

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



All Faculty Meeting  
University of Tulsa  
Tulsa, OK, 6 January 2011



# My message

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



# Outline

- Education



# Outline

- Education

- Peer Instruction



# Outline

- Education
- Peer Instruction
- Results



# Education



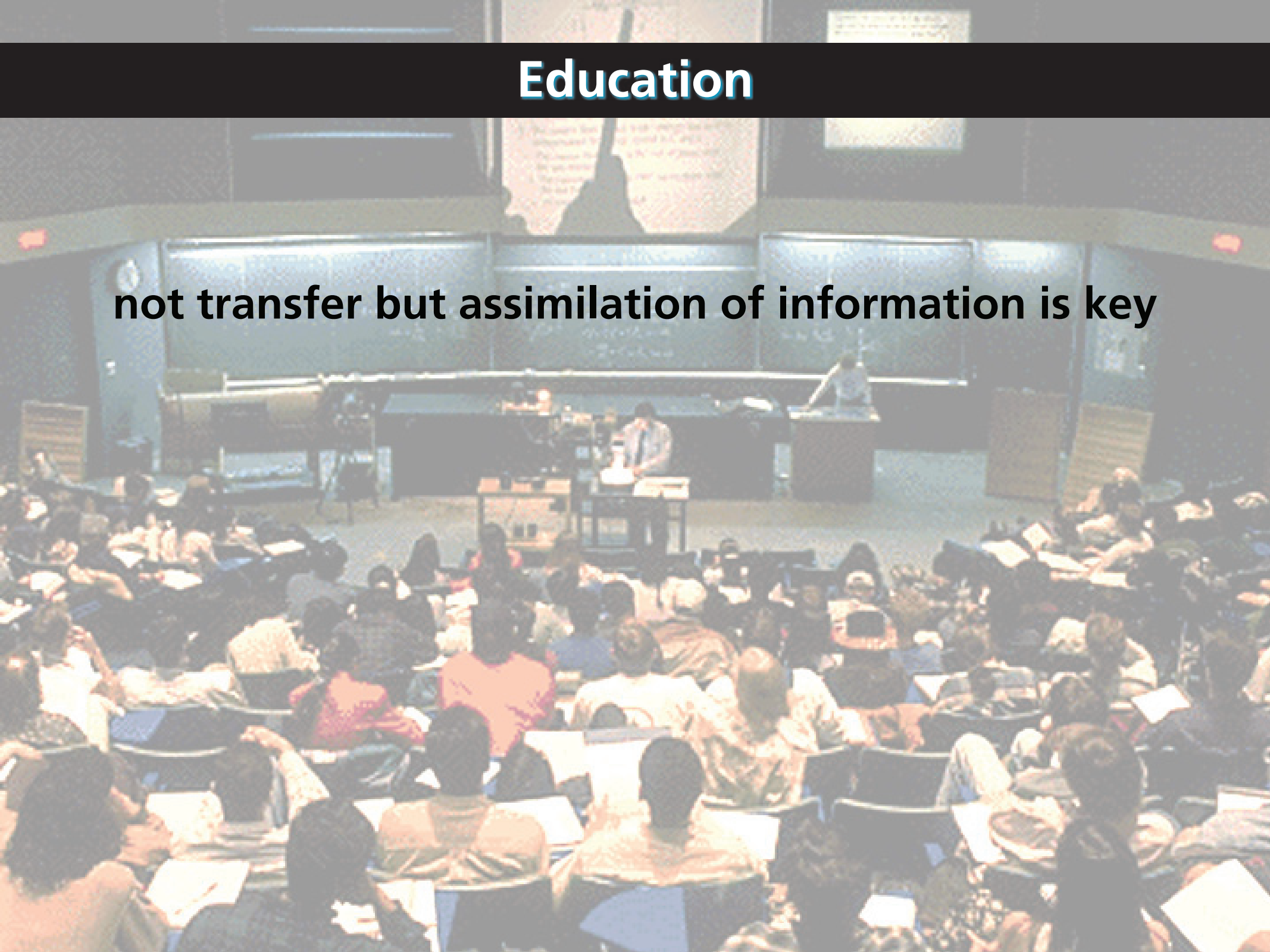
# Education

lectures focus on delivery of information

A wide-angle photograph of a large lecture hall. A lecturer stands at a podium on a raised platform at the front of the room, facing a large audience of students seated in rows of desks. The room features a large screen at the front displaying text and a chalkboard. The lighting is dim, with the main focus on the lecturer and the front of the stage.

# Education

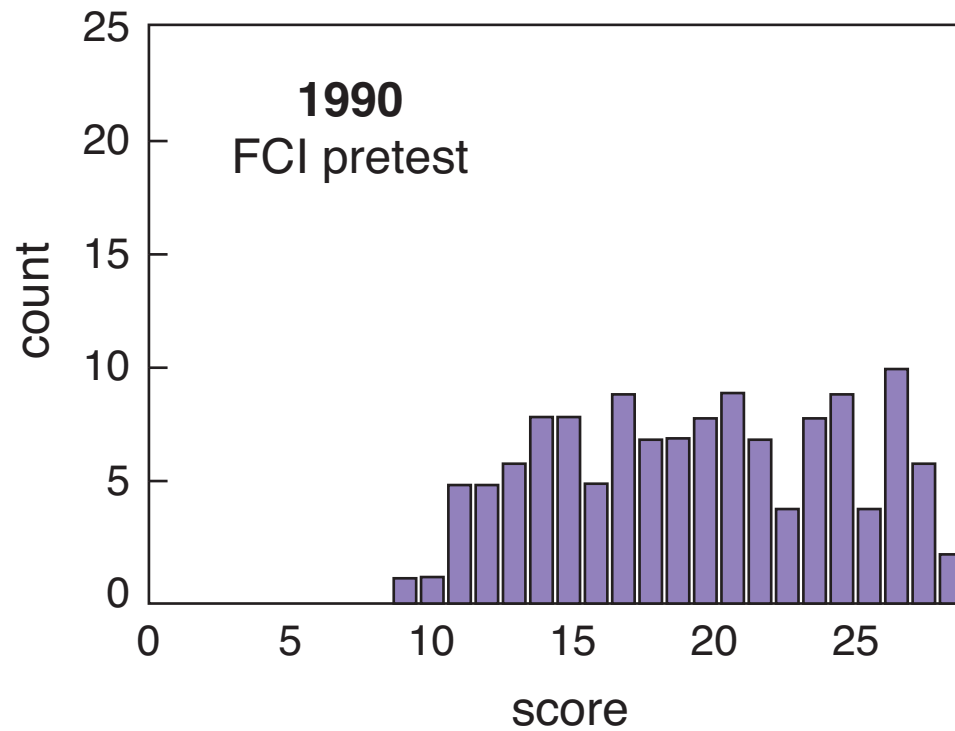
**not transfer but assimilation of information is key**





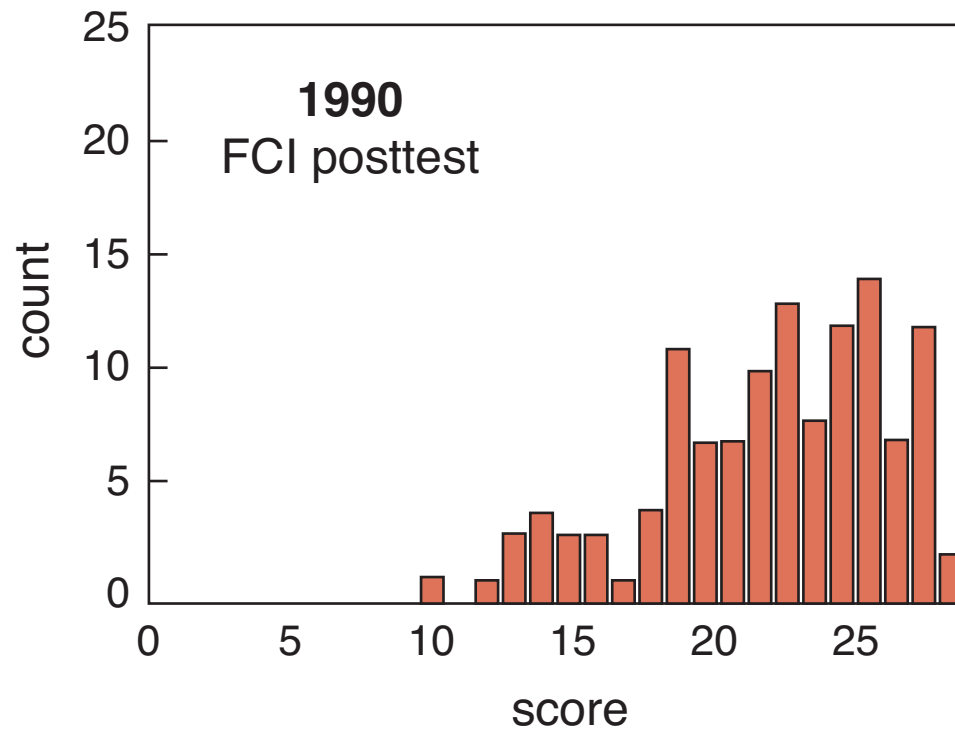
# Education

education is not just information transfer



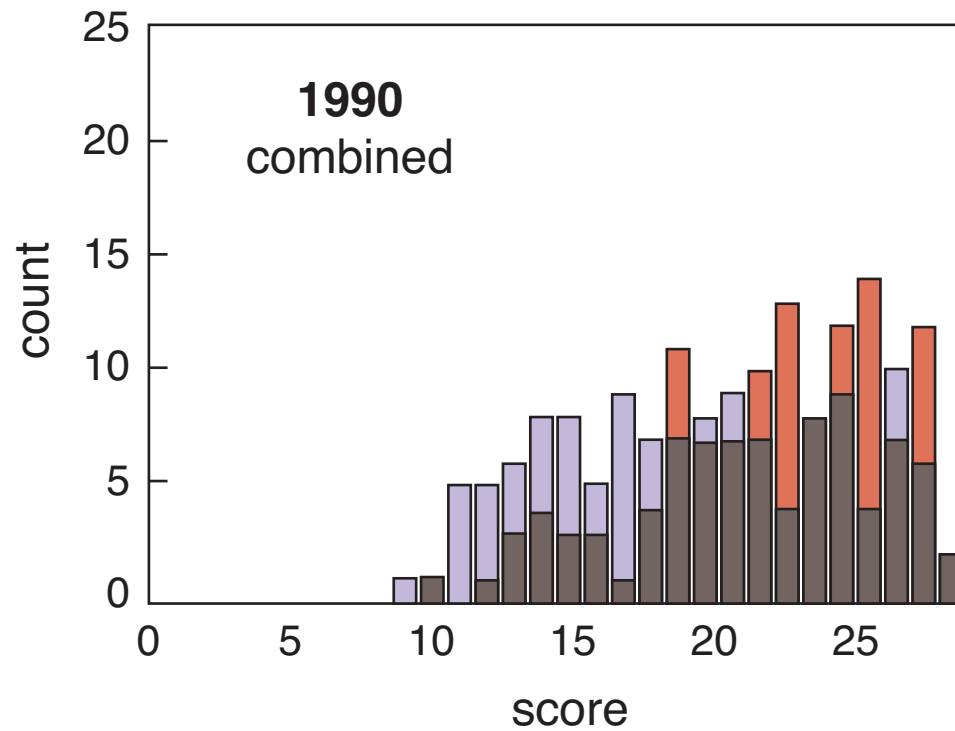
# Education

education is not just information transfer

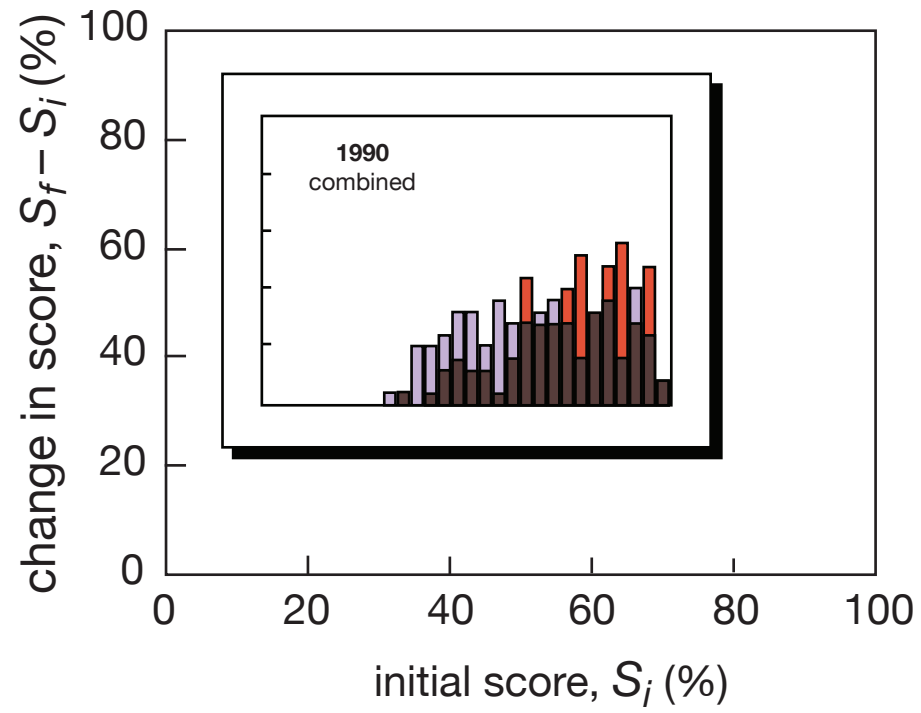


# Education

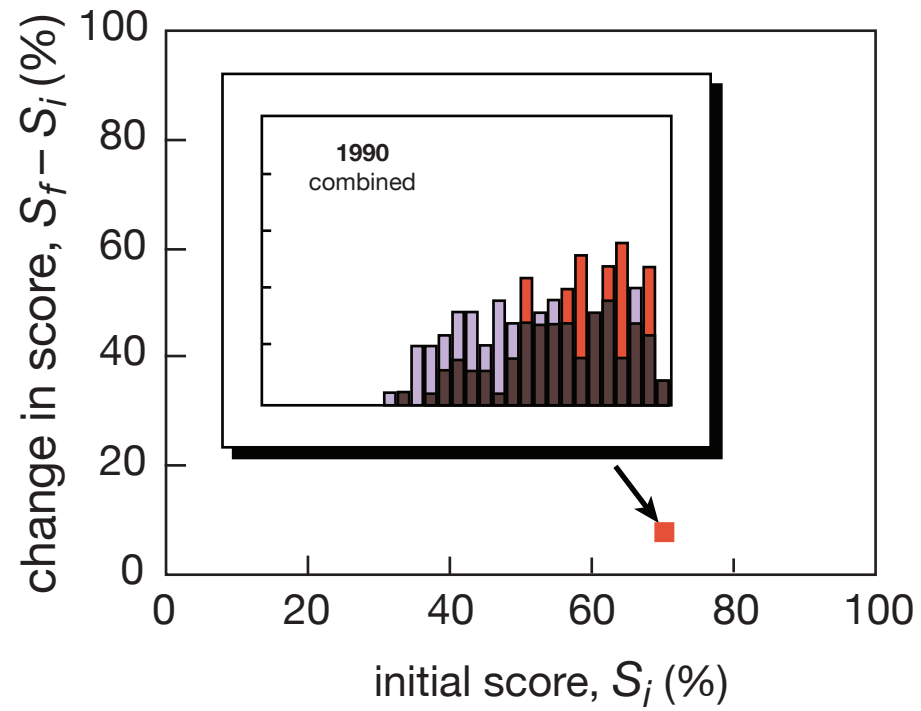
education is not just information transfer



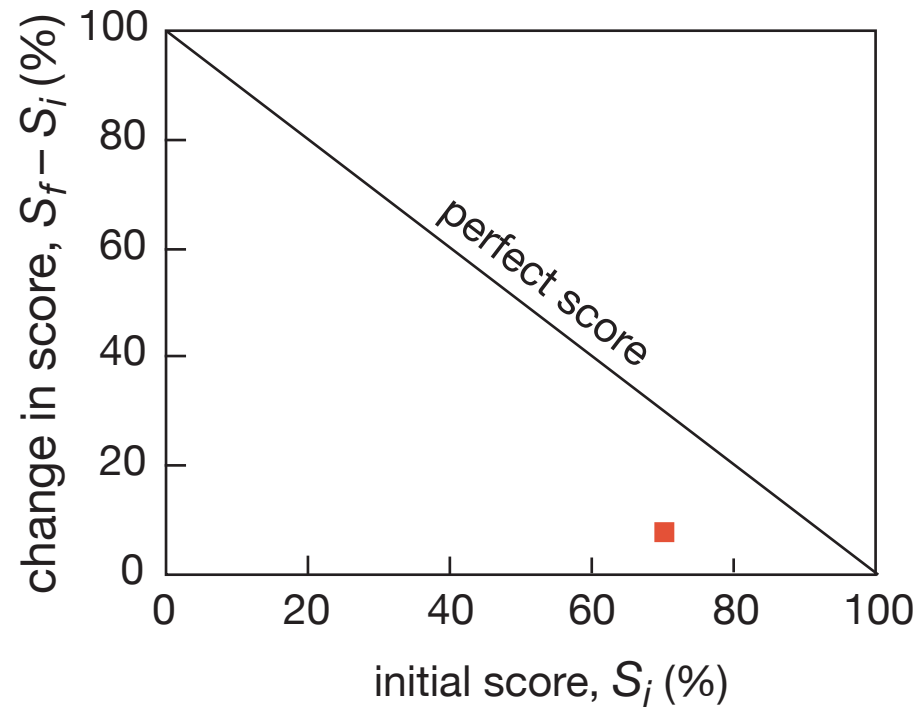
# Education



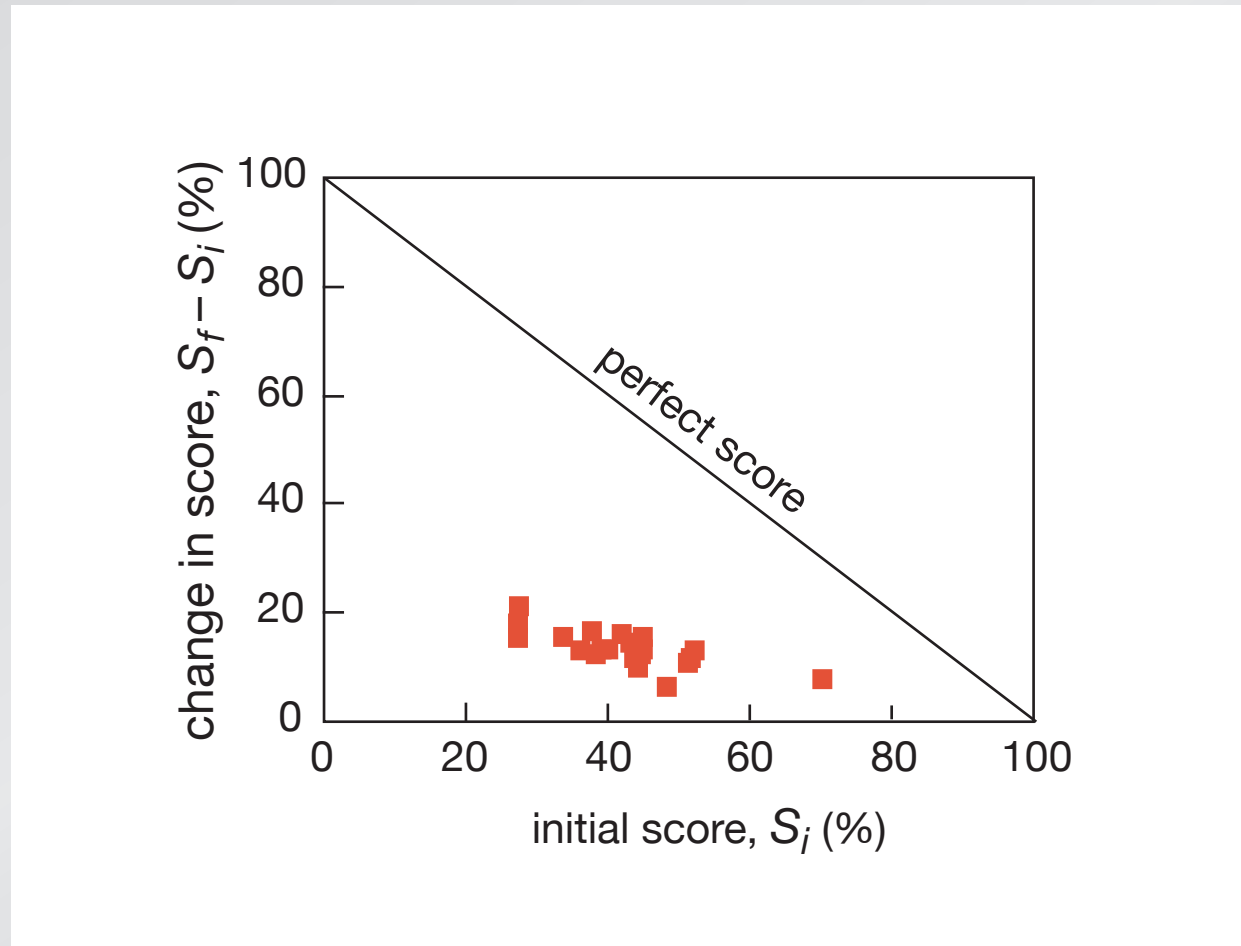
# Education



# Education

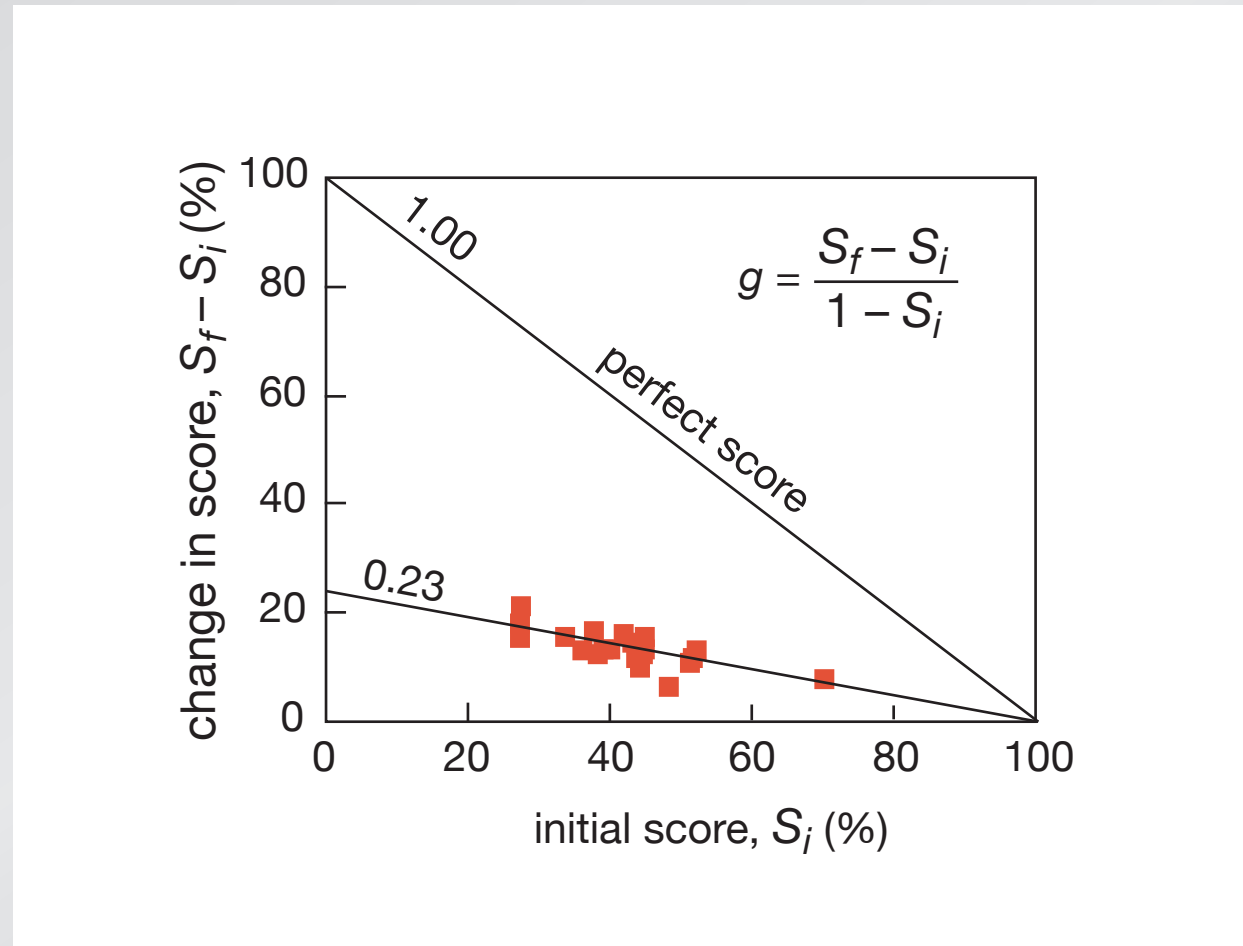


# Education



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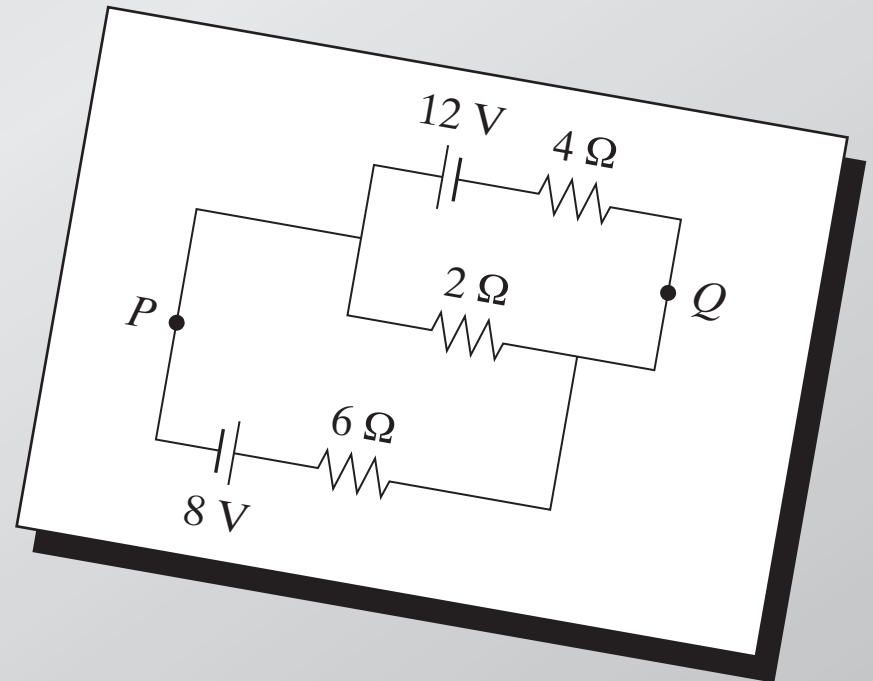
only one quarter of maximum gain realized





# Education

conventional problems misleading



# Education

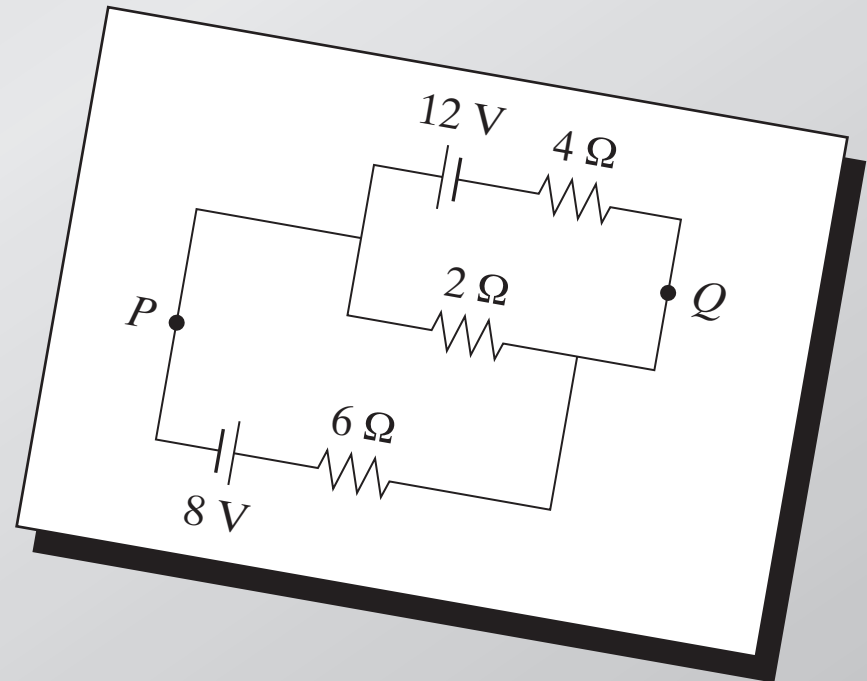
conventional problems misleading

Calculate:

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

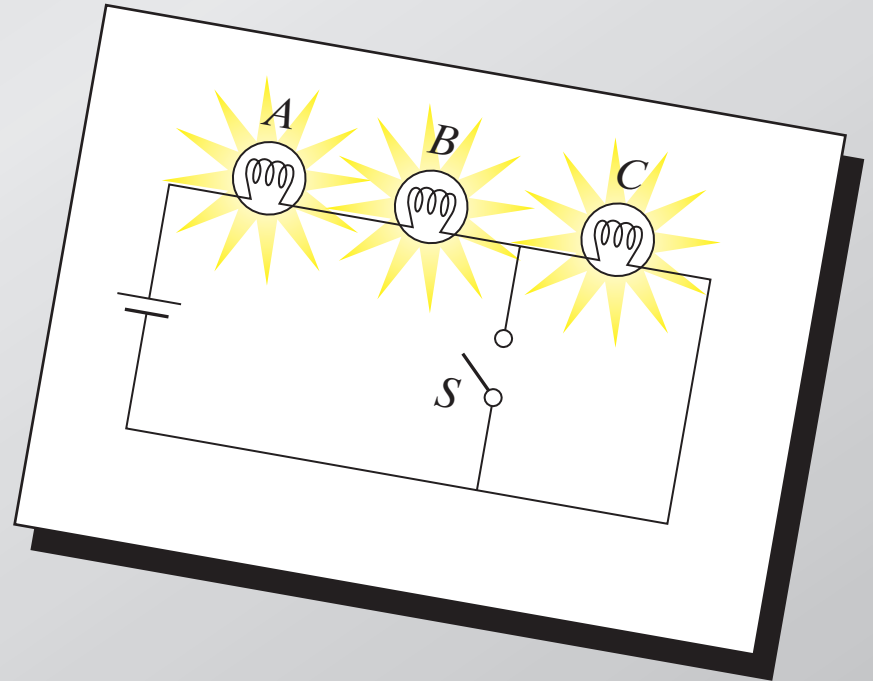
(b) potential difference

between  $P$  and  $Q$



# Education

are the basic principles understood?

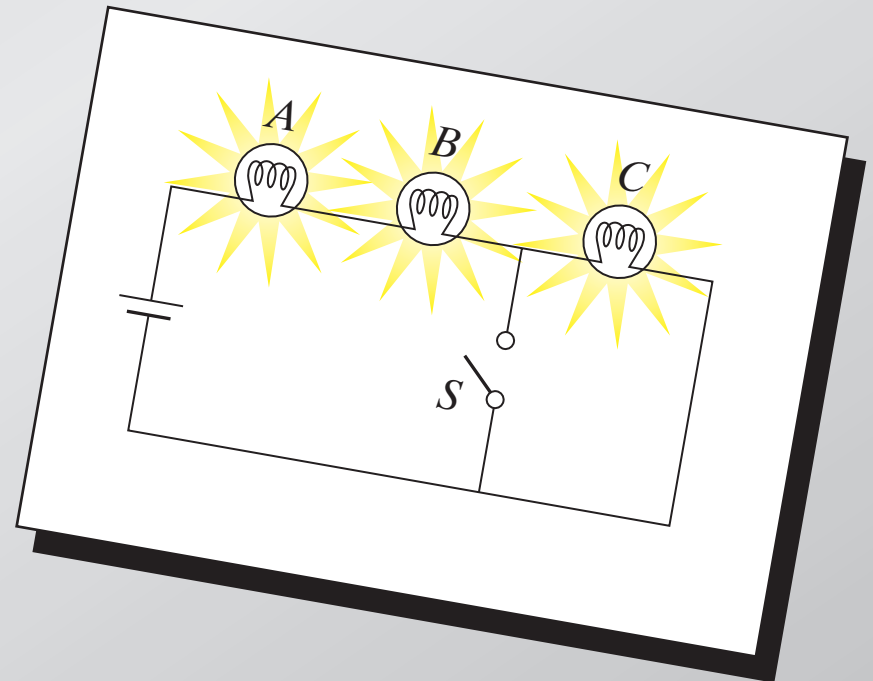


# Education

are the basic principles understood?

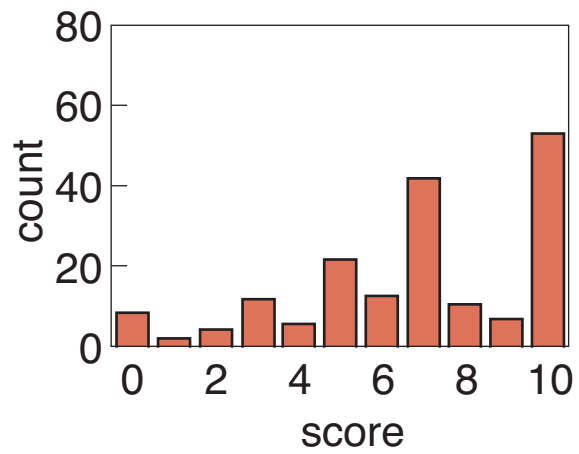
When  $S$  is closed, what happens to:

- (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?

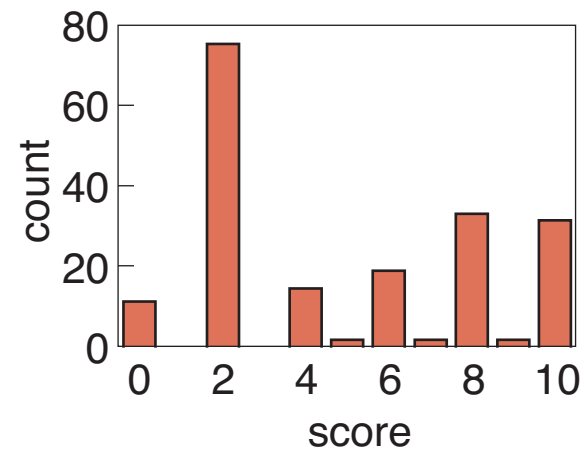


# Education

## conventional

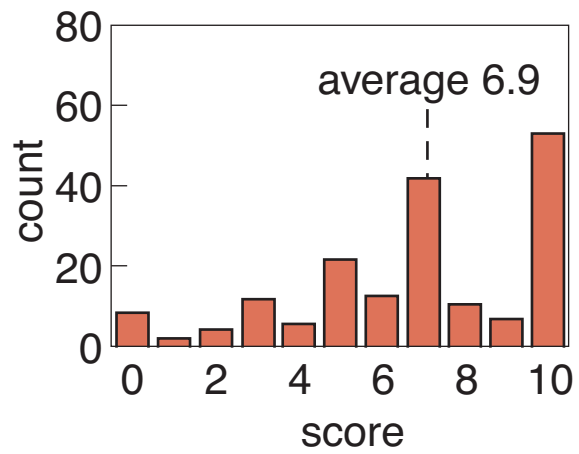


## conceptual

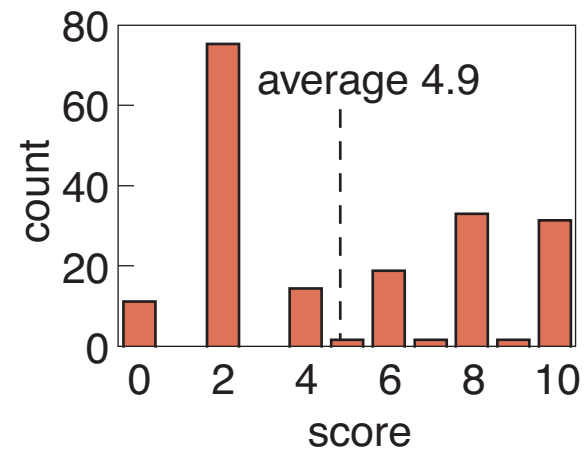


# Education

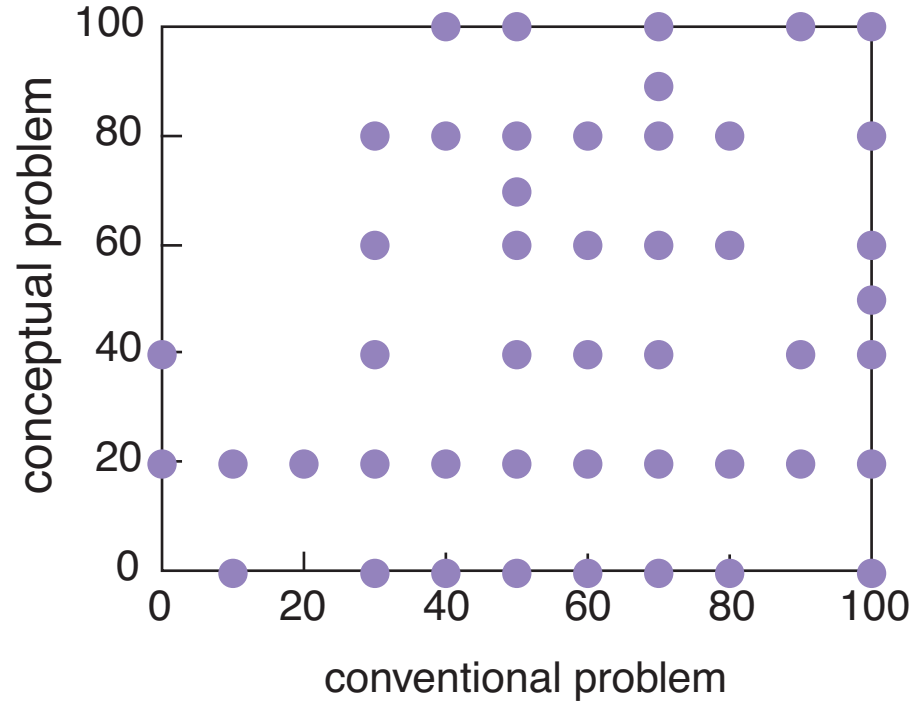
## conventional



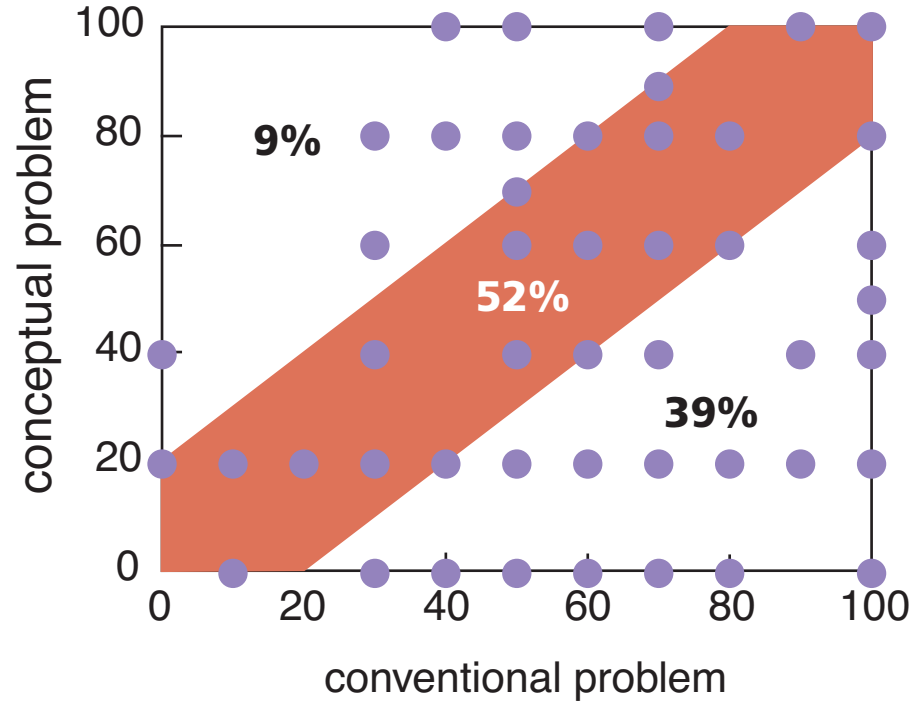
## conceptual



# Education



# Education





A large lecture hall with students seated at desks, facing a stage with a lecturer and a large screen displaying text. The text on the screen is partially legible and appears to be a list or a set of instructions. The room is dimly lit, with the main light source coming from the stage area.

So what should we do?

# Peer Instruction

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

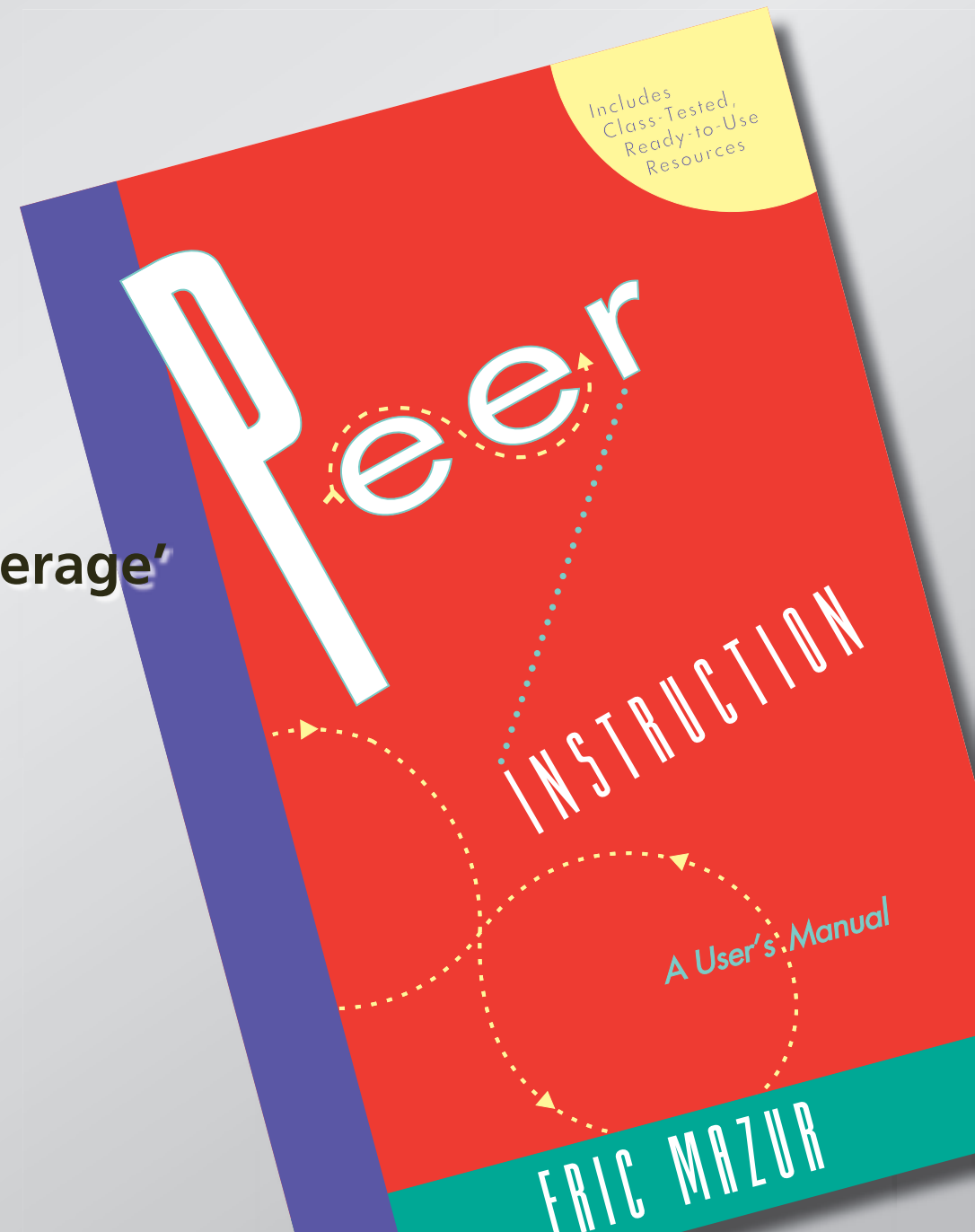
# Peer Instruction

**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**

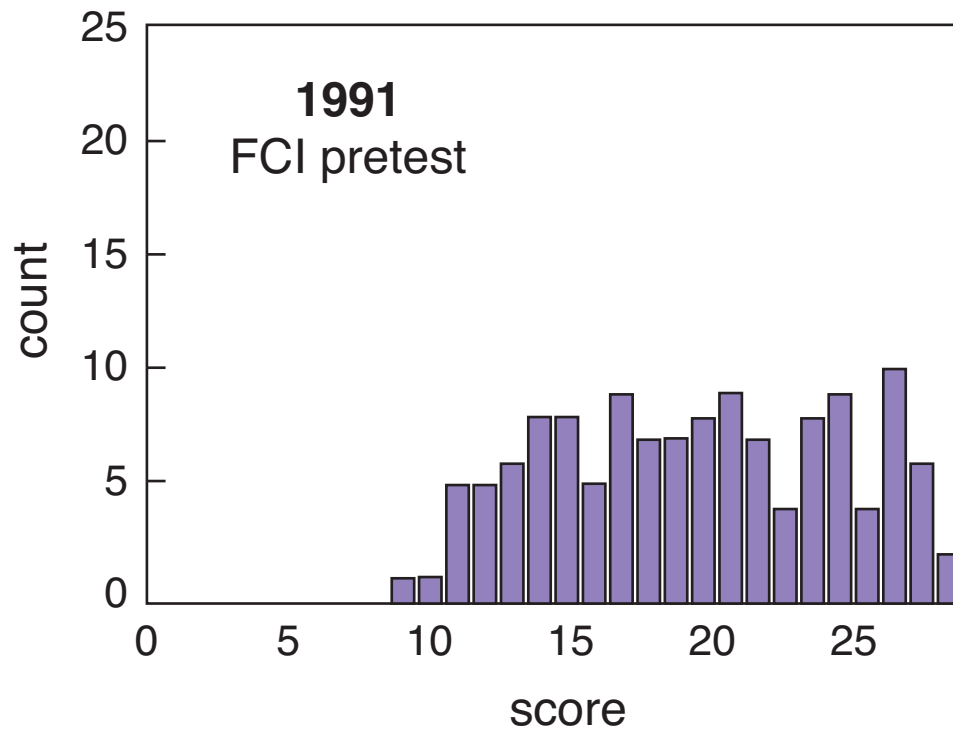


# Results

**is it any good?**

# Results

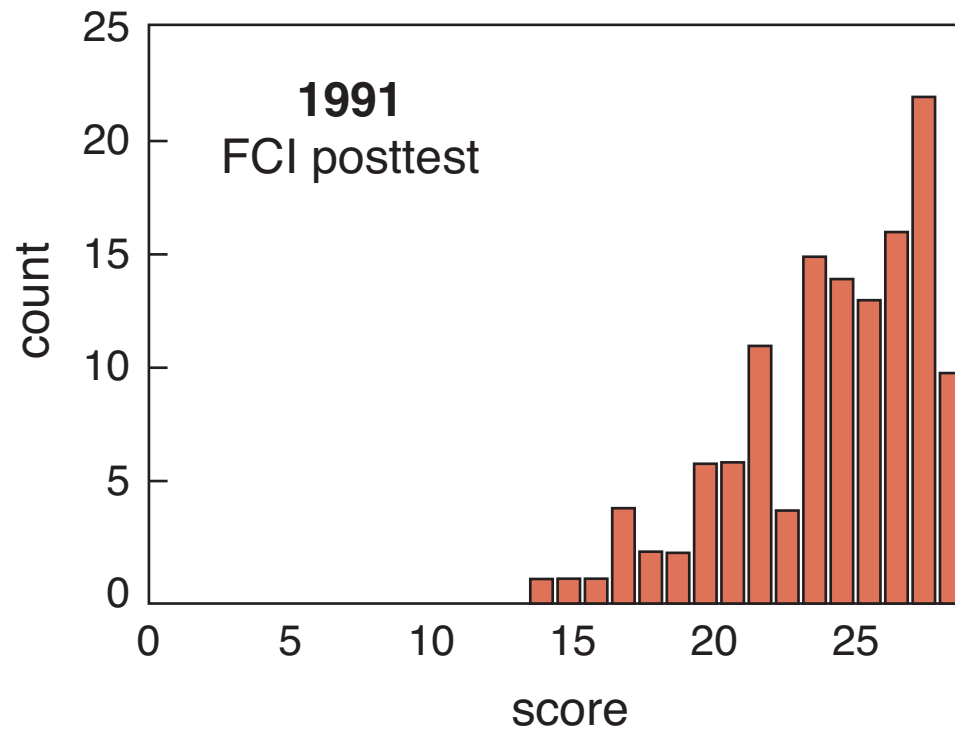
## first year of implementing PI





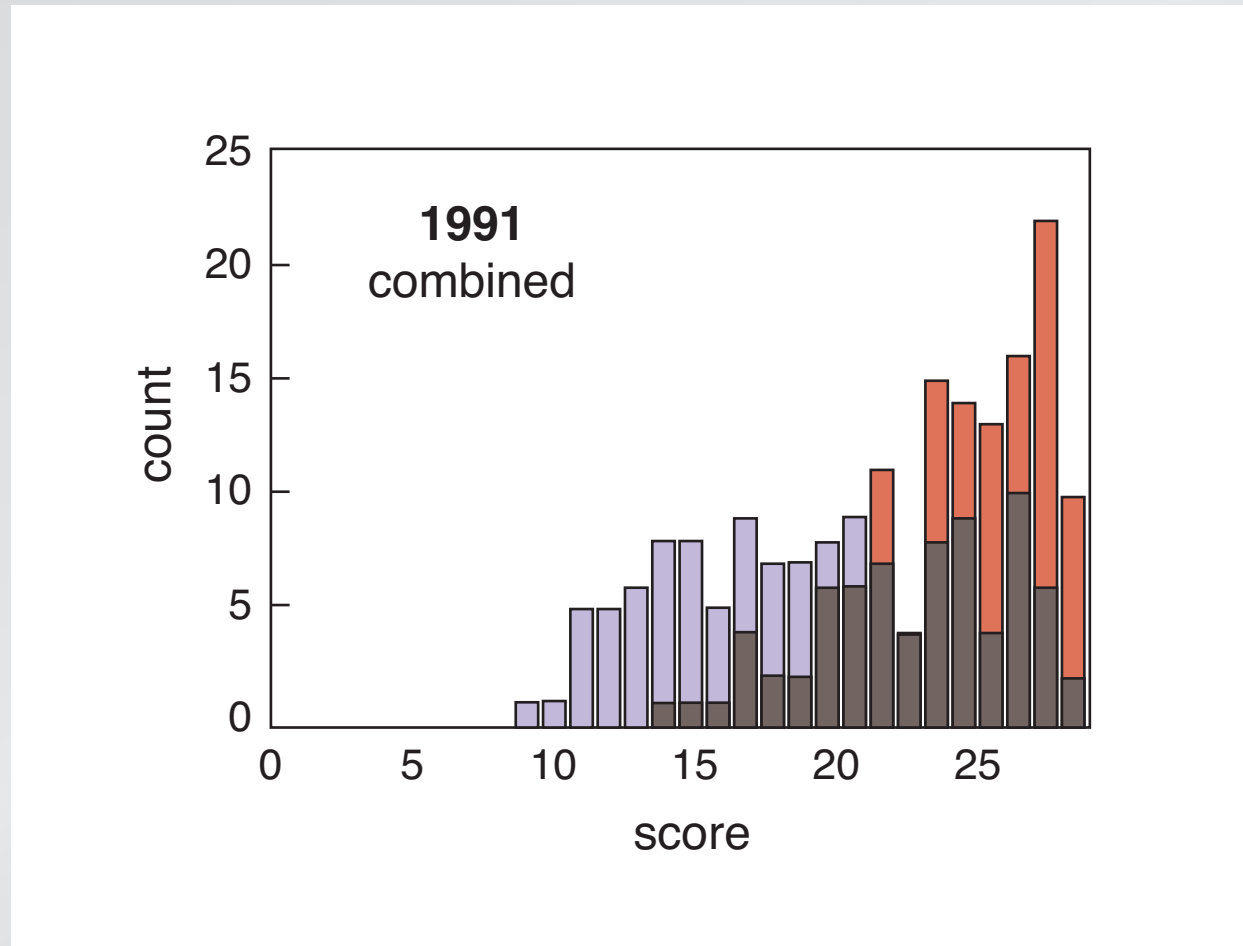
# Results

first year of implementing PI

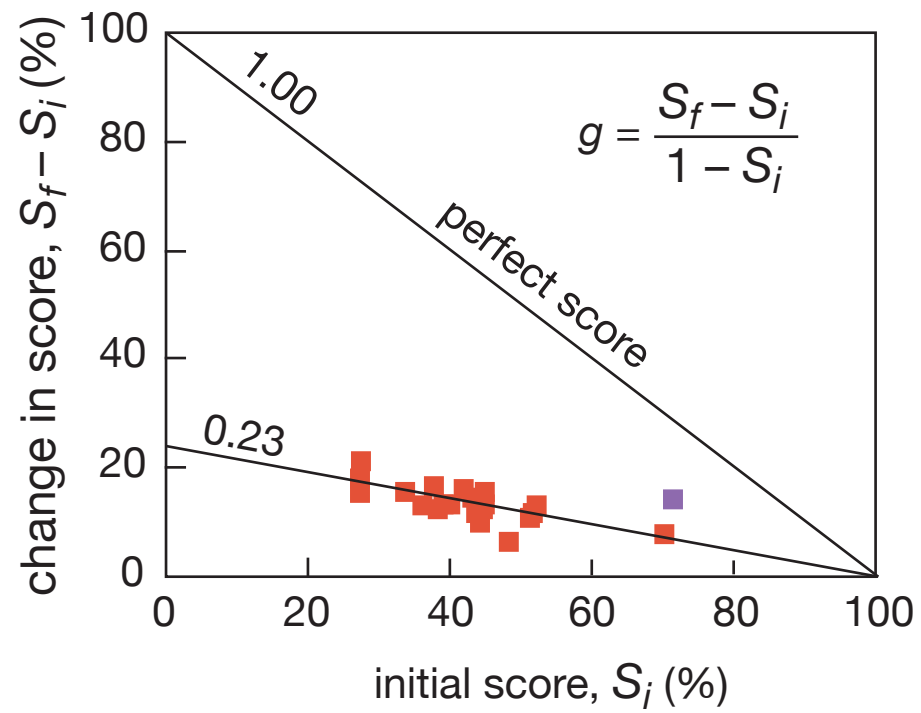


# Results

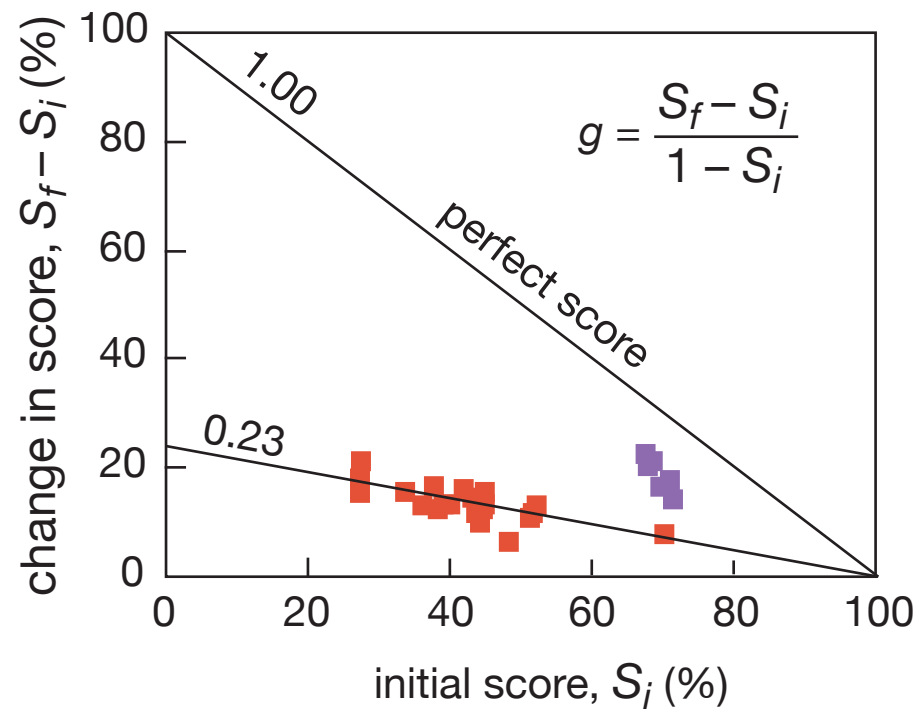
## first year of implementing PI



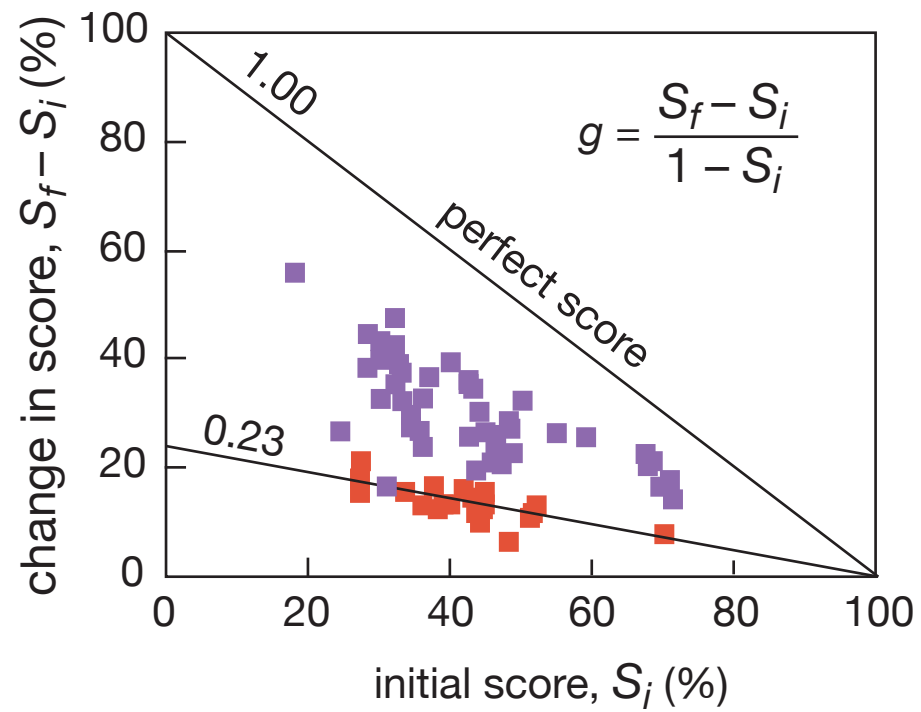
# Results



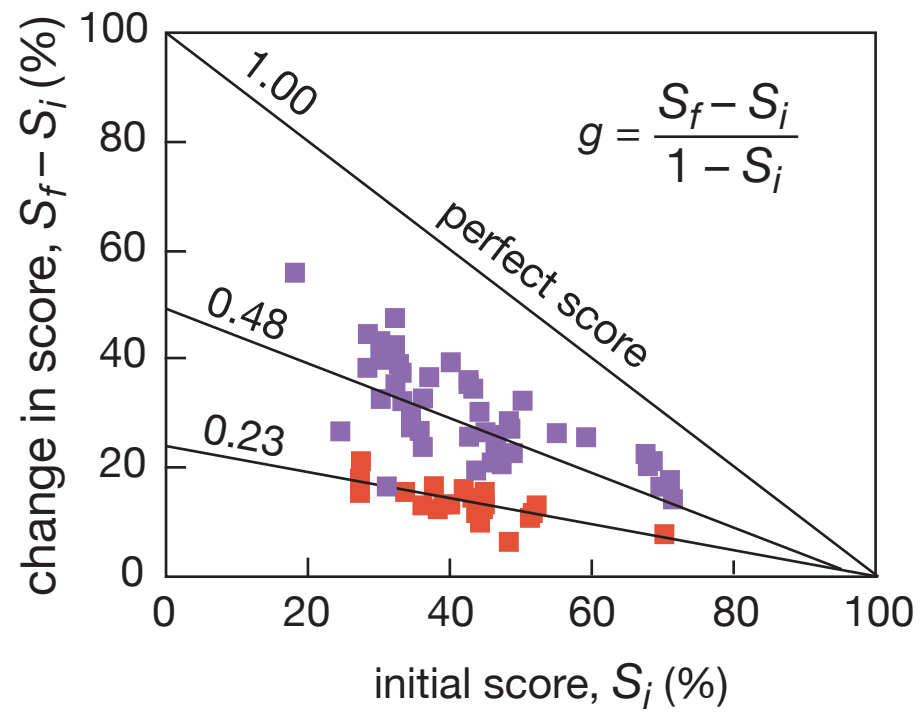
# Results



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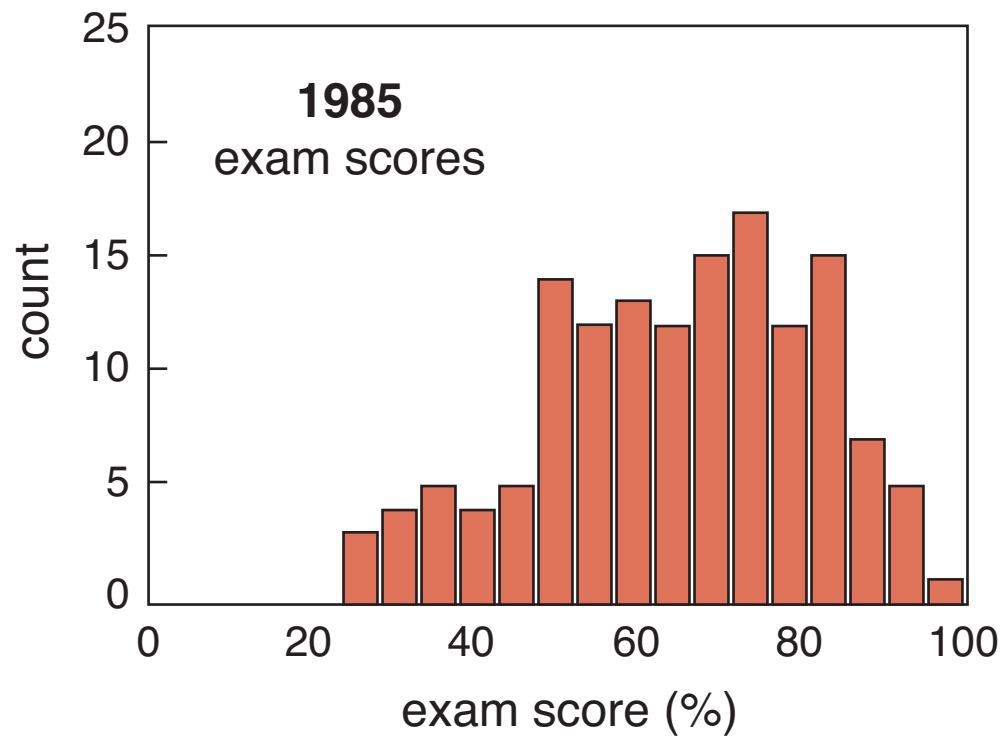
# Results



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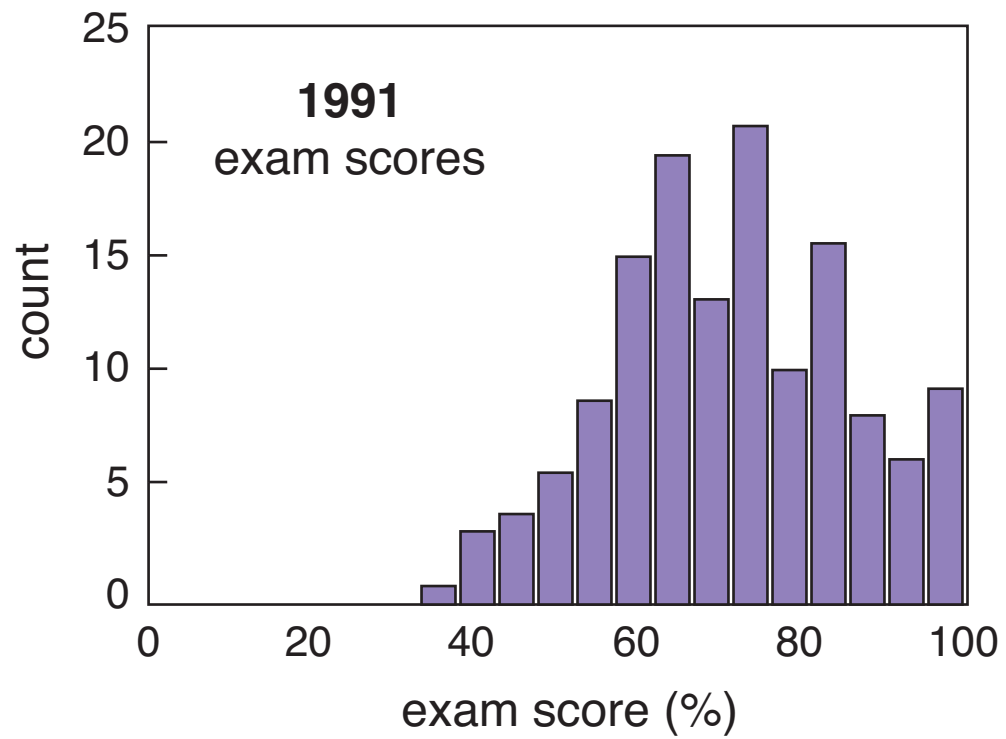
**what about problem solving?**

# Results

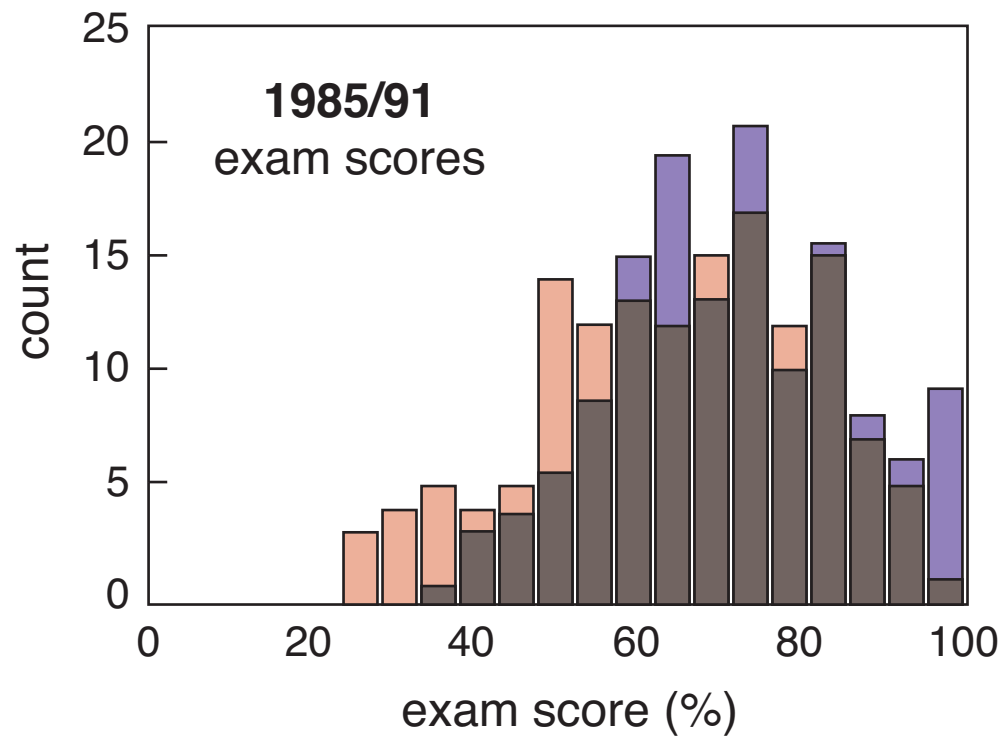




# Results



# Results



# Conclusion

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

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



# Summary

**Traditional indicators of success misleading**

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**Traditional indicators of success misleading**

**Education is no longer about information**

**Funding:**

**National Science Foundation**

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