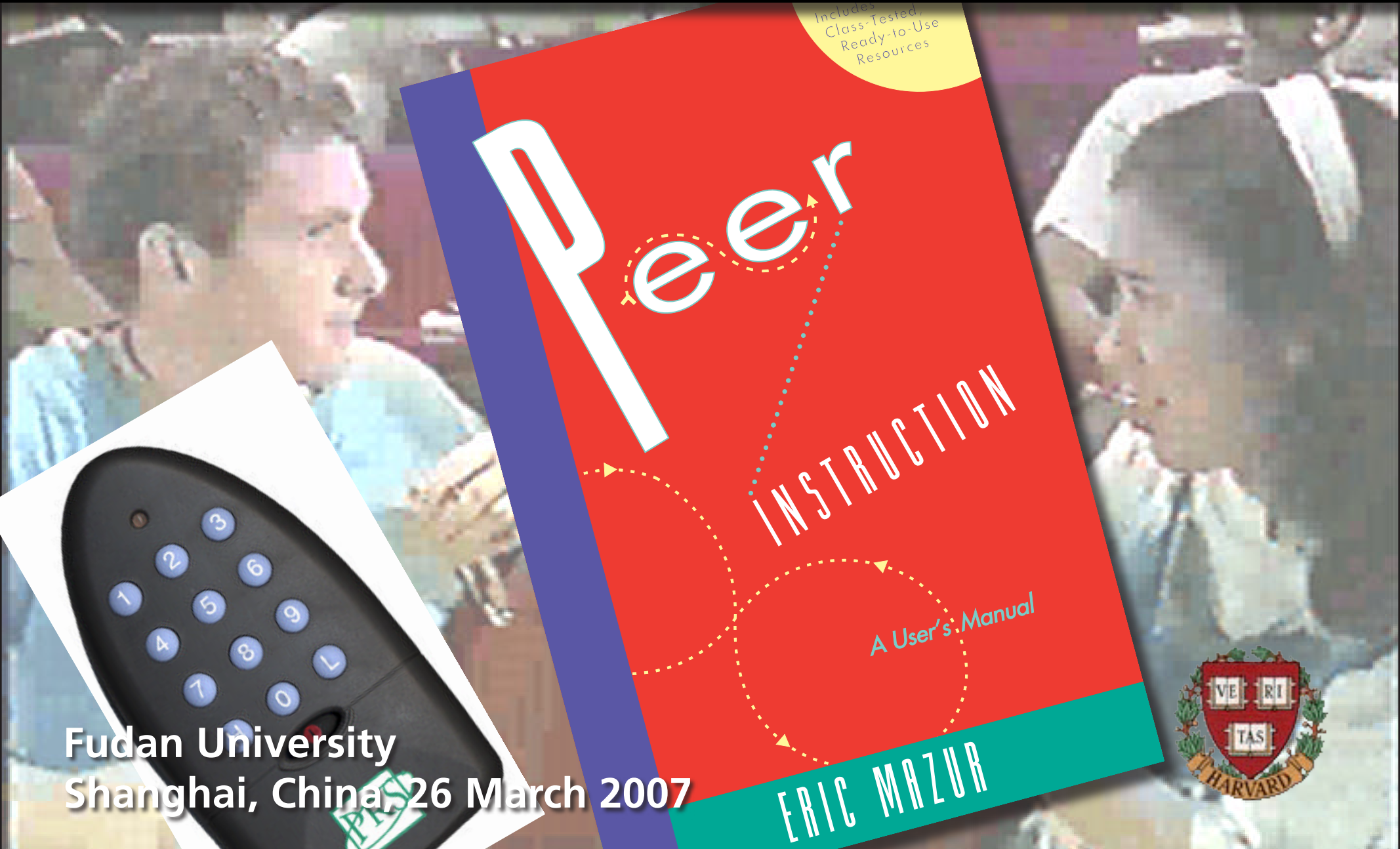
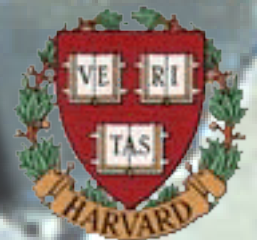


# Understanding or Memorization: Are we teaching the right thing?



Fudan University  
Shanghai, China, 26 March 2007



# My message

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



# Outline

- Education



# Outline

- Education
- Peer Instruction



# Outline

- Education
- Peer Instruction
- Results





# Education



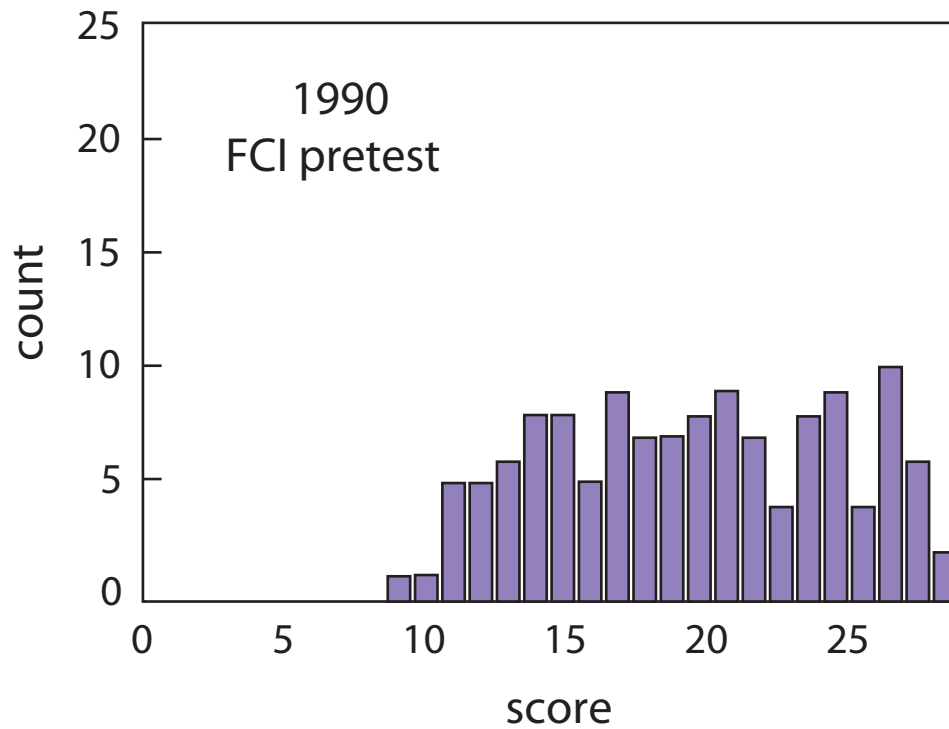
# Education

lectures focus on delivery of information

A wide-angle photograph of a large lecture hall. The room is filled with students seated at long desks, all facing towards the front. At the front of the room, a lecturer is standing at a podium, addressing the class. Behind the lecturer is a large projection screen displaying text. The walls are a light blue color, and the overall atmosphere is that of a formal educational setting.

# Education

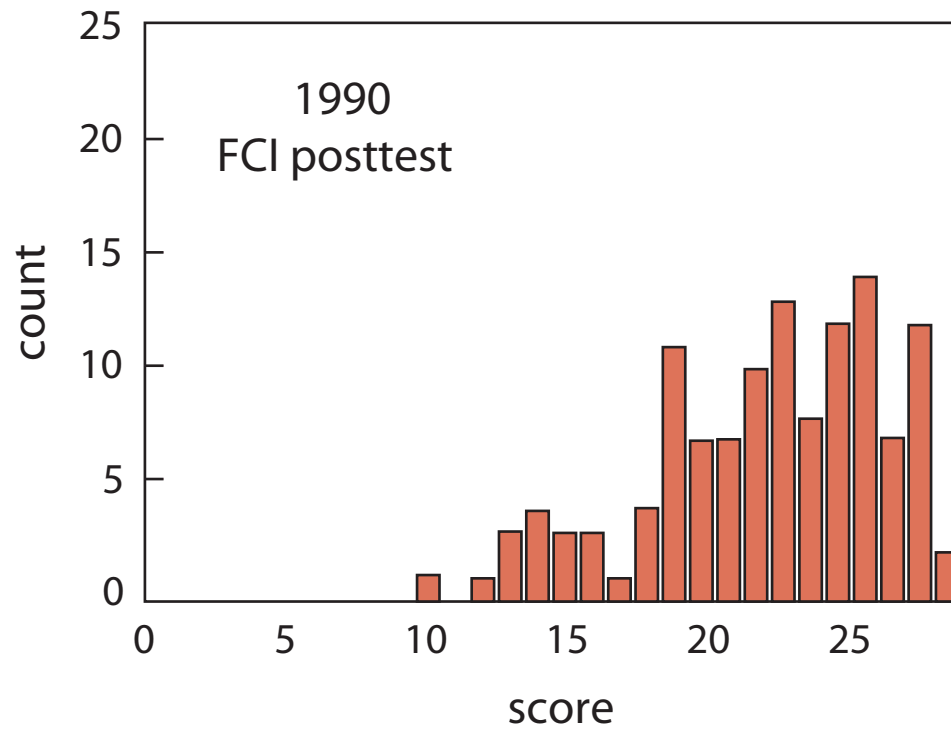
education is not just information transfer





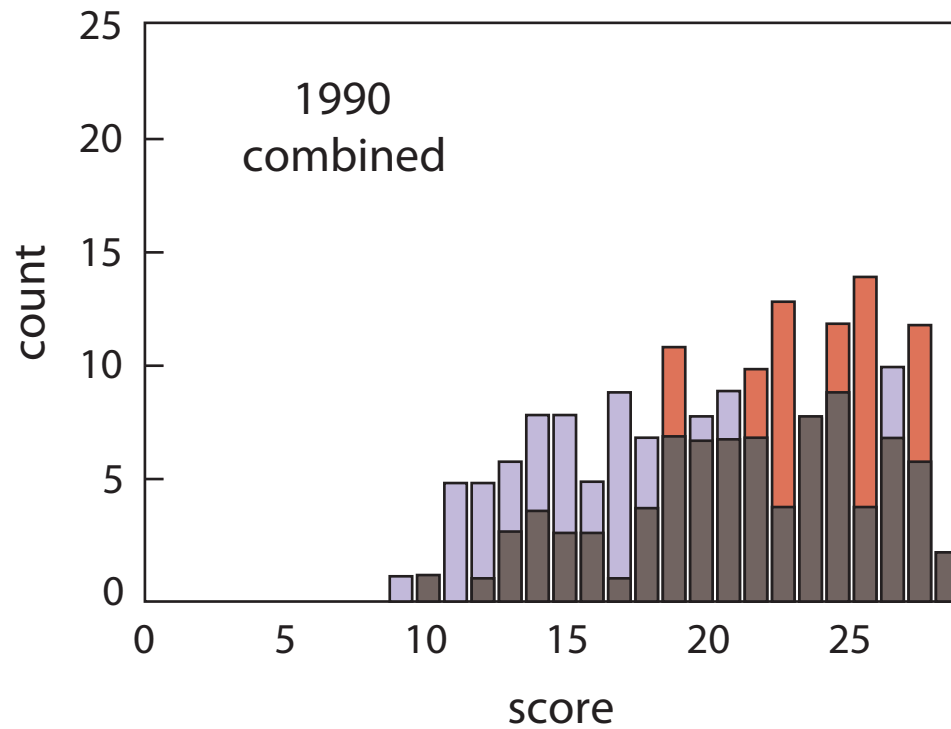
# Education

education is not just information transfer

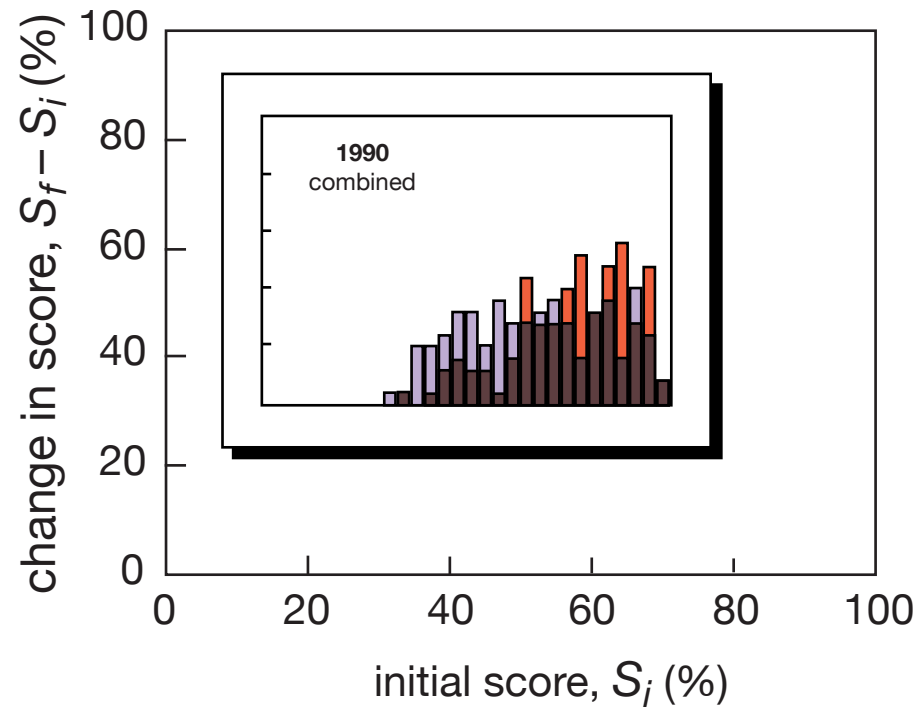


# Education

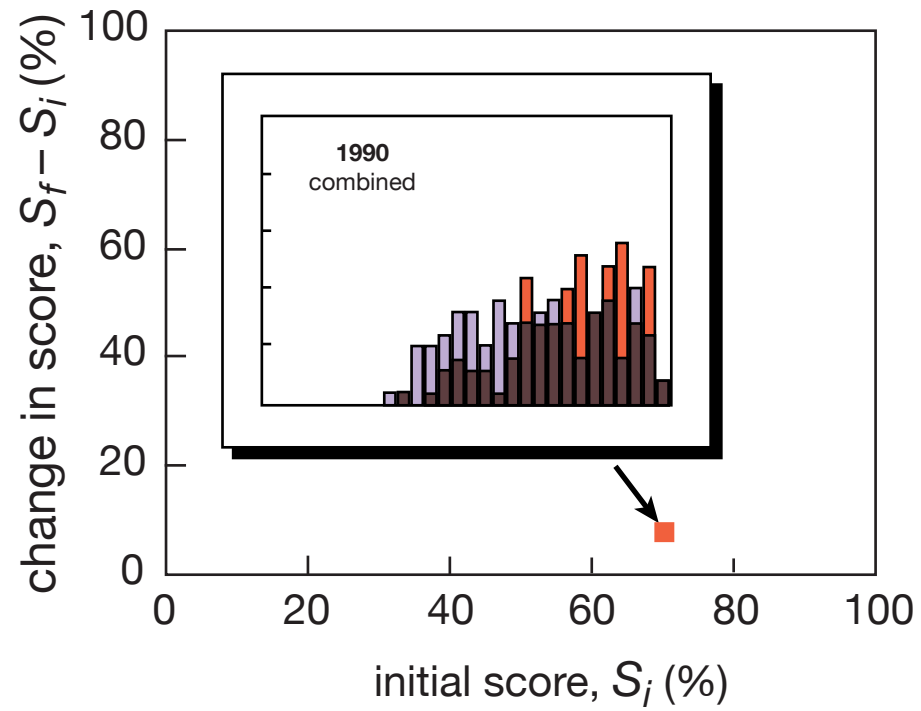
education is not just information transfer



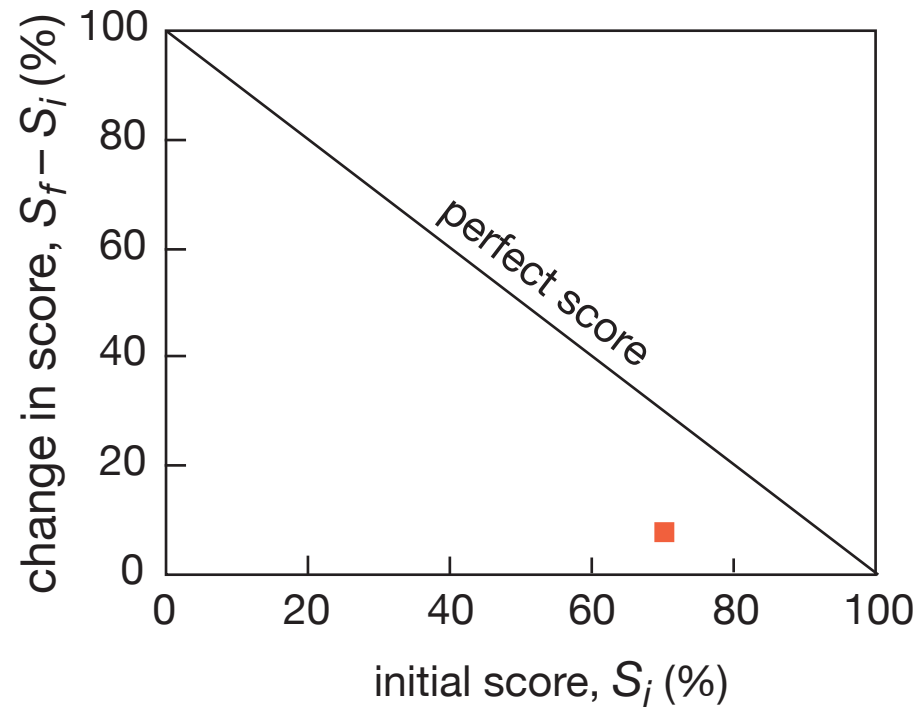
# Education



# Education

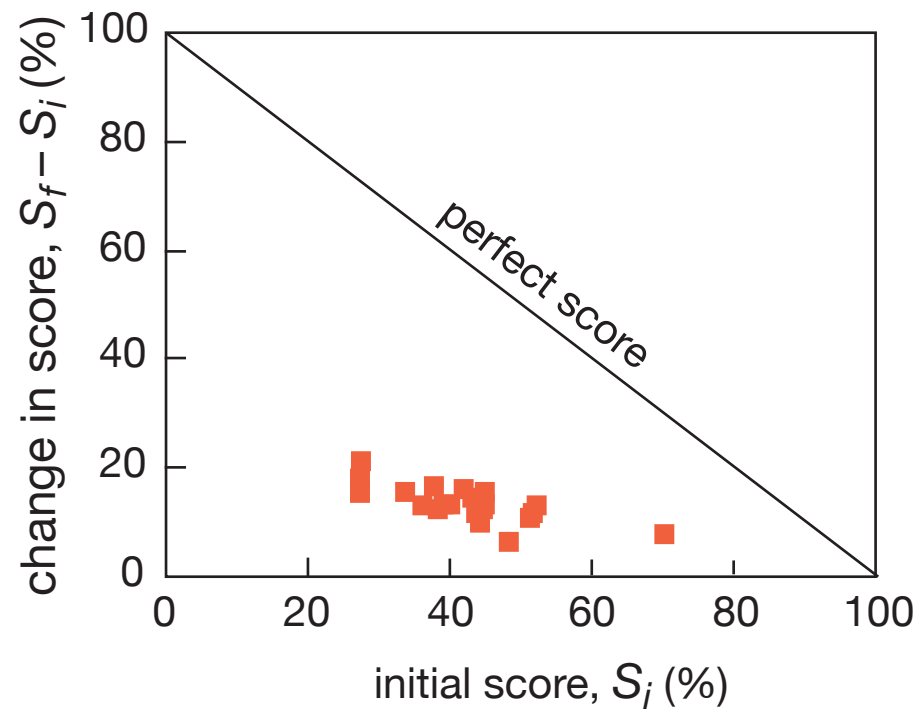


# Education



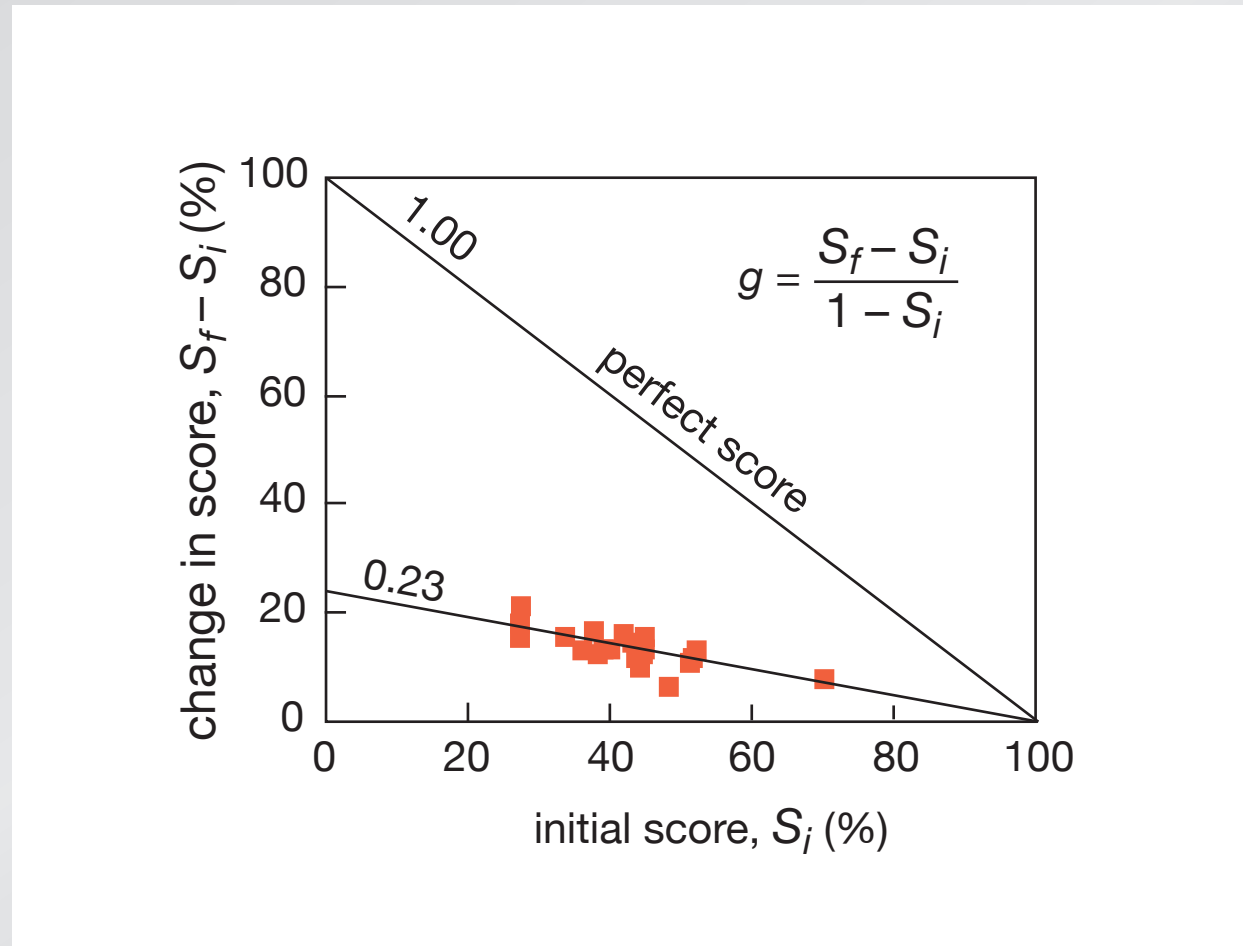


# Education



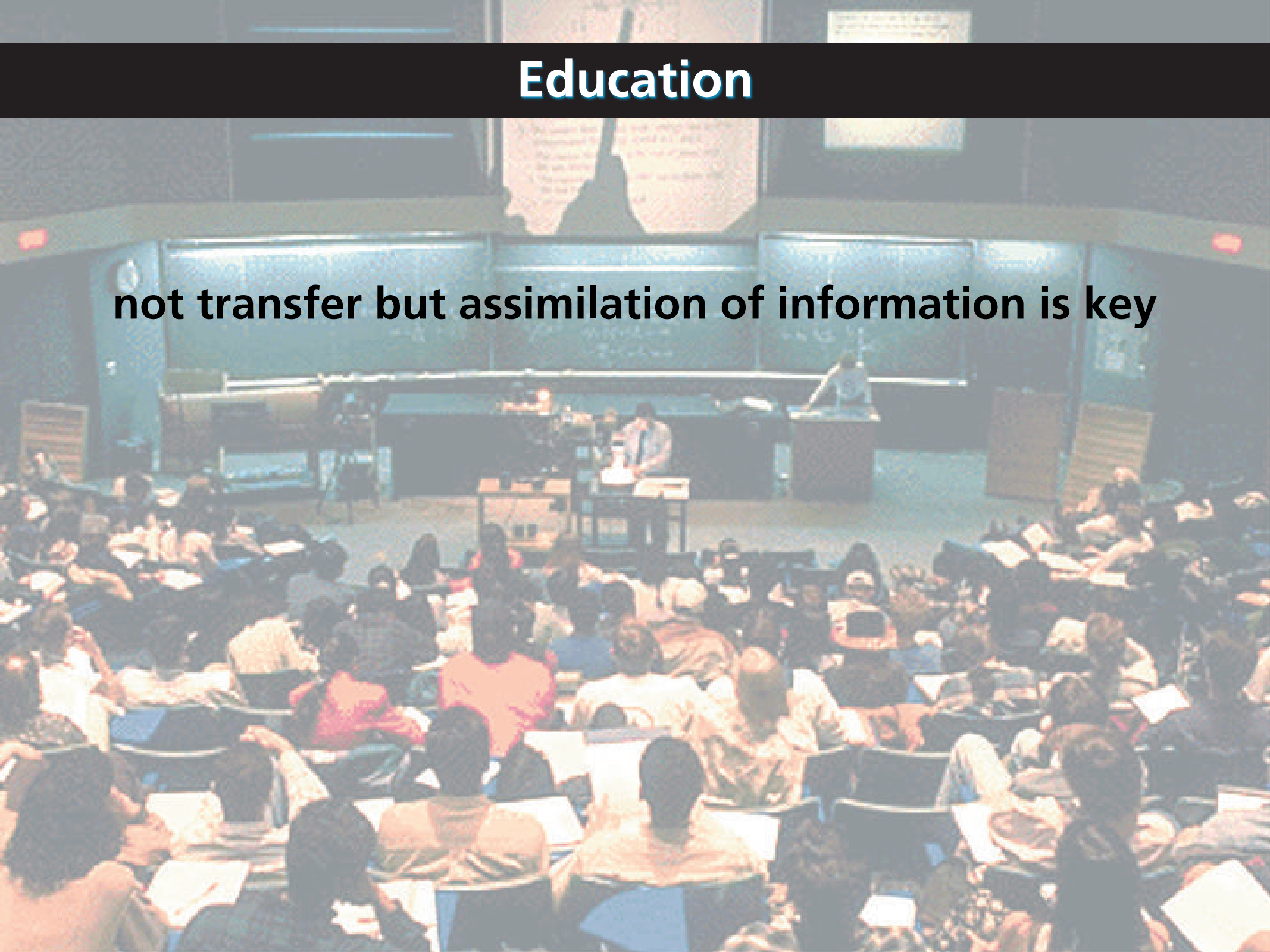
# Education

only one quarter of maximum gain realized



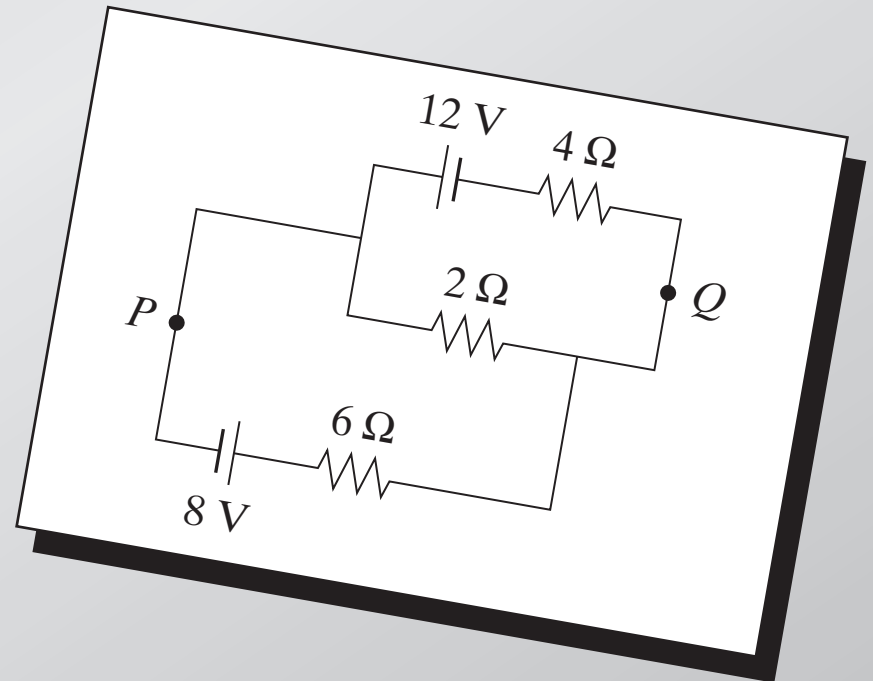
# Education

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



# Education

conventional problems misleading



# Education

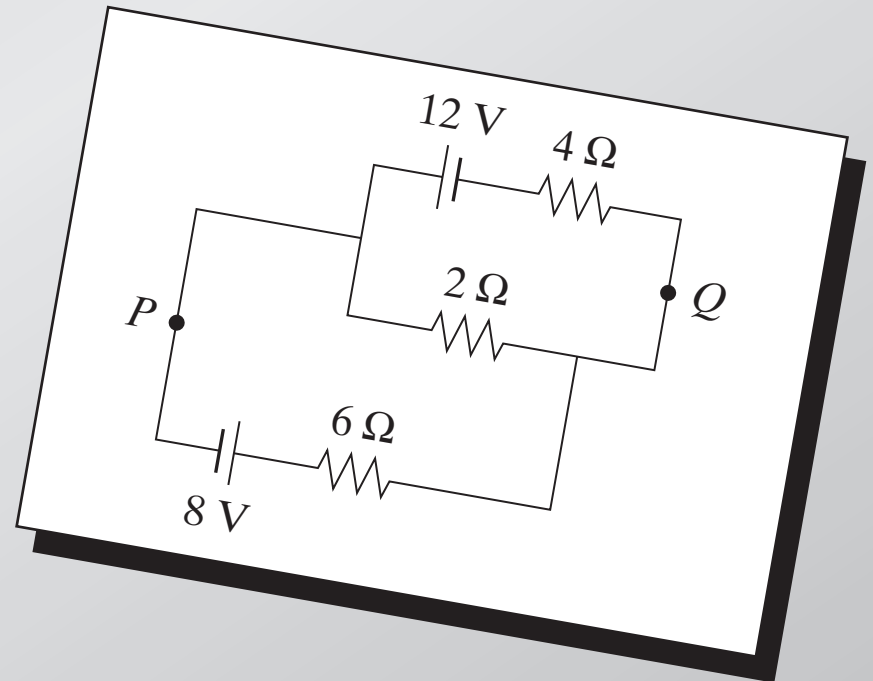
conventional problems misleading

Calculate:

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

(b) potential difference

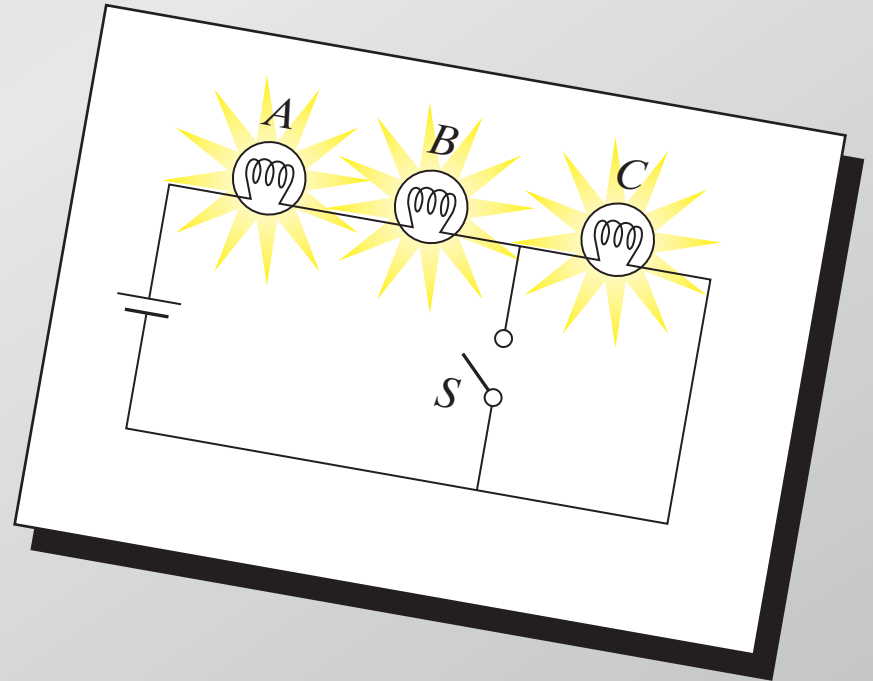
between  $P$  and  $Q$





# Education

are the basic principles understood?

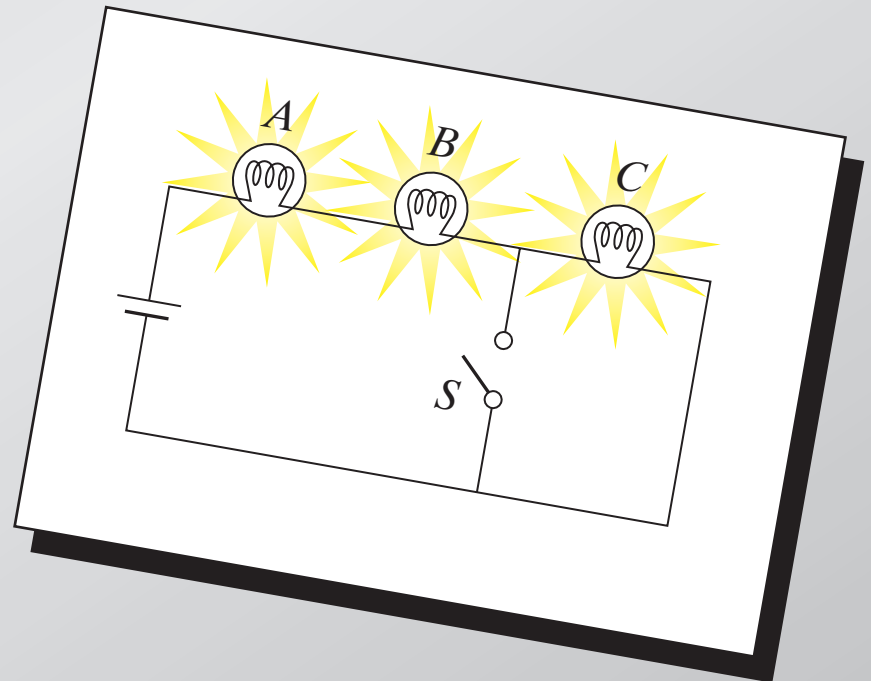


# Education

are the basic principles understood?

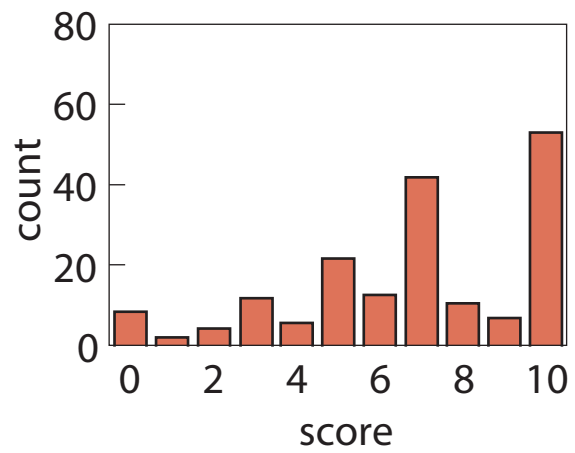
When  $S$  is closed, what happens to:

- (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?

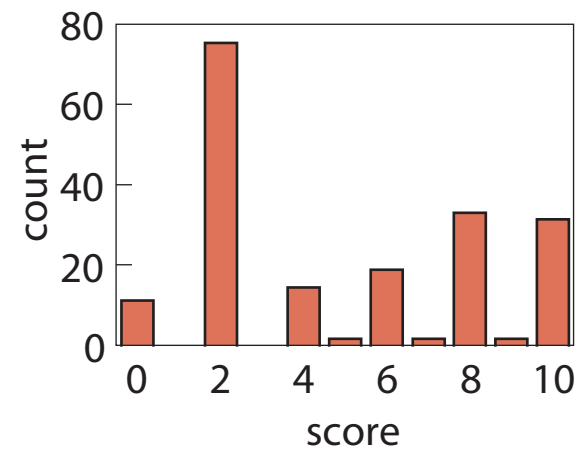


# Education

**conventional**

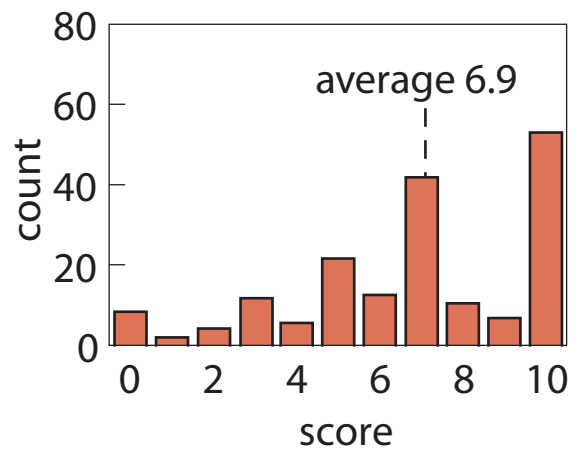


**conceptual**

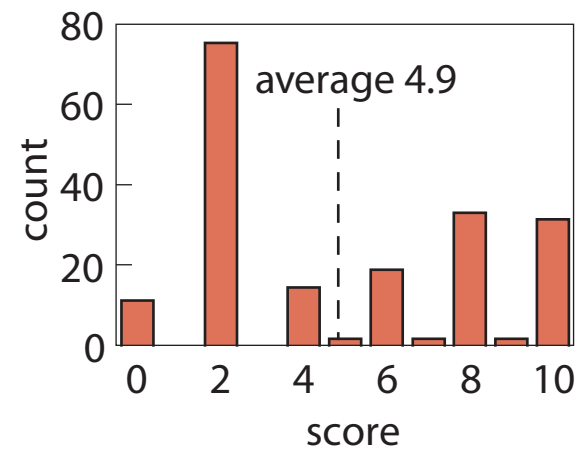


# Education

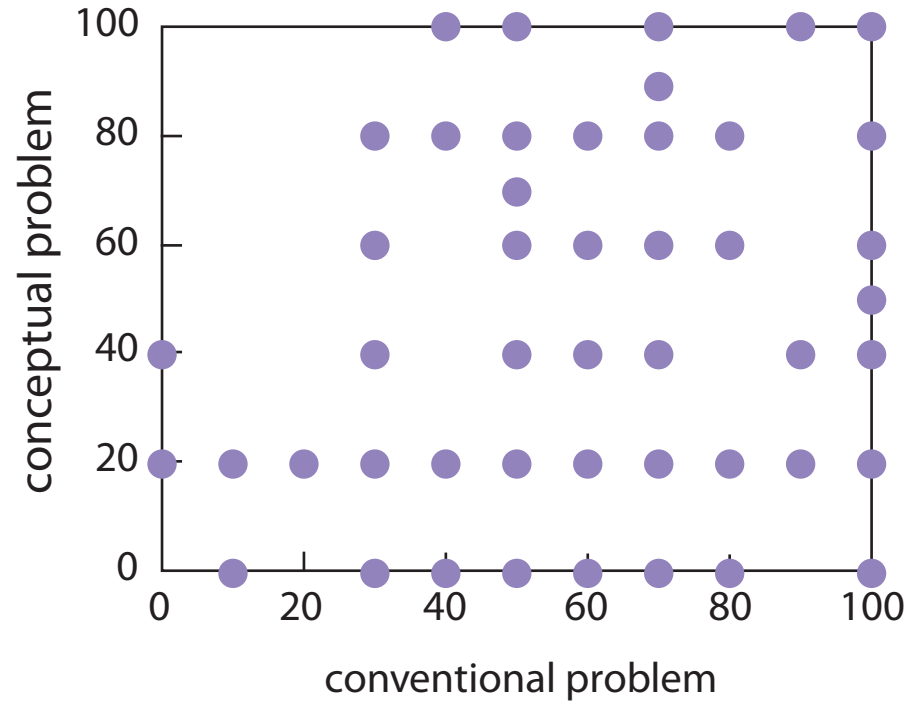
## conventional



## conceptual

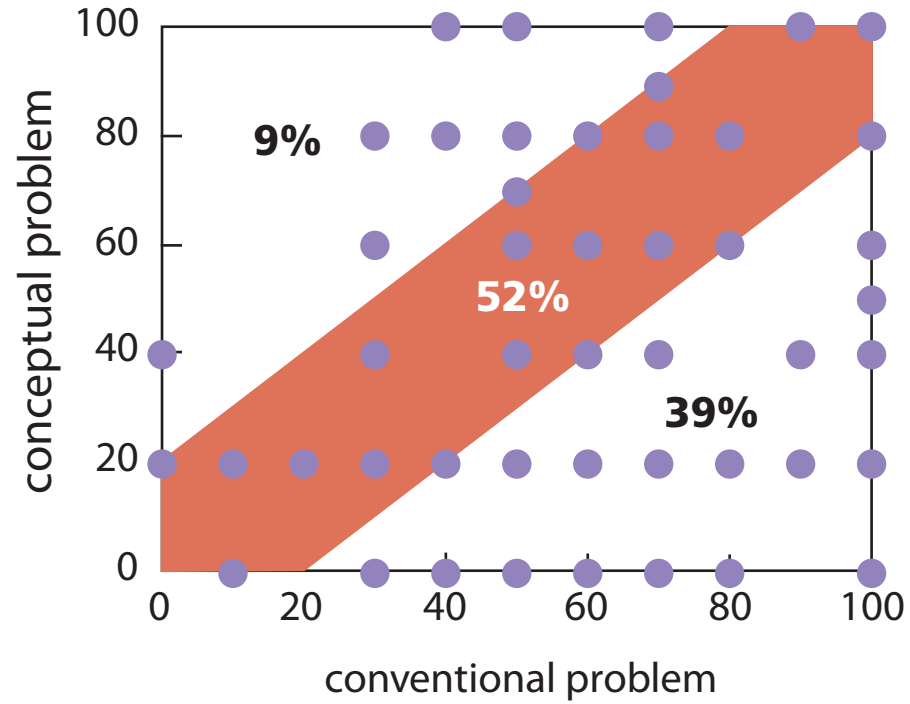


# Education





# Education



A large lecture hall with a professor at a podium and students seated at desks. A large screen at the front displays text and a diagram. The text on the screen is partially legible and includes the words "The world is full of..." and "The world is full of...".

So what should we do?

# Peer Instruction

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

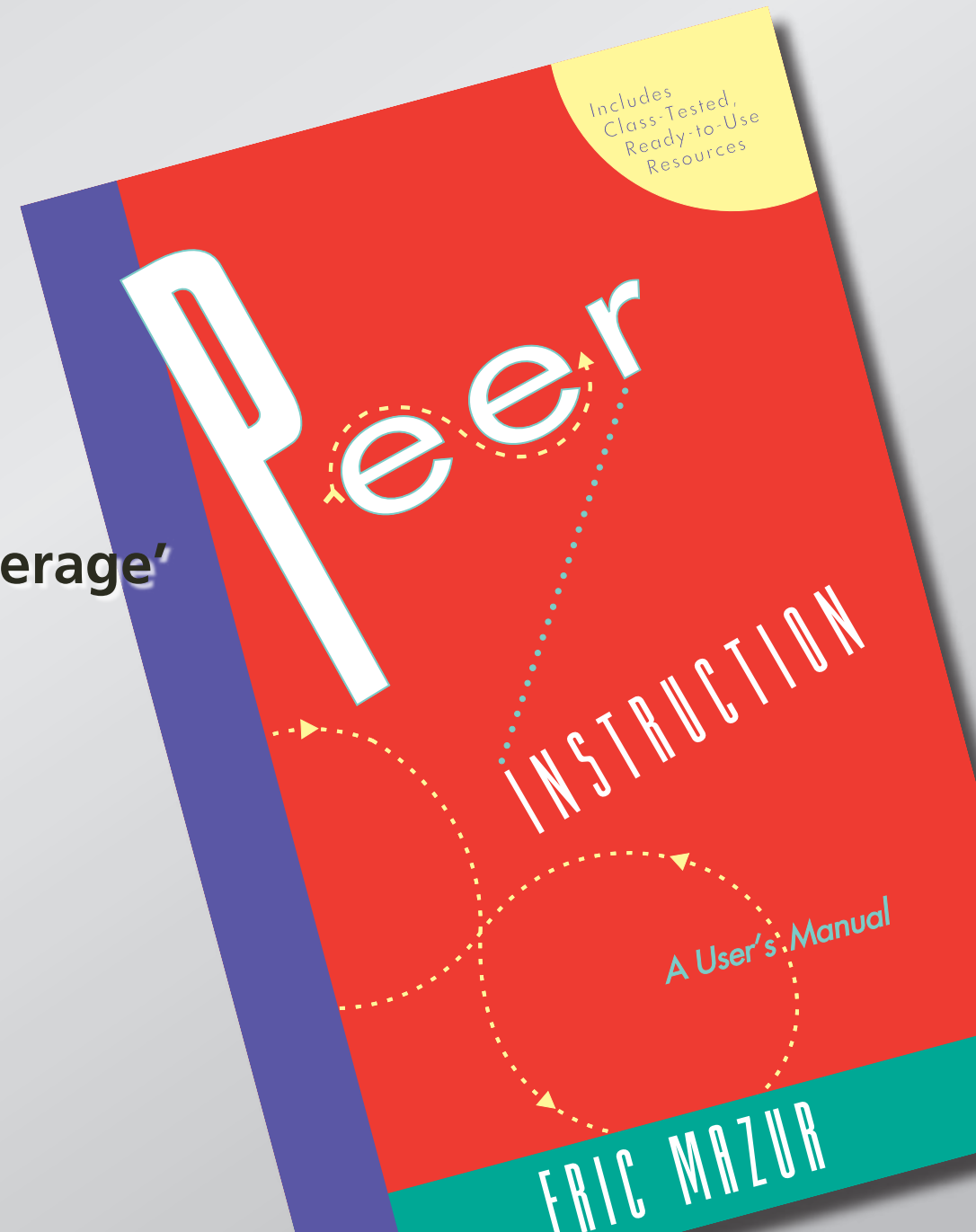
# Peer Instruction

**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**



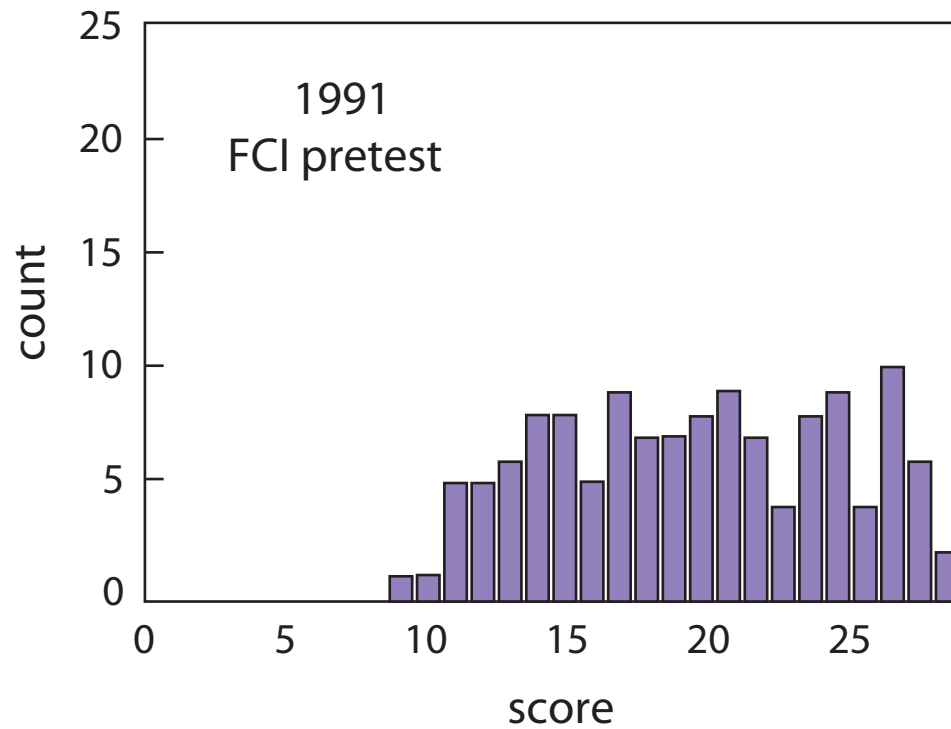
# Results

**is it any good?**



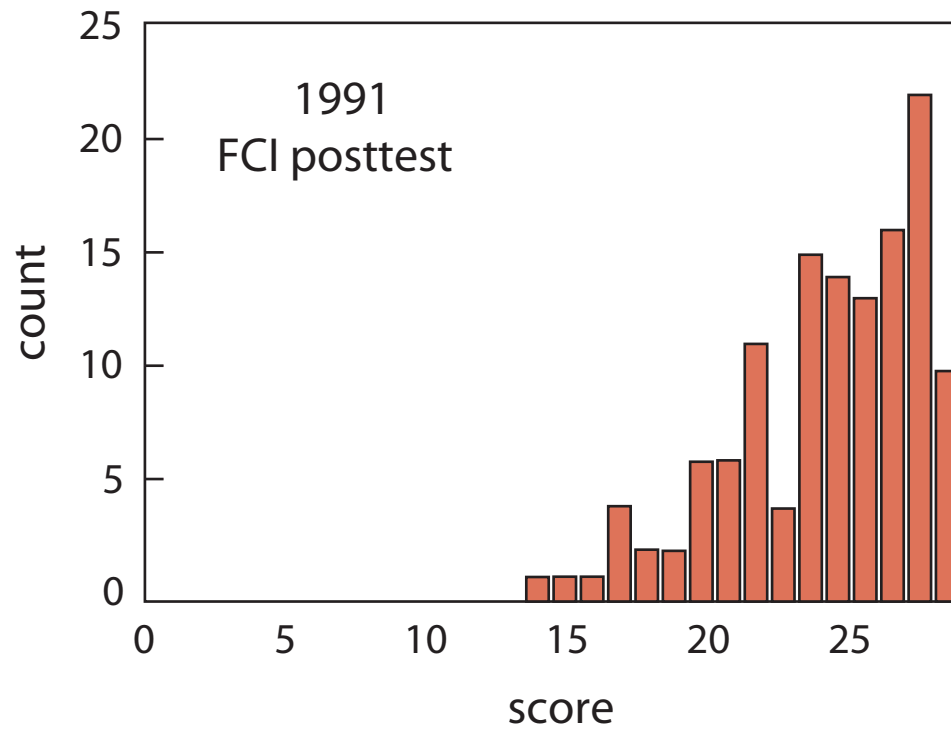
# Results

## first year of implementing PI



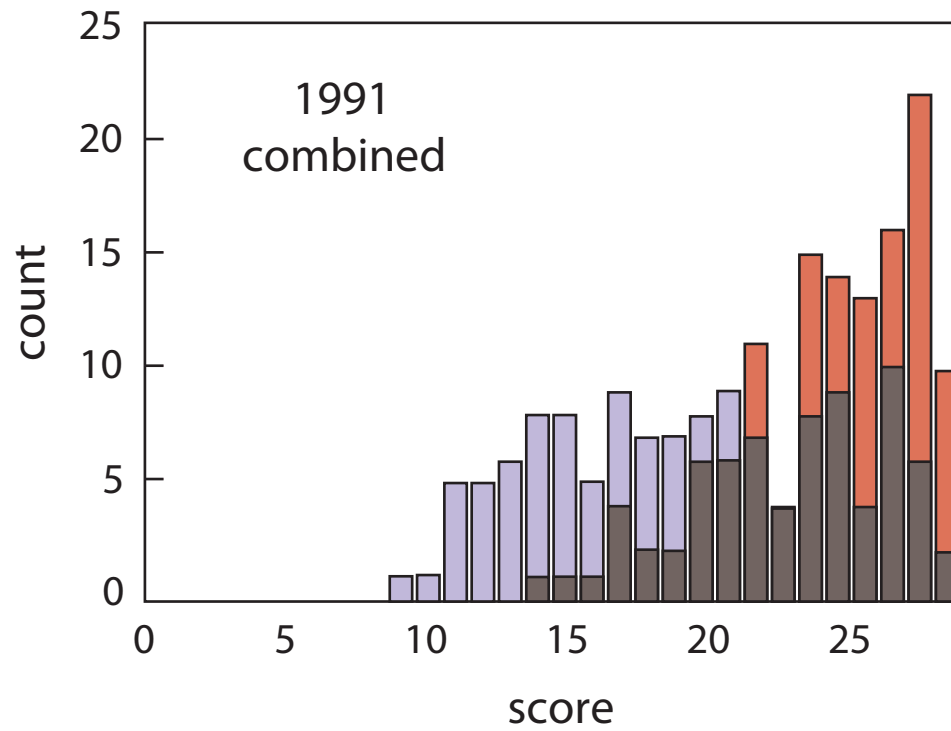
# Results

## first year of implementing PI

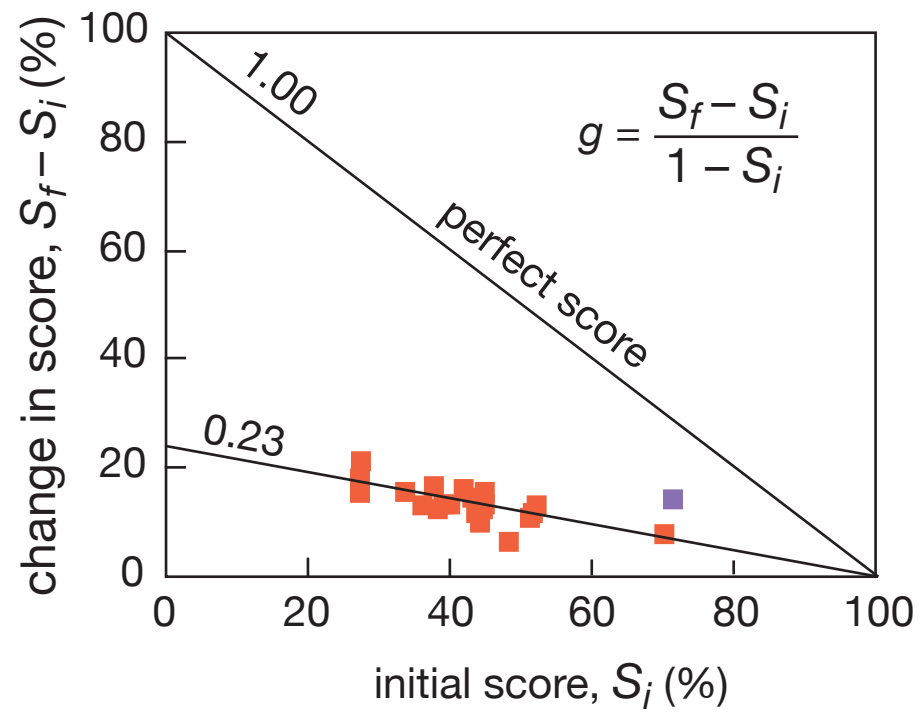


# Results

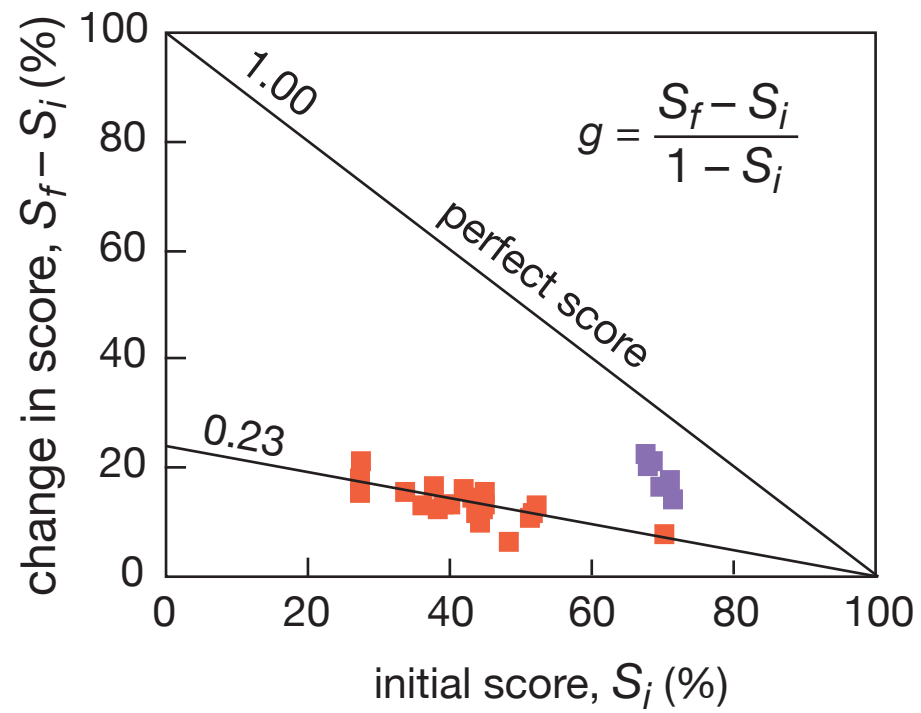
## first year of implementing PI



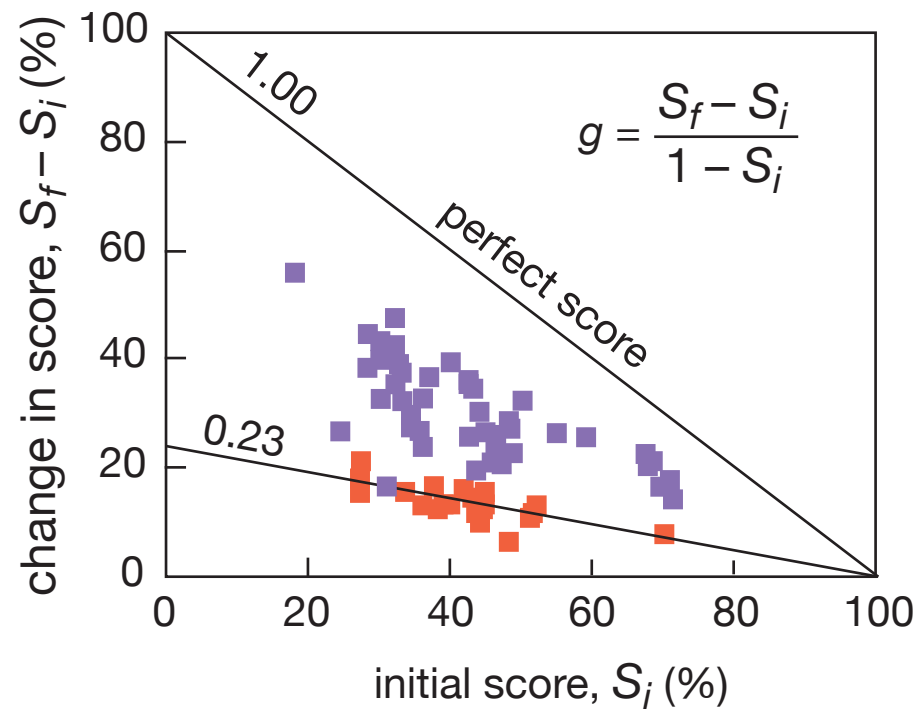
# Results



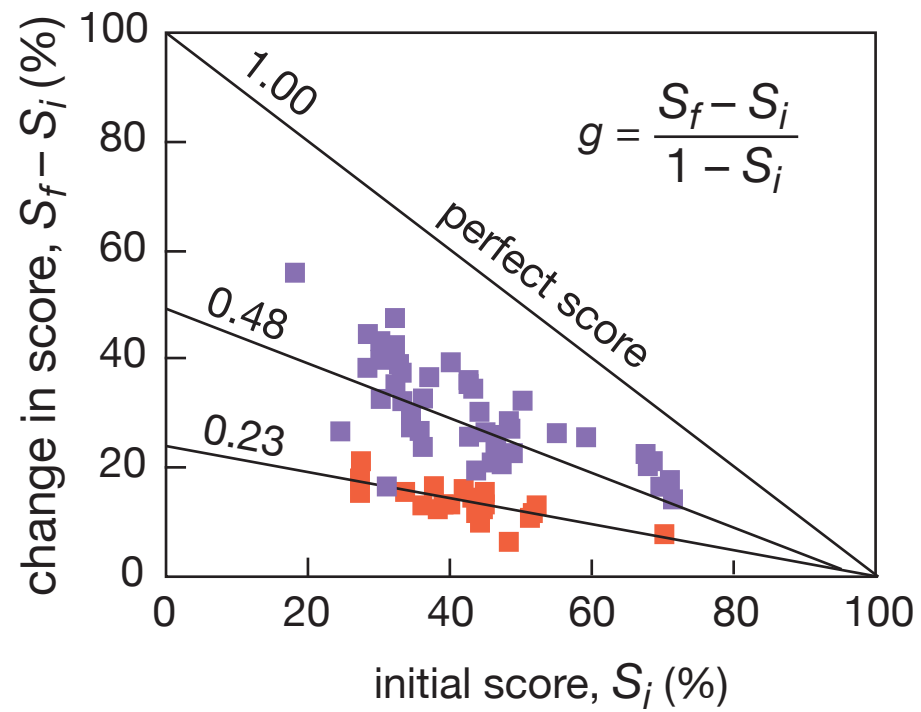
# Results



# Results



# Results

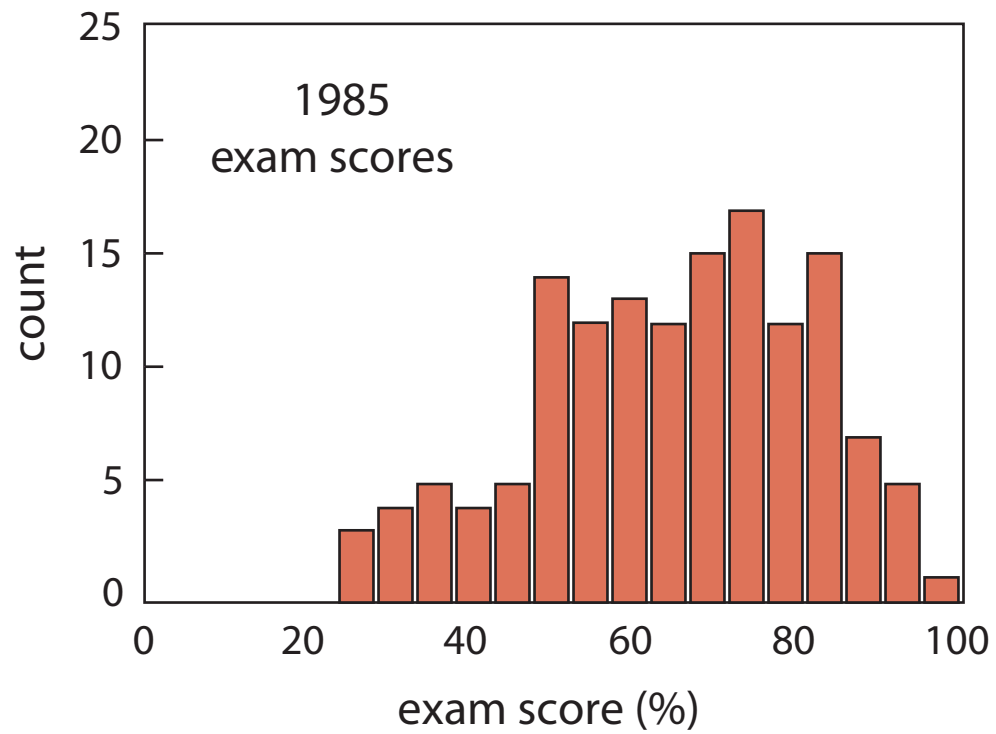


# Results

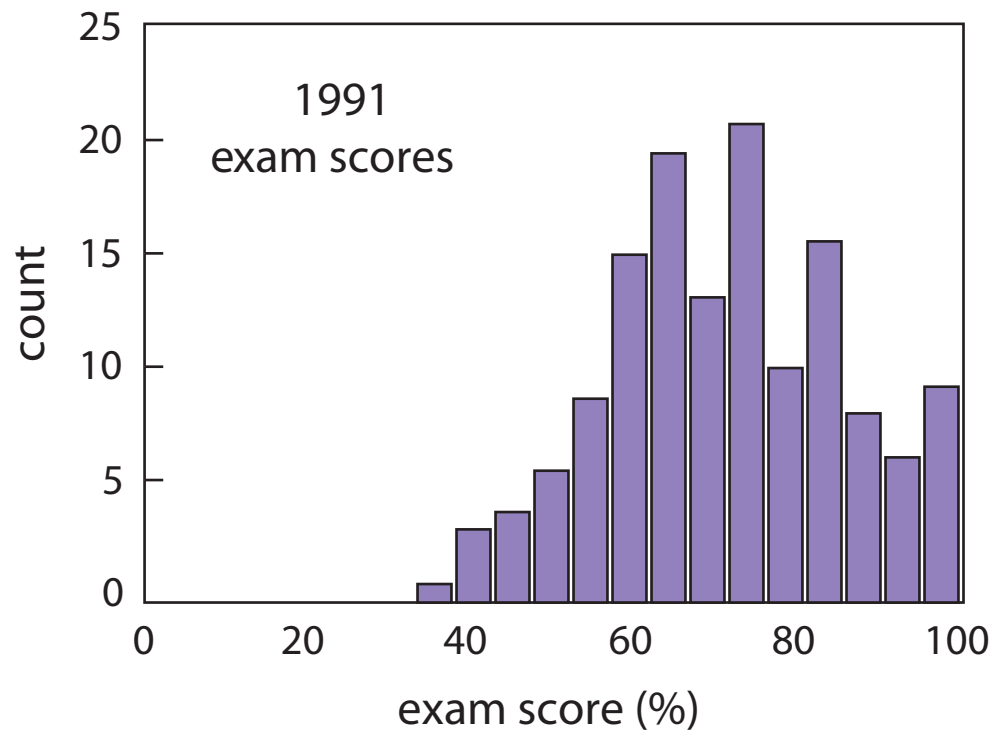
**what about problem solving?**



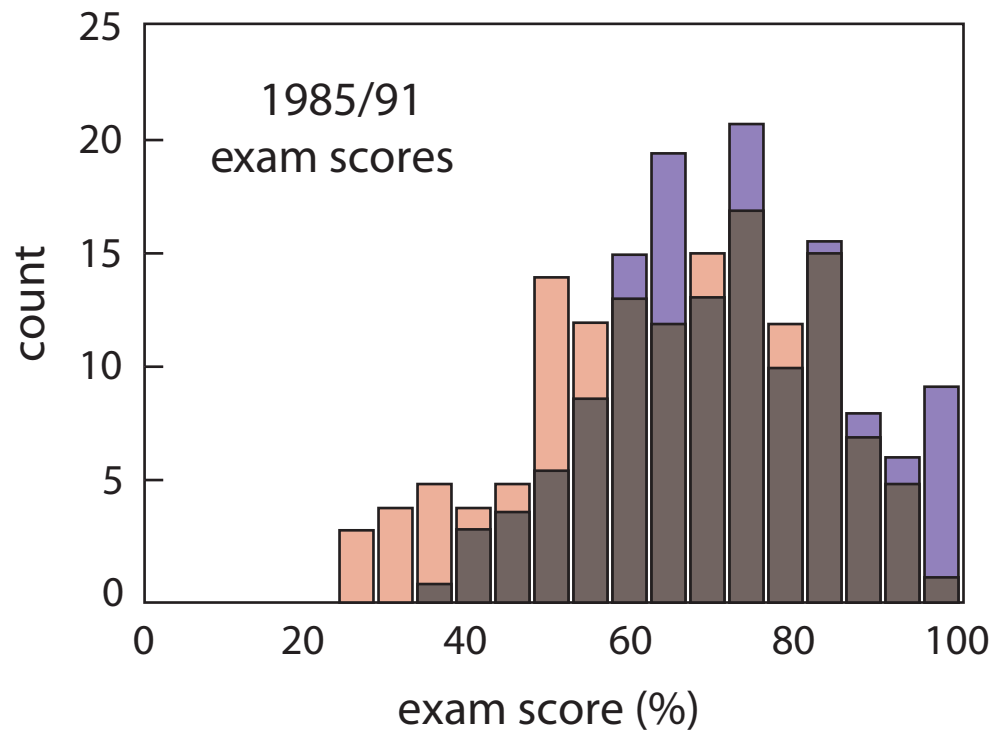
# Results



# 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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