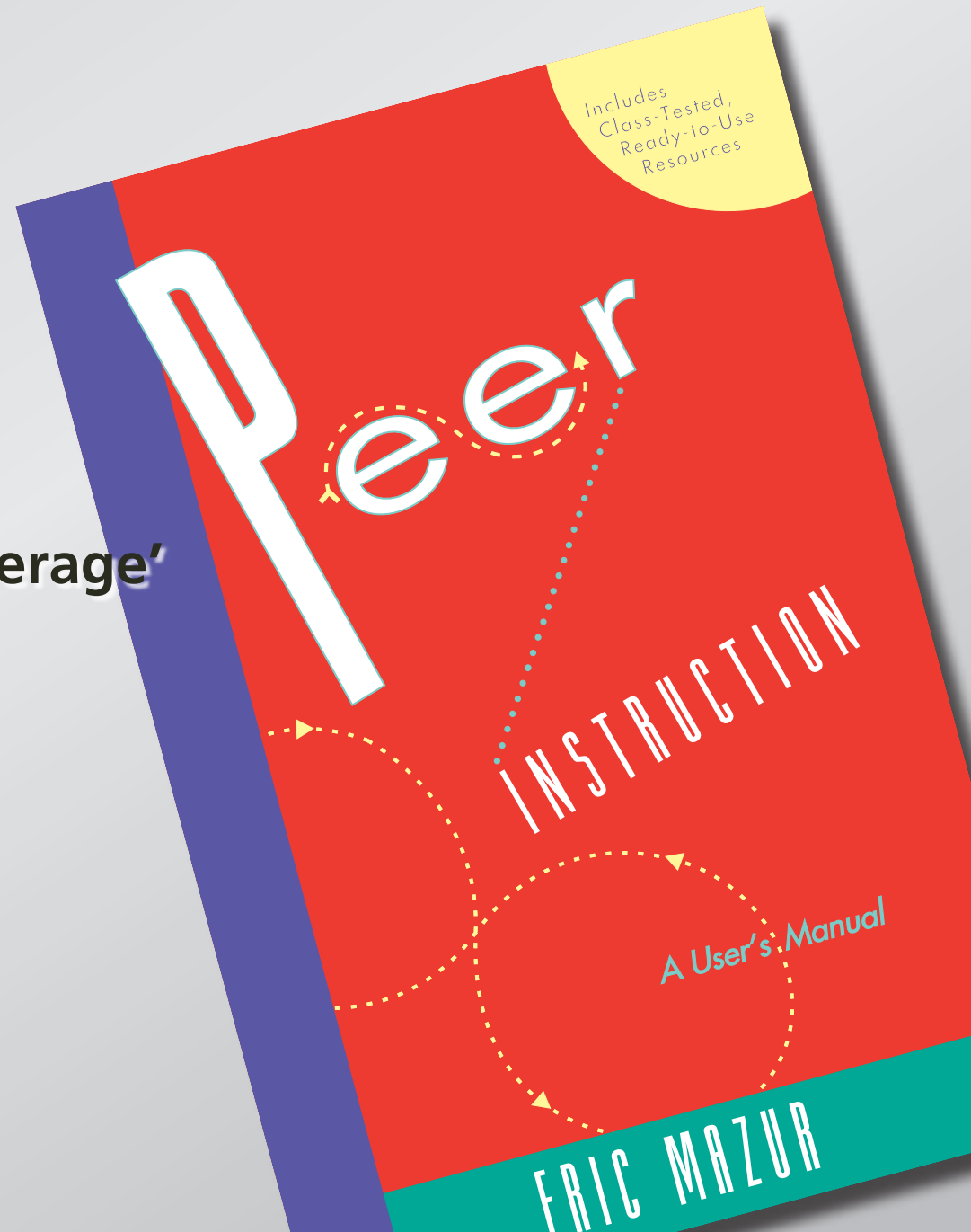
# Peer Instruction

**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**

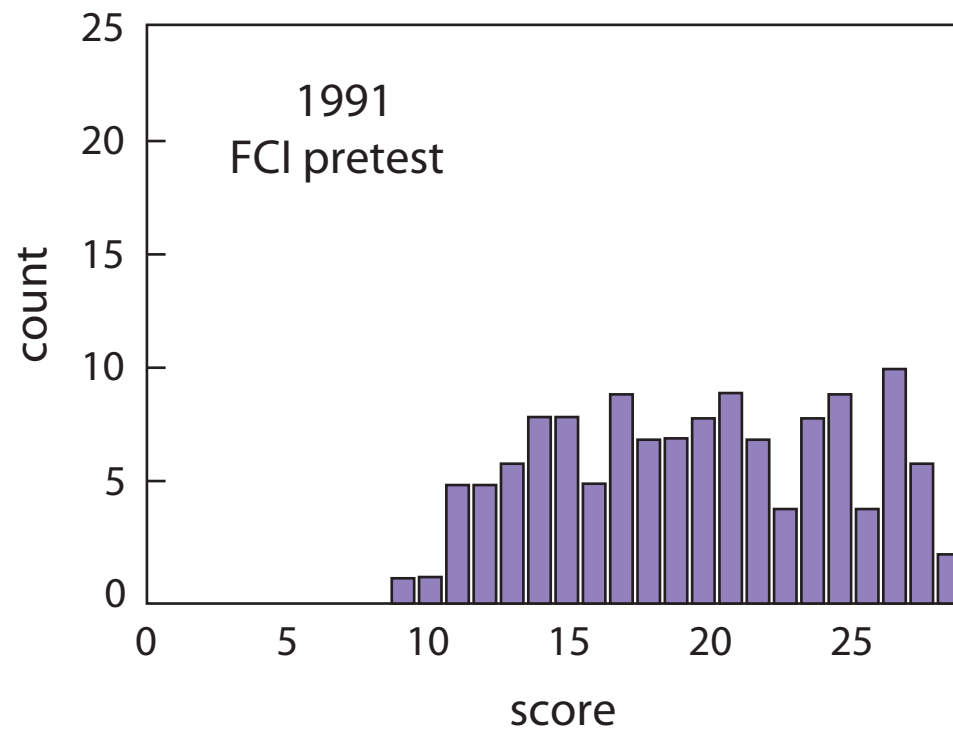


# Results

is it any good?

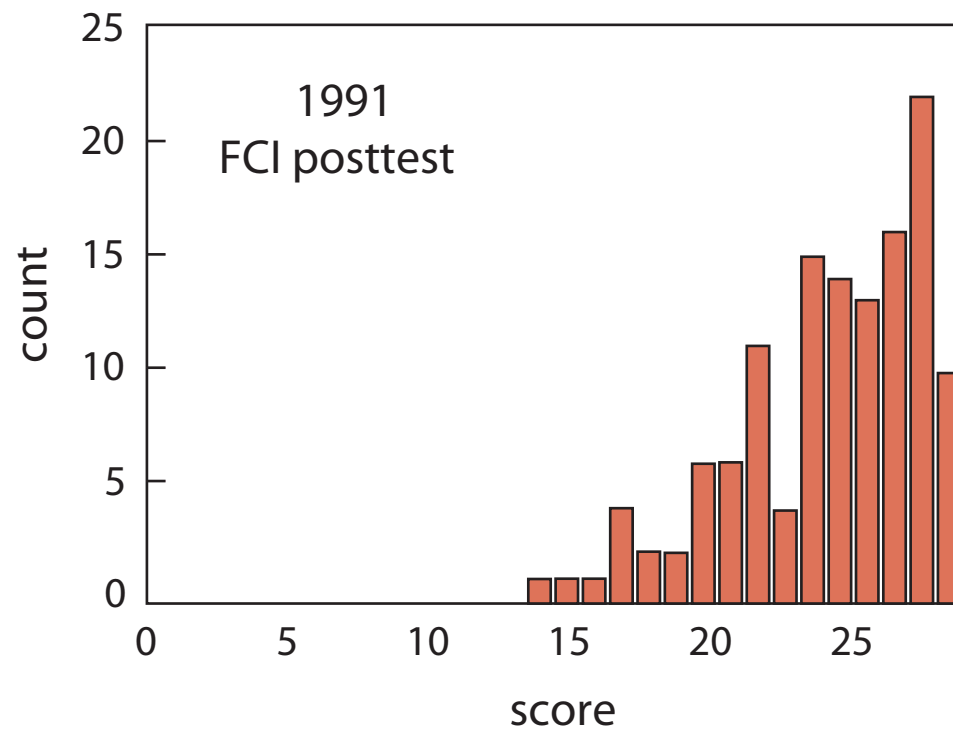
# Results

first year of implementing PI



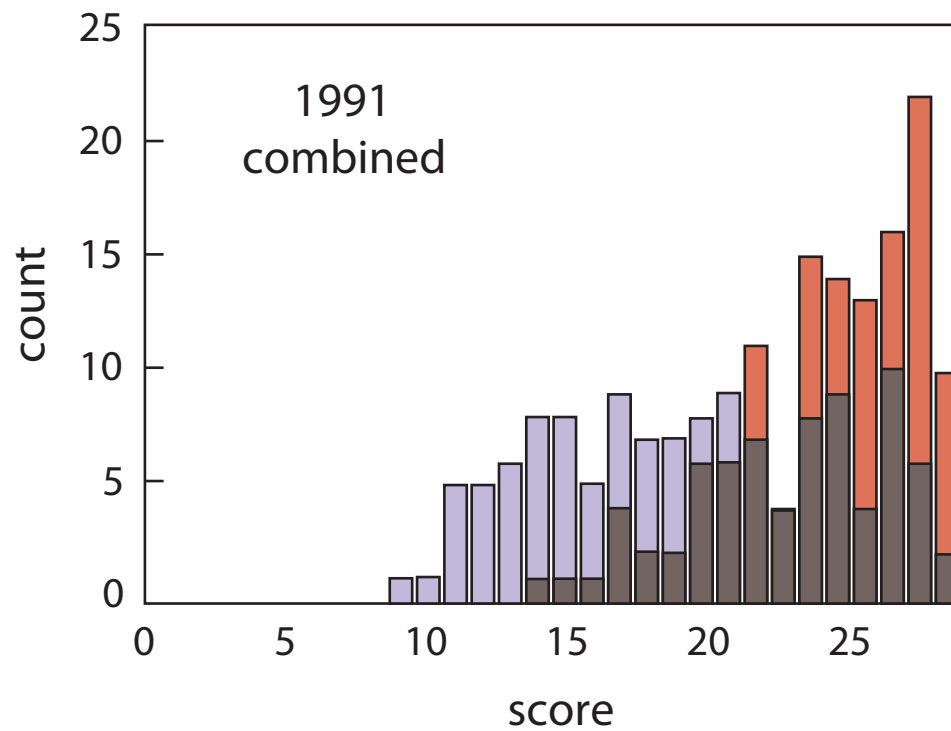
# Results

first year of implementing PI

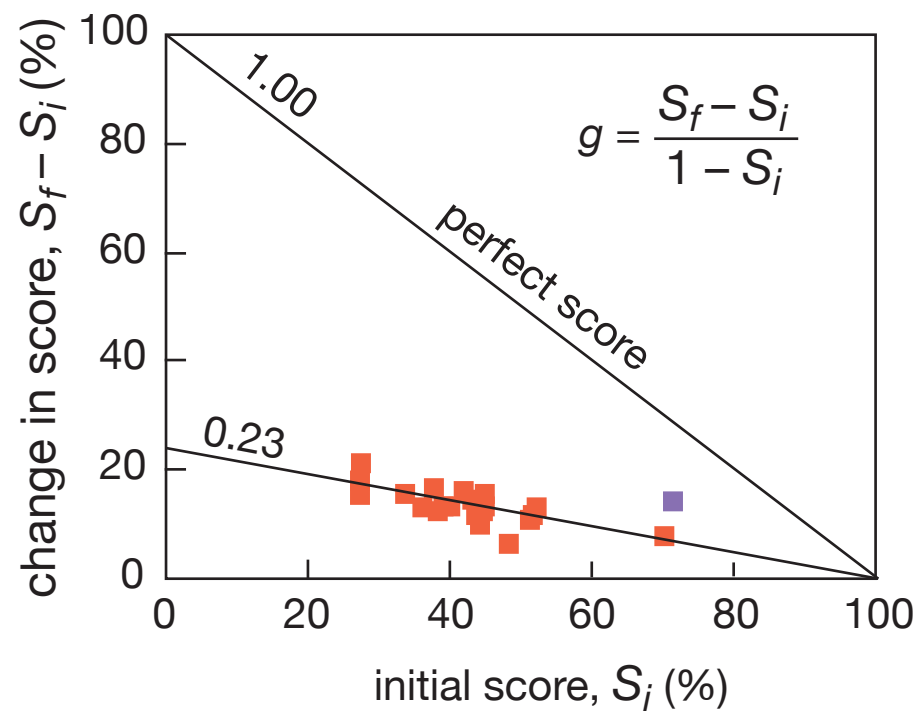


# Results

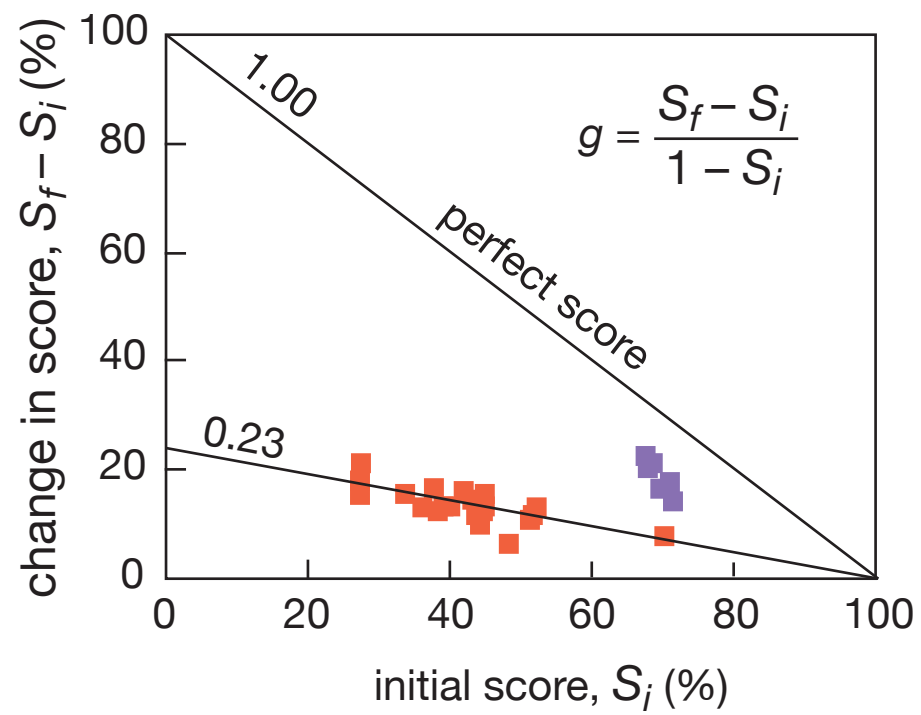
## first year of implementing PI



# Results

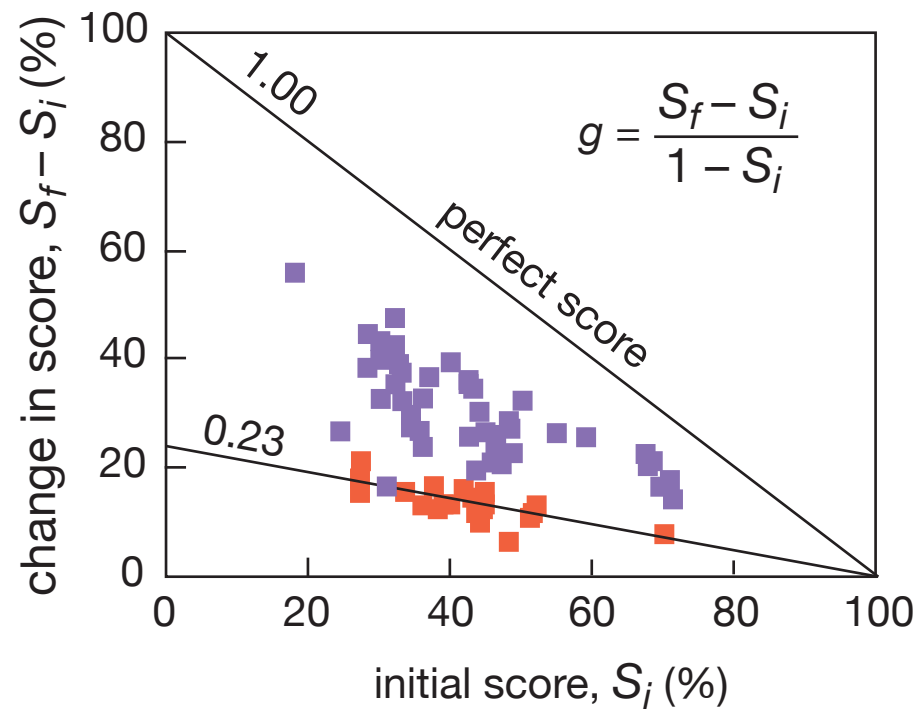


# Results

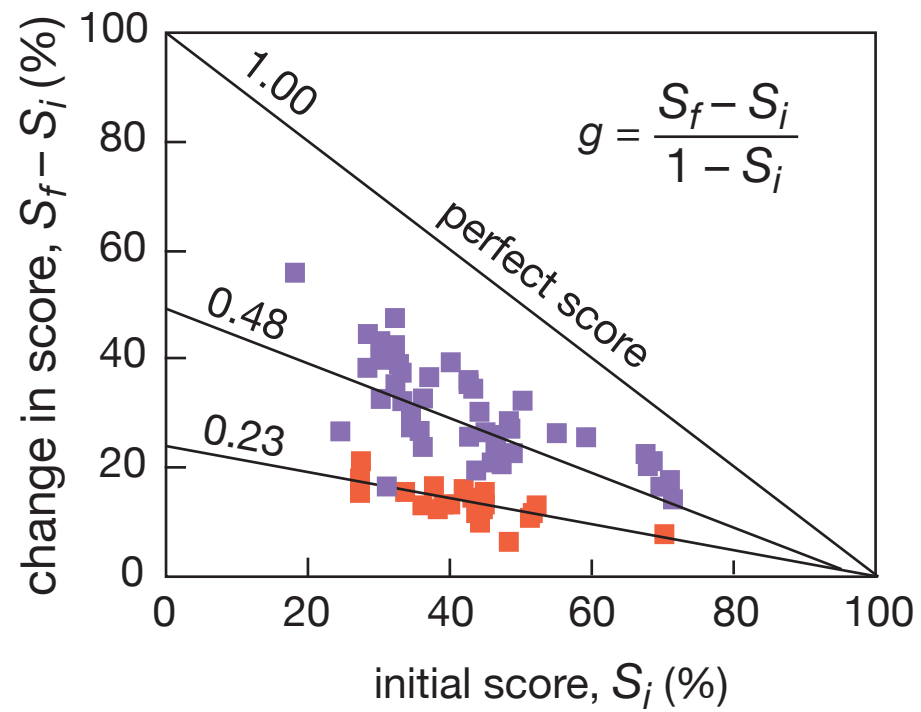




# Results



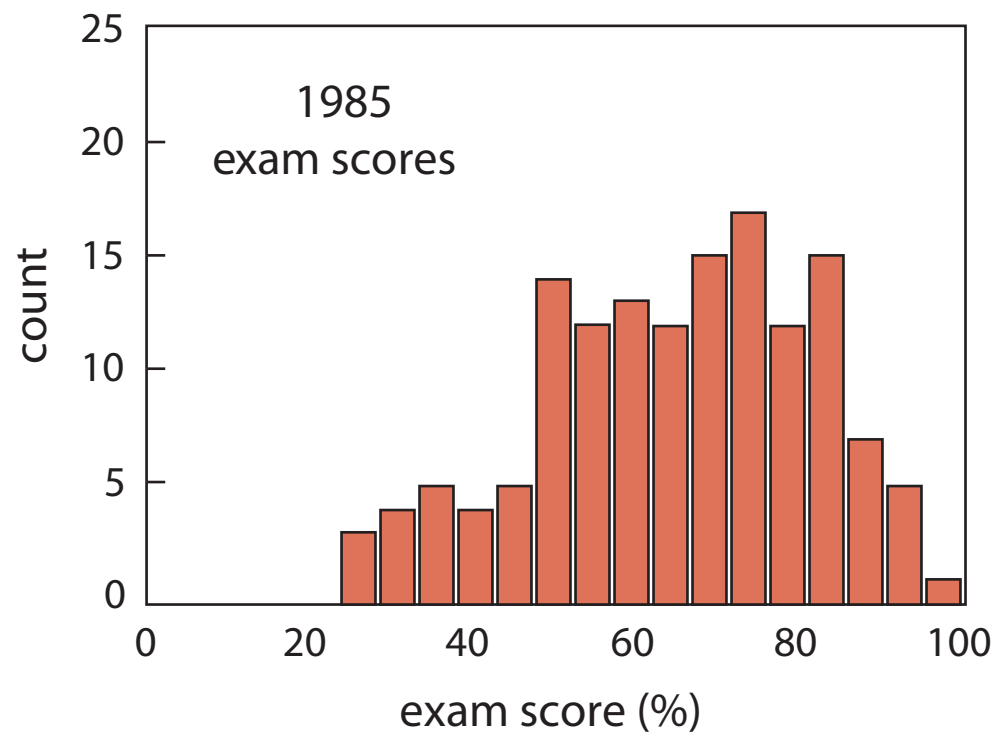
# Results



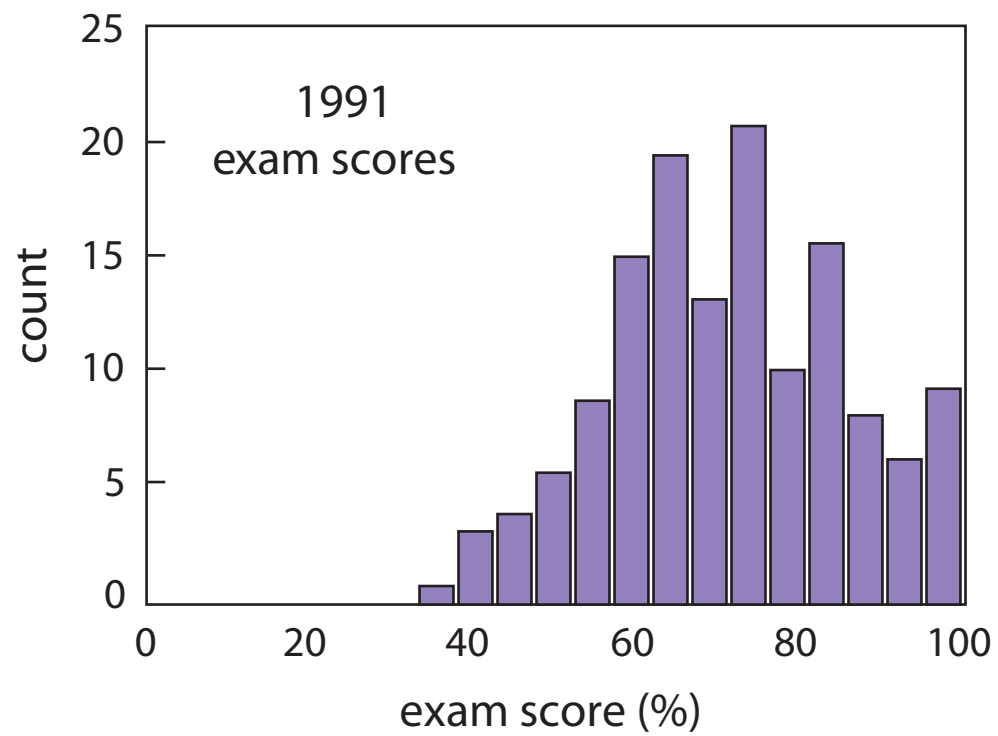
# Results

**what about problem solving?**

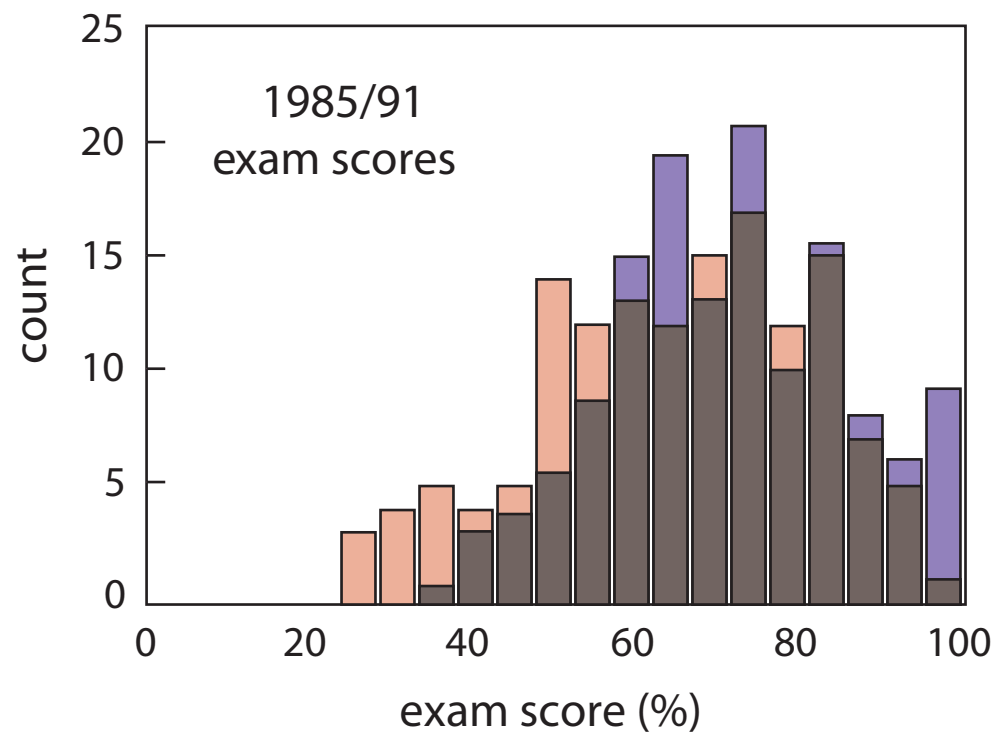
# Results



# 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!)**





**Funding:**

**National Science Foundation**

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