

Active learning

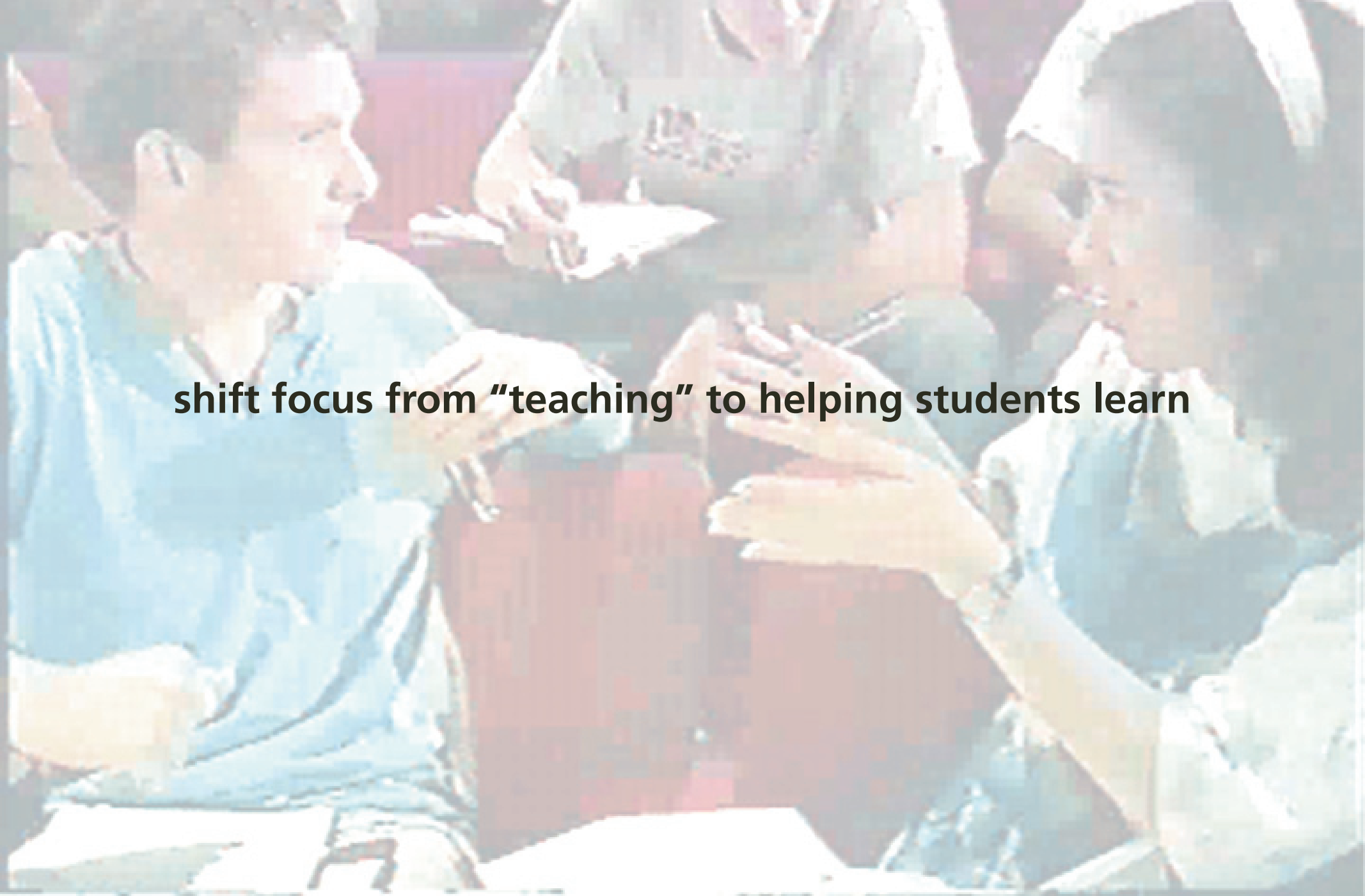


IDEA league workshop on
Excellence in Engineering Education, TU Delft
Delft, Netherlands 3 November 2011



My message

shift focus from “teaching” to helping students learn



Outline

- Education



Outline

- Education
- Peer Instruction



Outline

- Education
- Peer Instruction
- Results

Education



Learning spaces



Learning spaces

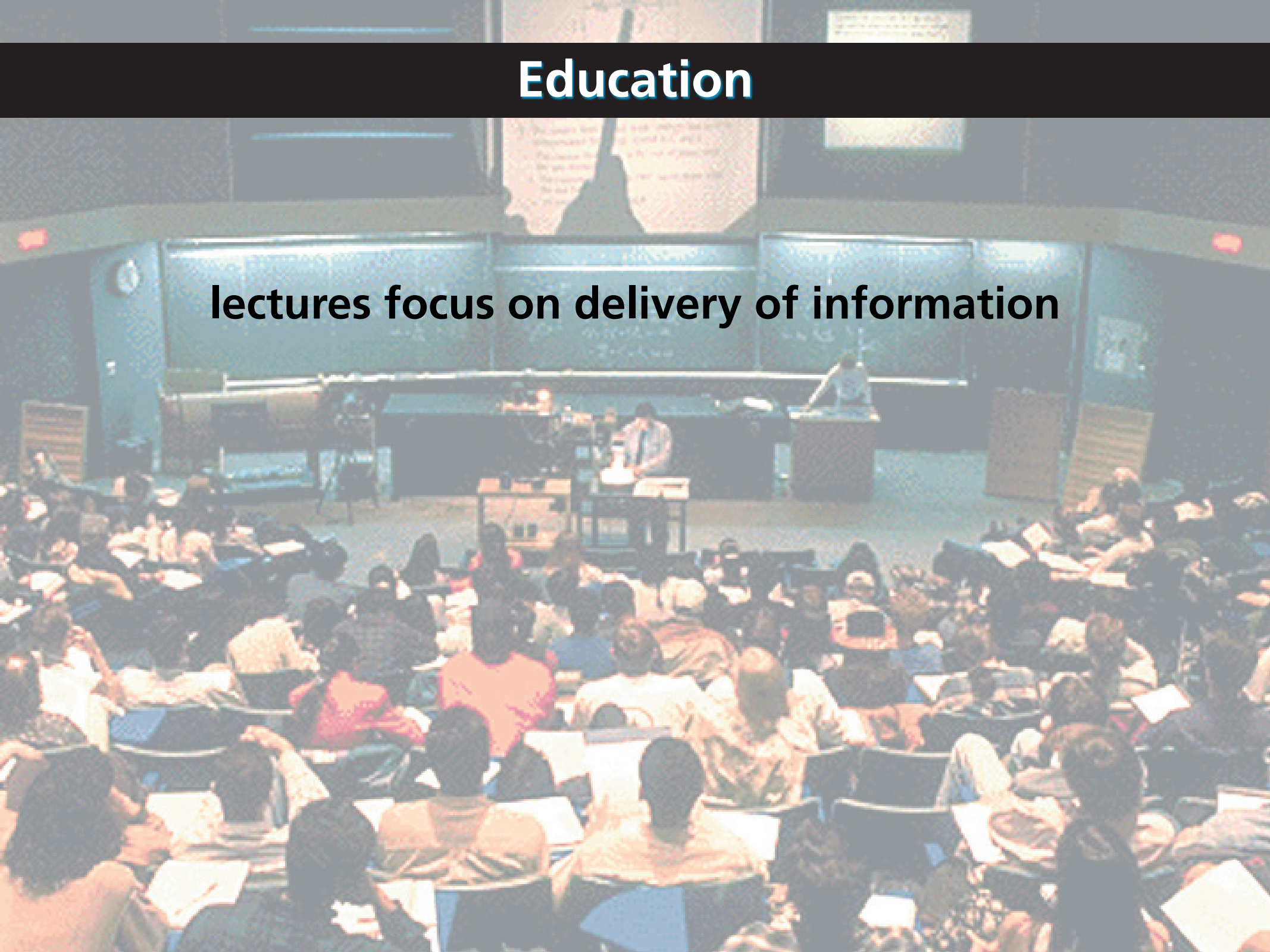


Learning spaces



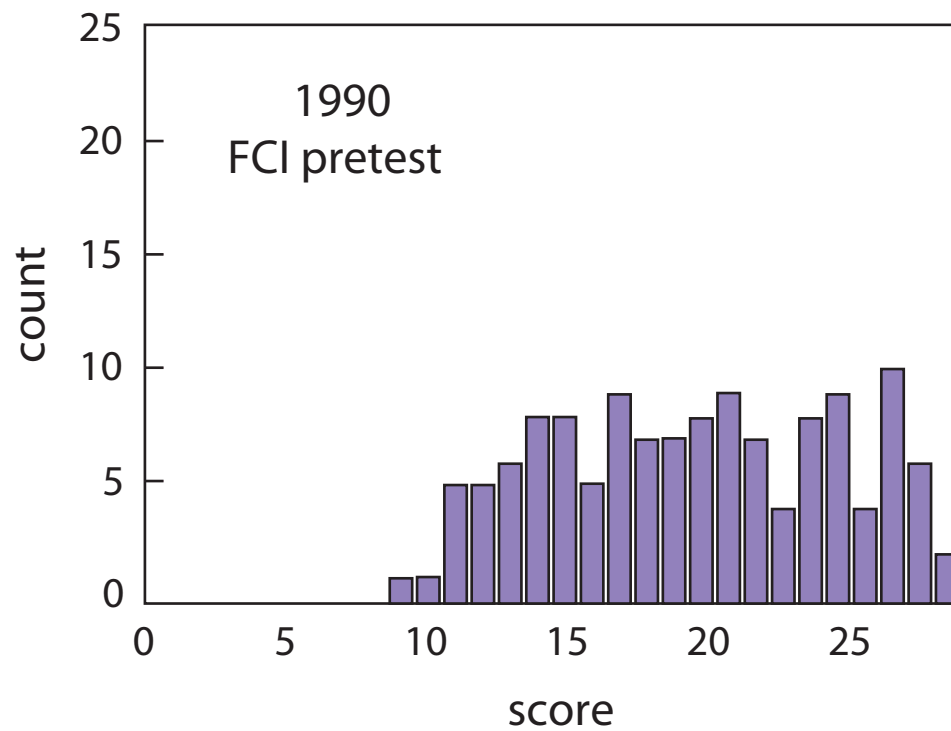
Education

lectures focus on delivery of information



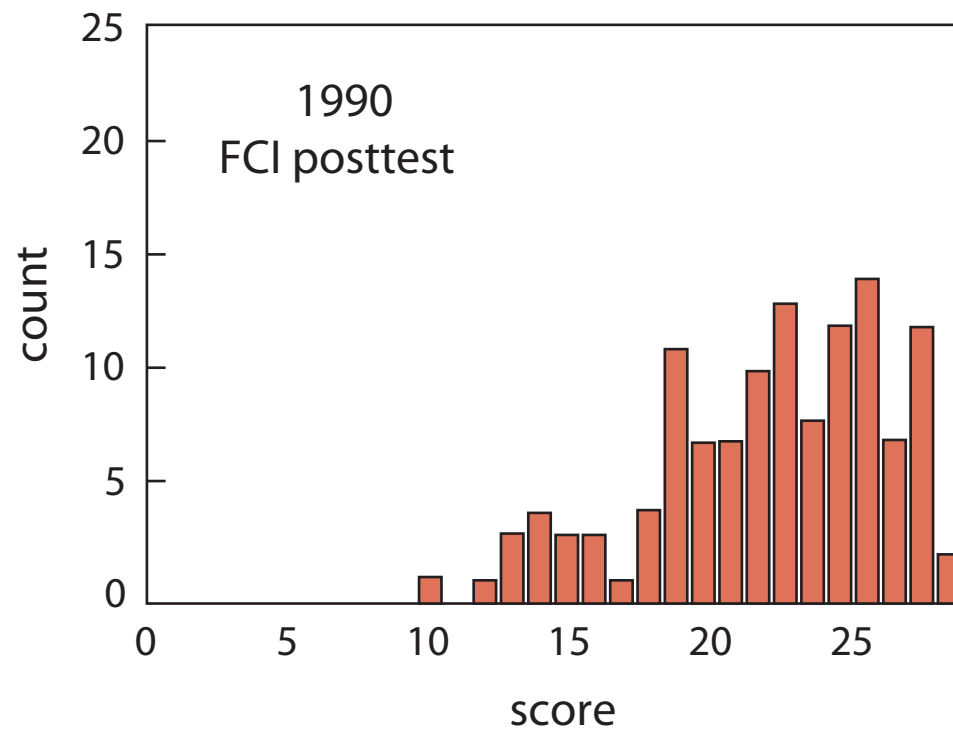
Education

education is not just information transfer



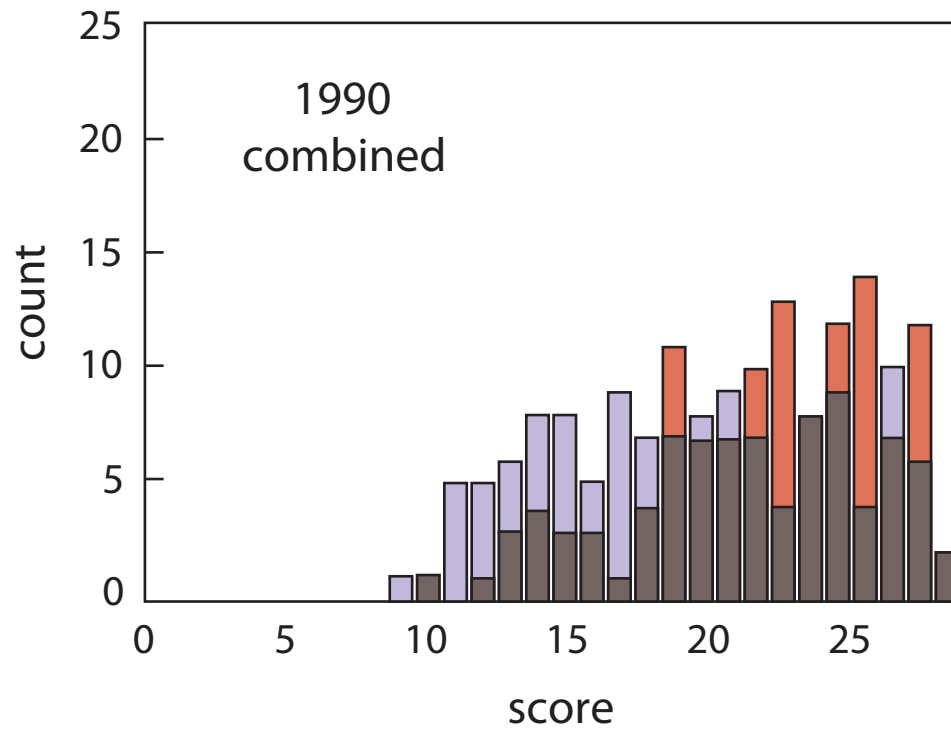
Education

education is not just information transfer

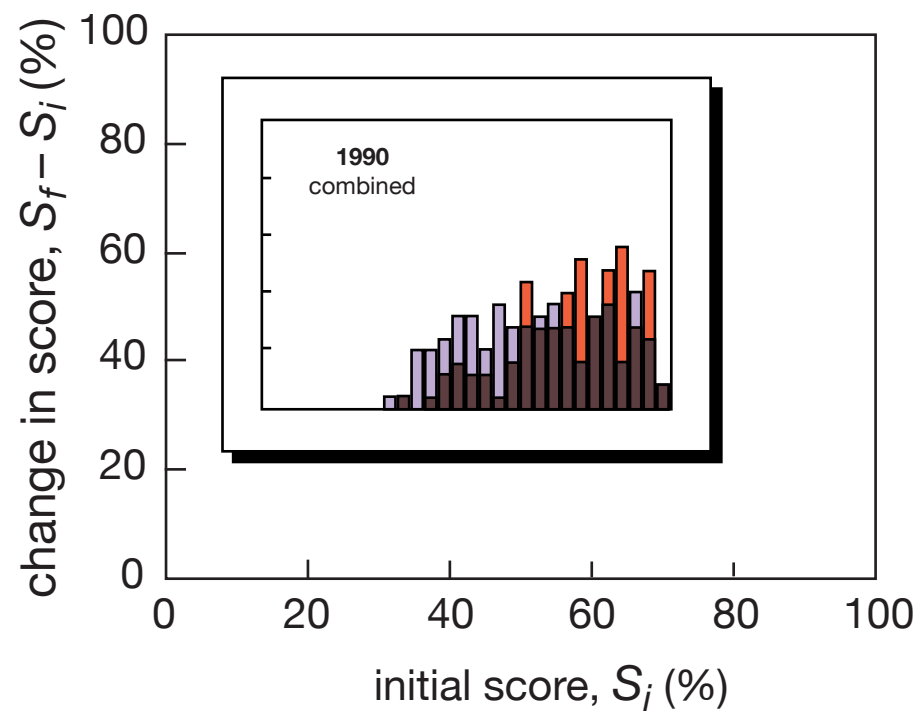


Education

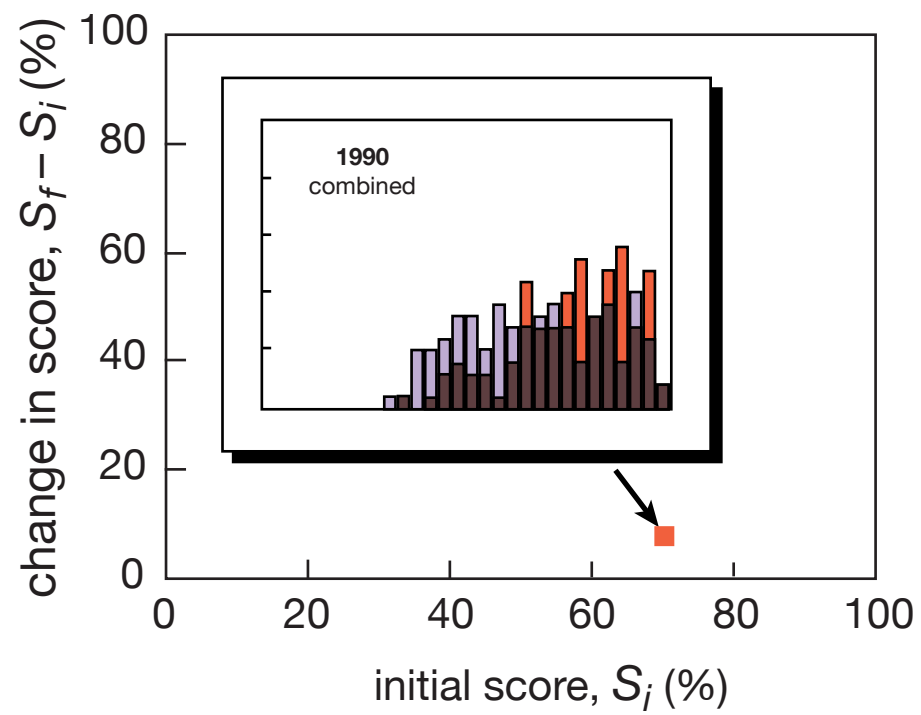
education is not just information transfer



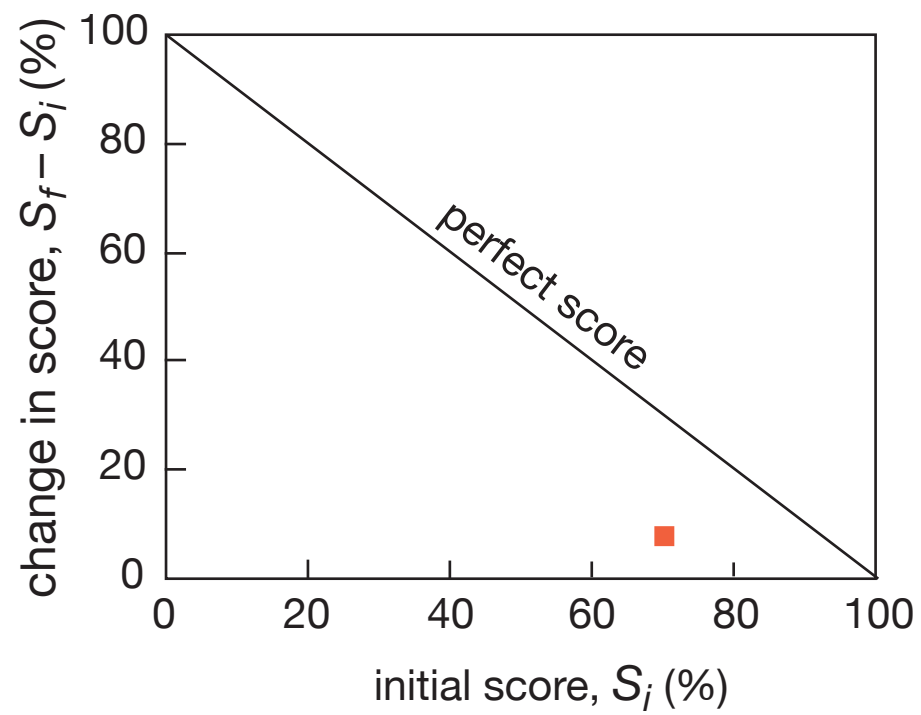
Education



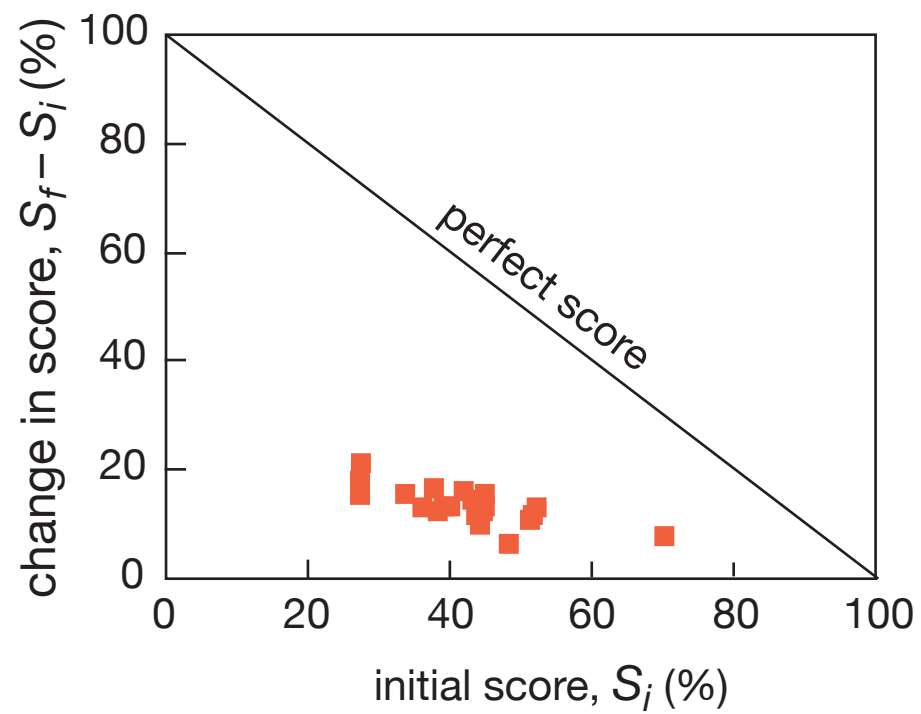
Education



Education



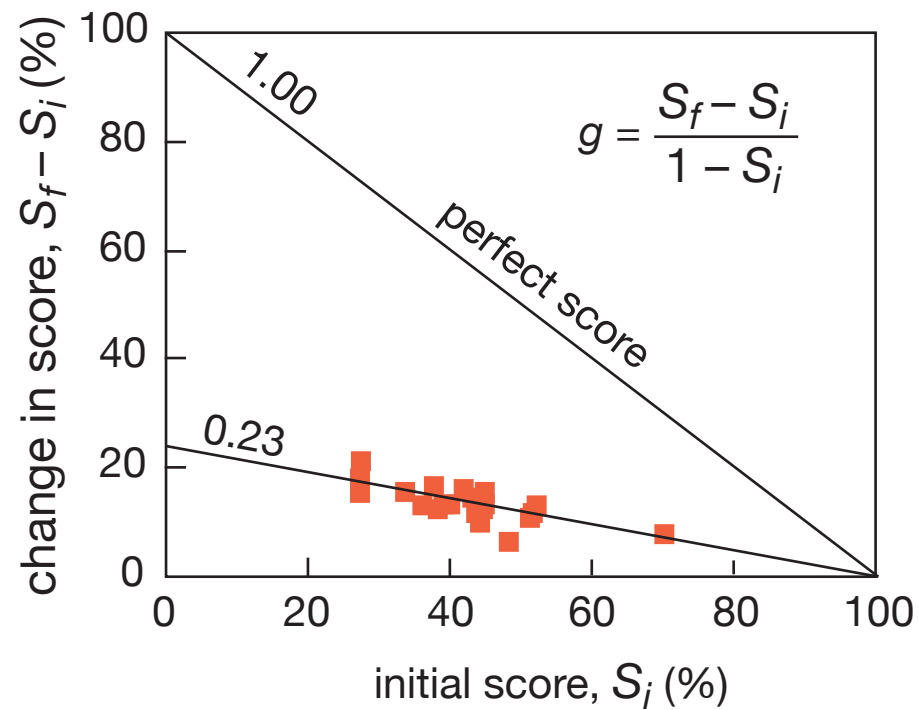
Education



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

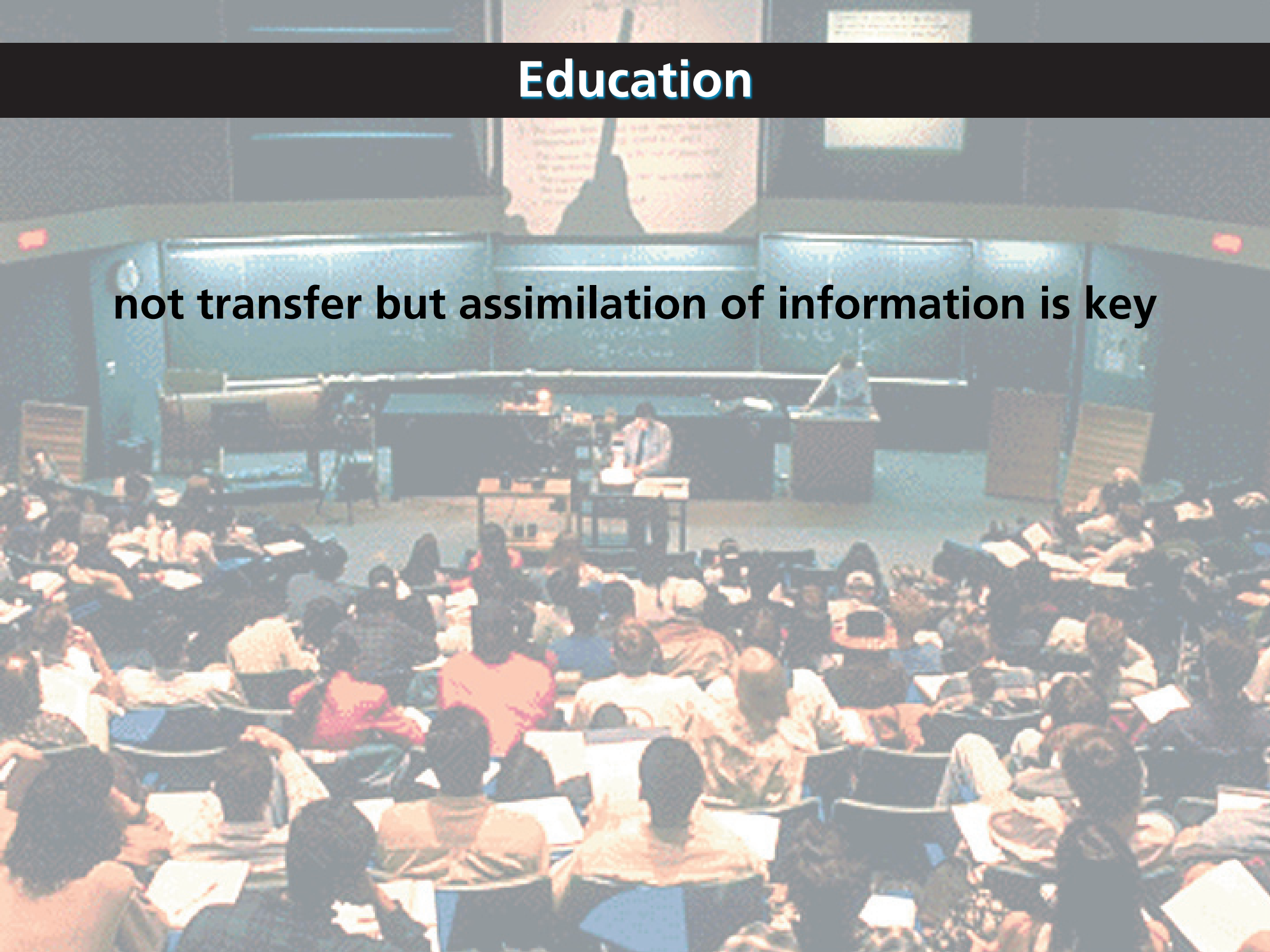
Education

only one quarter of maximum gain realized



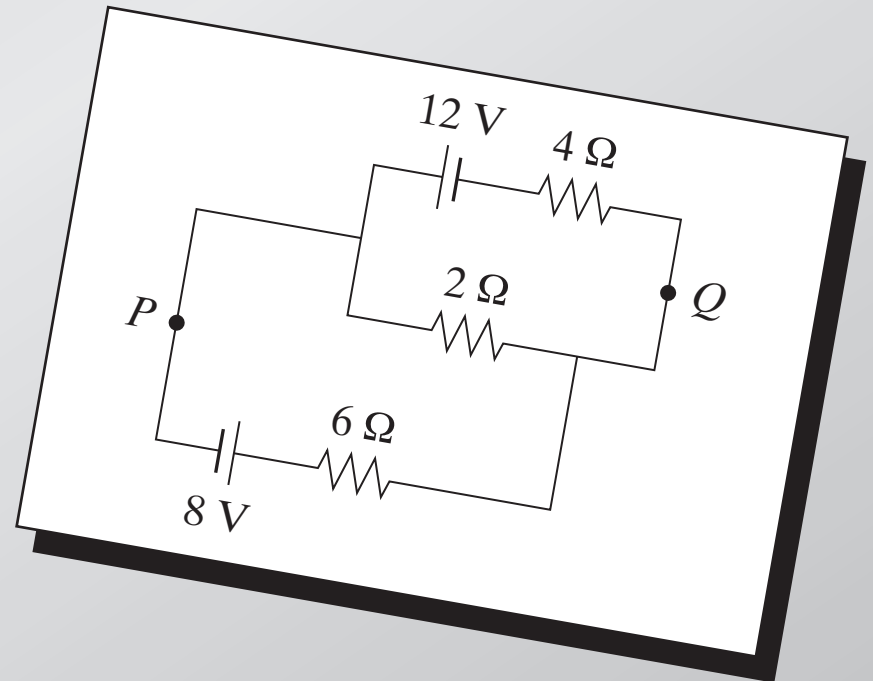
Education

not transfer but assimilation of information is key



Education

conventional problems misleading



Education

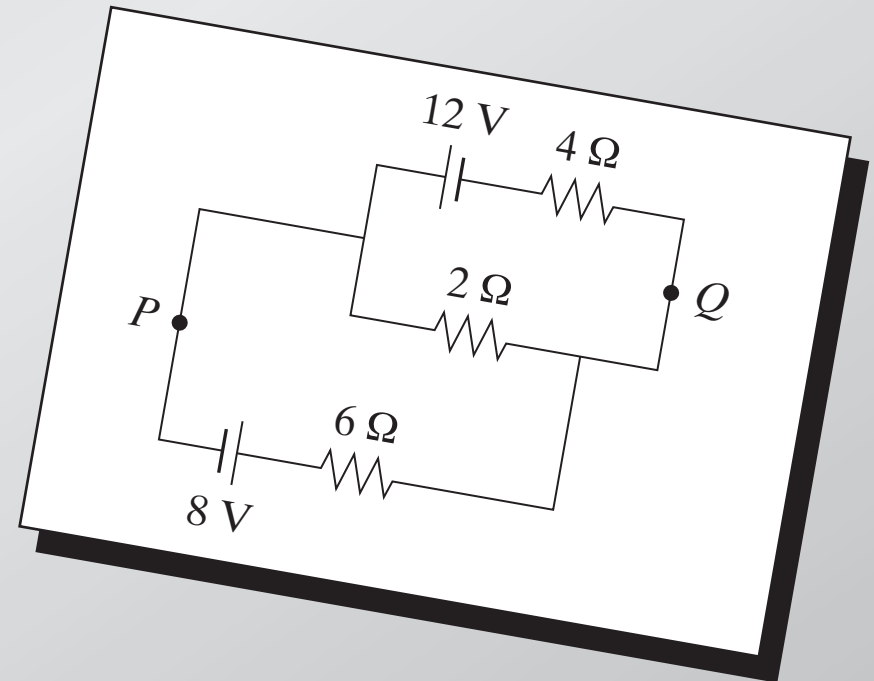
conventional problems misleading

Calculate:

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

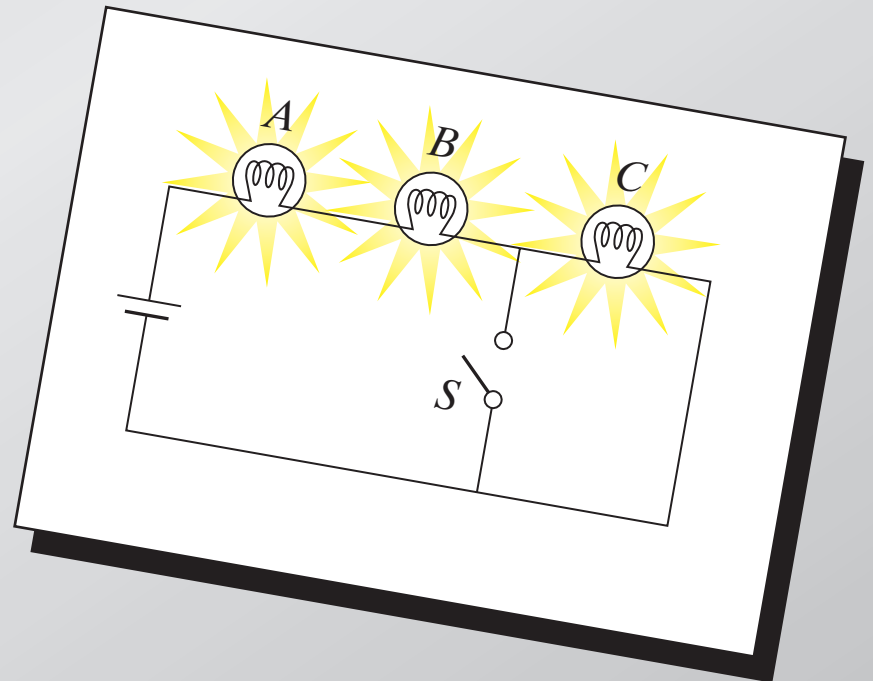
(b) potential difference

between P and Q



Education

are the basic principles understood?

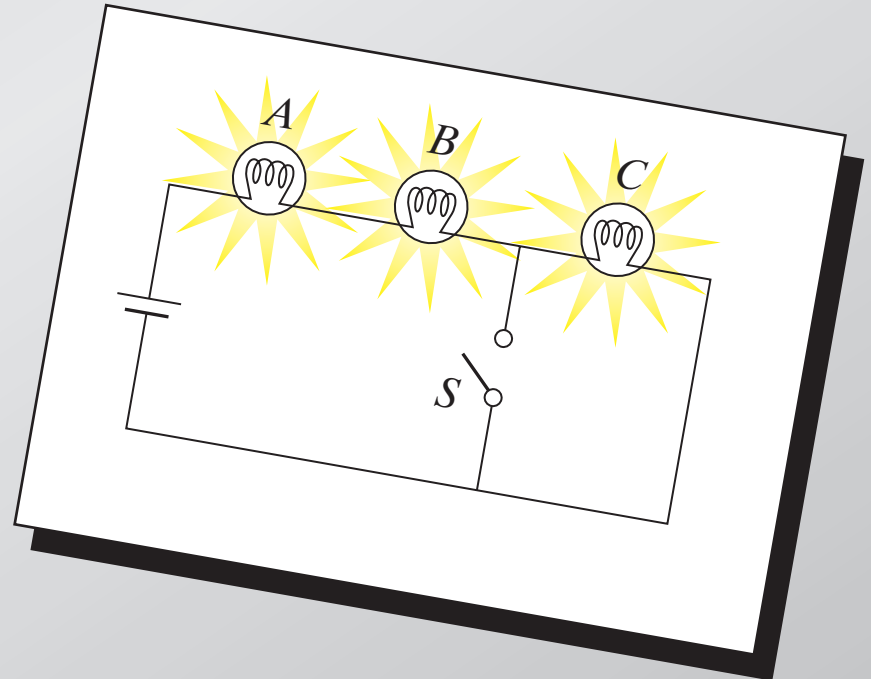


Education

are the basic principles understood?

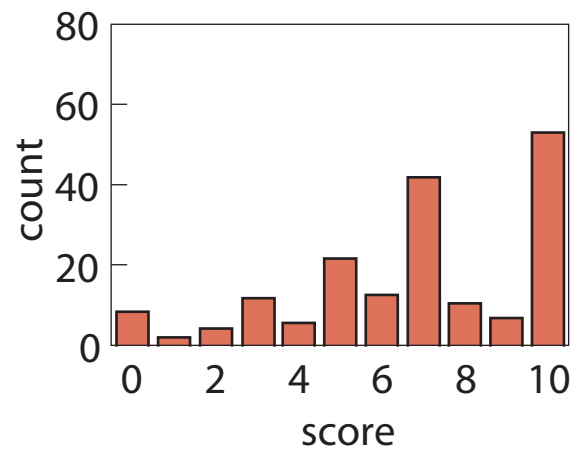
When S is closed, what happens to:

- (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?

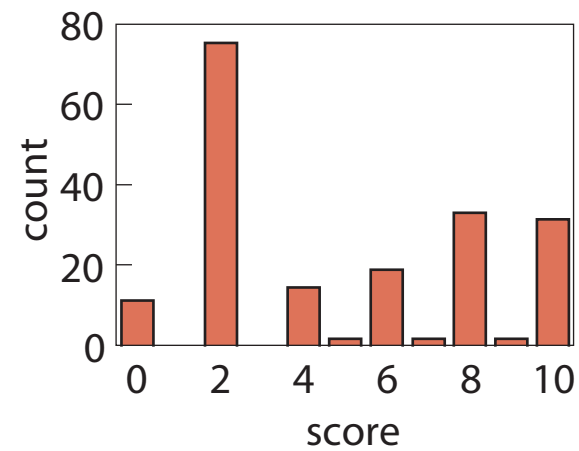


Education

conventional

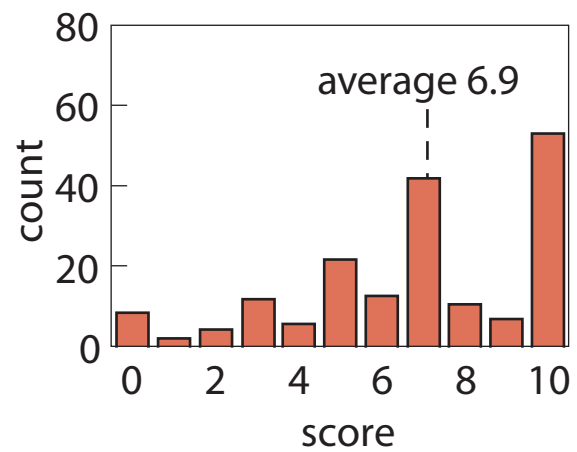


conceptual

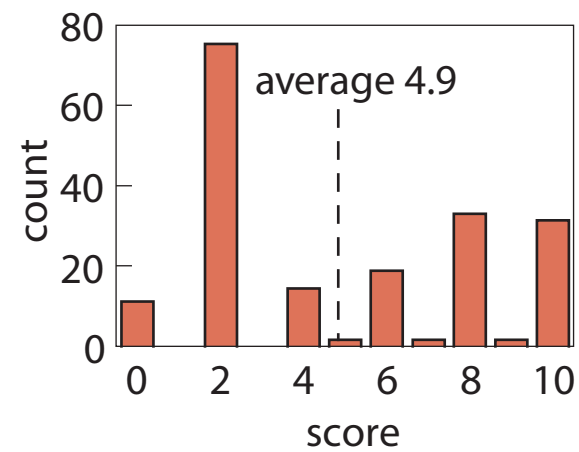


Education

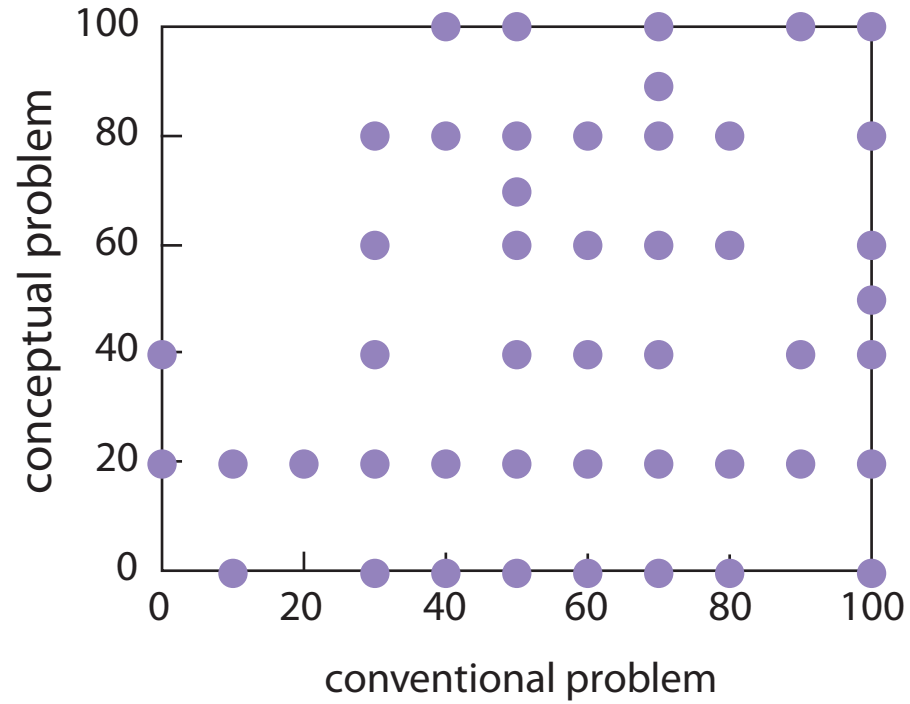
conventional



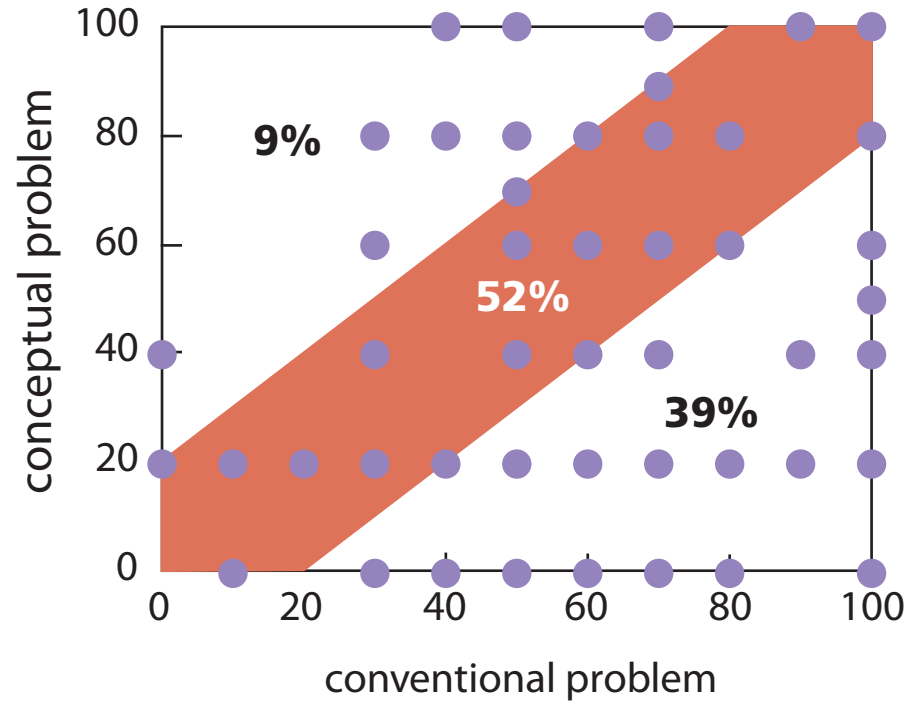
conceptual



Education



Education





The image shows a large lecture hall from the perspective of the back of the room. Students are seated at long desks, facing a stage. A lecturer is standing at a podium on the stage, facing the audience. A large screen is visible on the stage, displaying text. The text on the screen is partially legible and appears to be a list of items. The text on the screen is as follows:

What are the following components of a system?

- 1. The system is a set of components that are interconnected by a network of communication links.
- 2. The system is a set of components that are interconnected by a network of communication links.
- 3. The system is a set of components that are interconnected by a network of communication links.
- 4. The system is a set of components that are interconnected by a network of communication links.
- 5. The system is a set of components that are interconnected by a network of communication links.

So what should we do?

Peer Instruction

Give students more responsibility for gathering information...

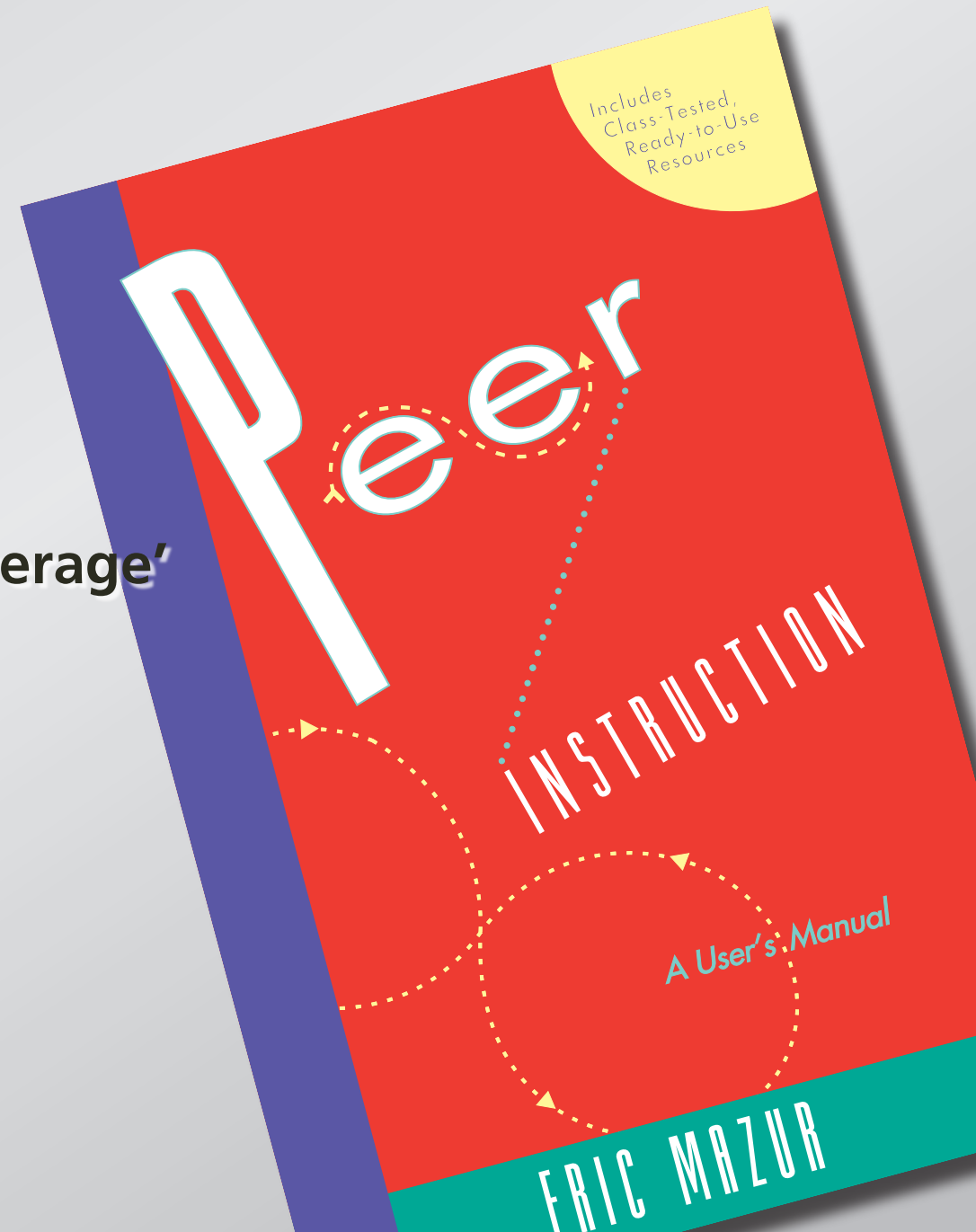
Peer Instruction

**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

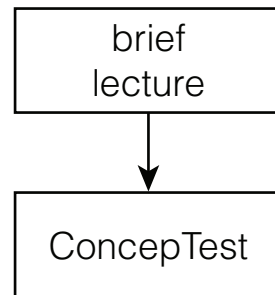
ConcepTest:

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

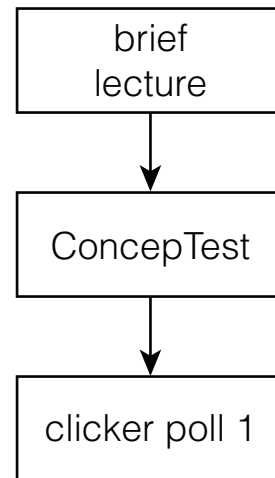
Peer Instruction

brief
lecture

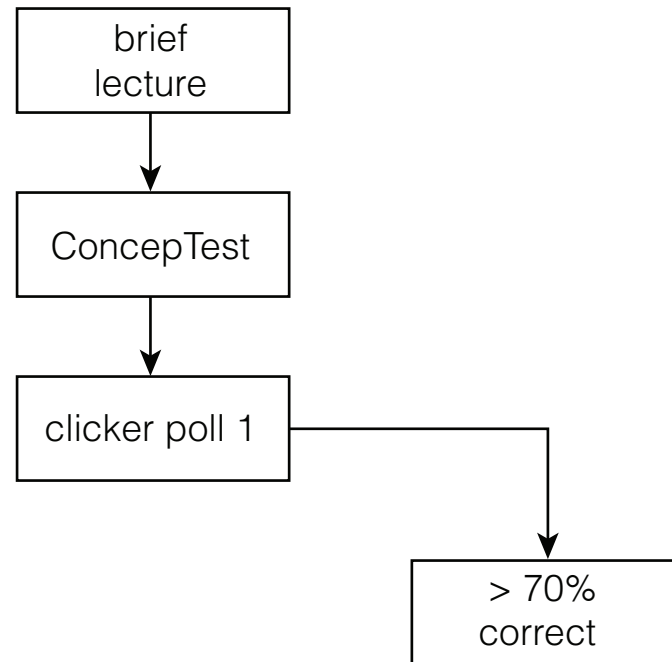
Peer Instruction



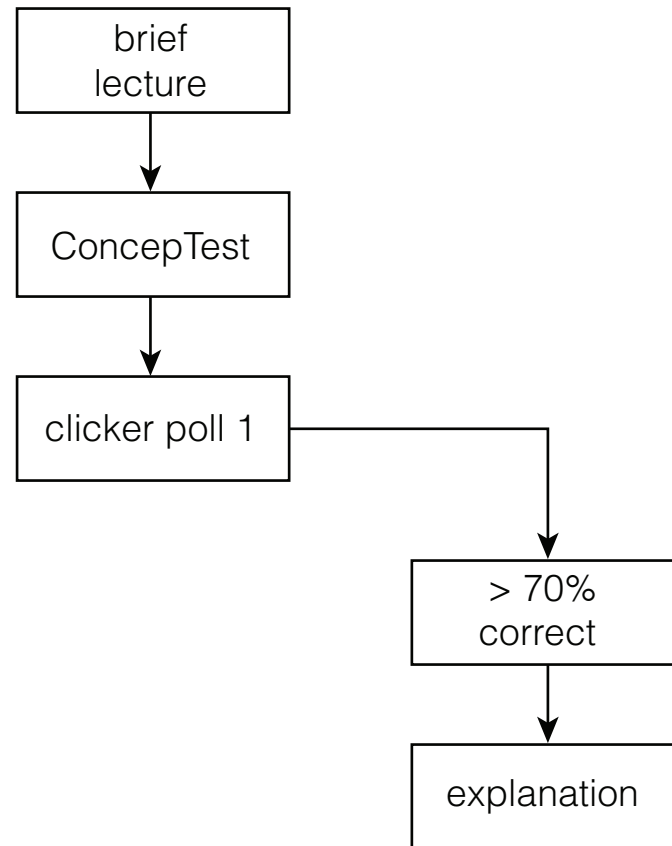
Peer Instruction



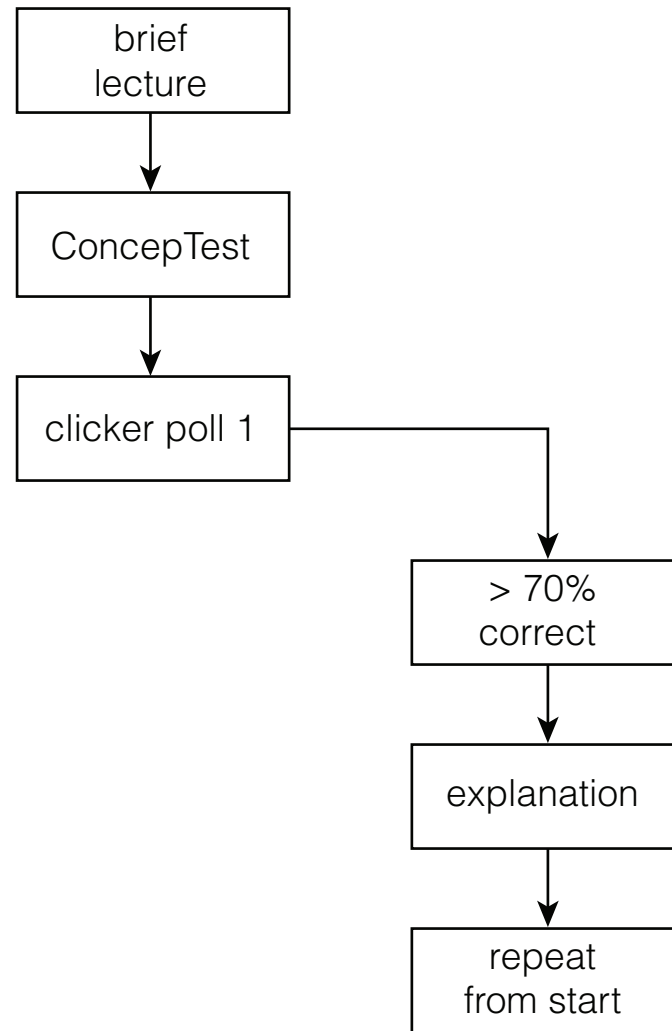
Peer Instruction



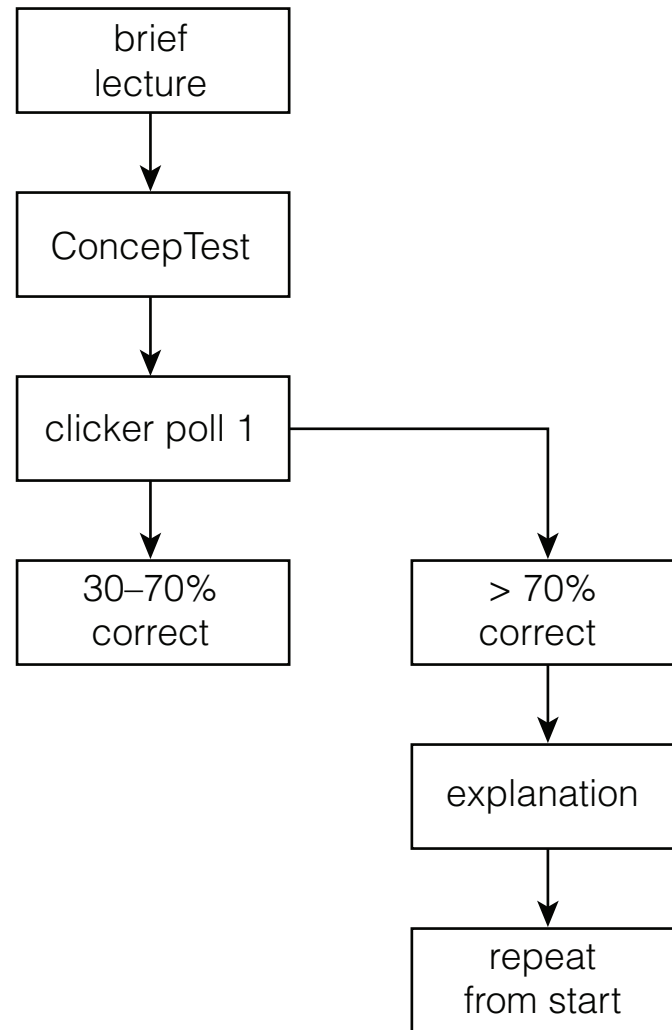
Peer Instruction



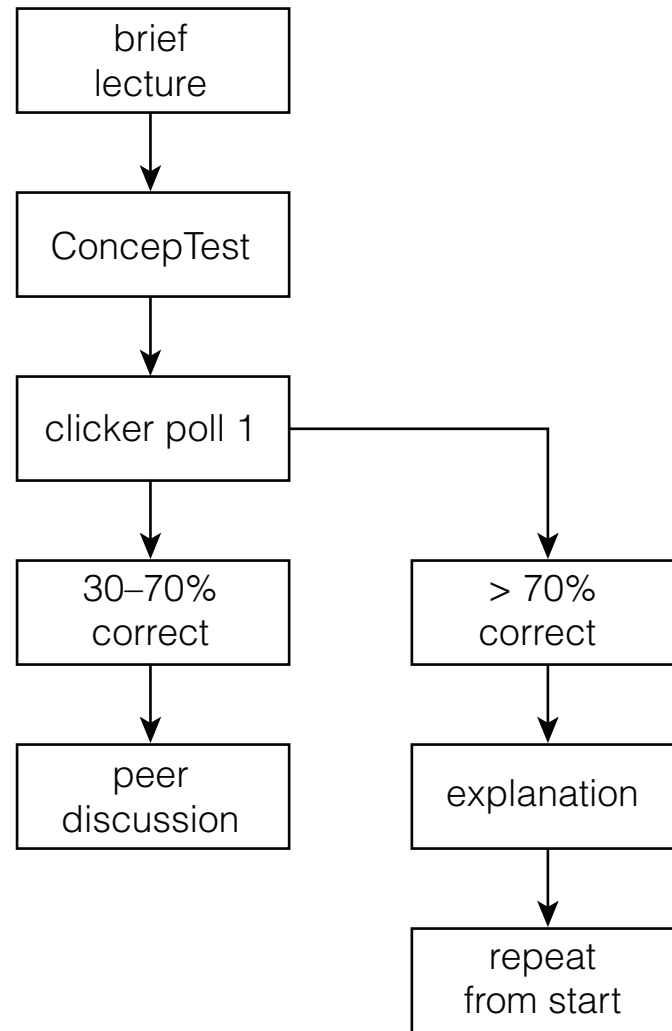
Peer Instruction



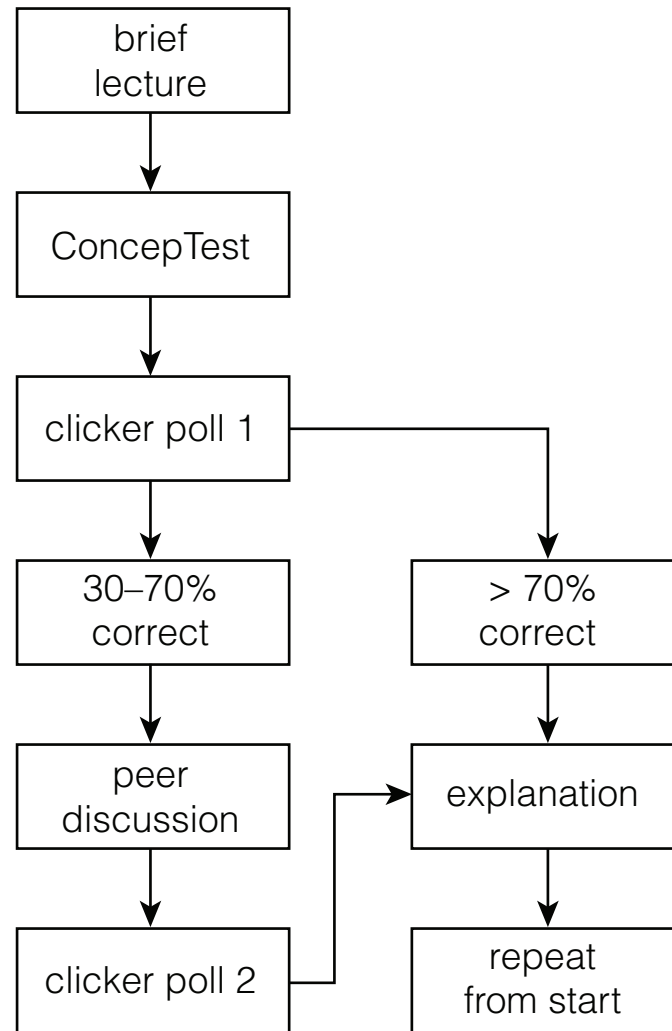
Peer Instruction



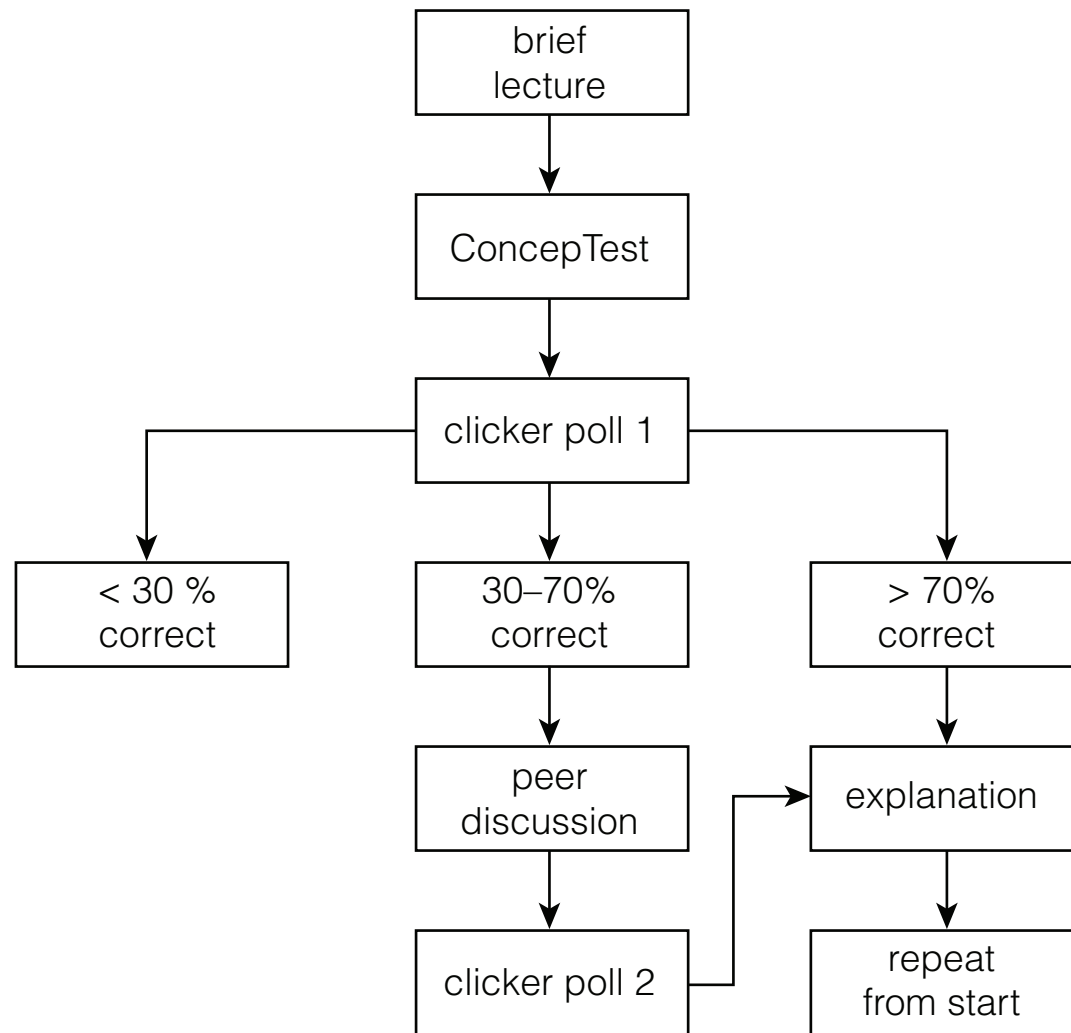
Peer Instruction



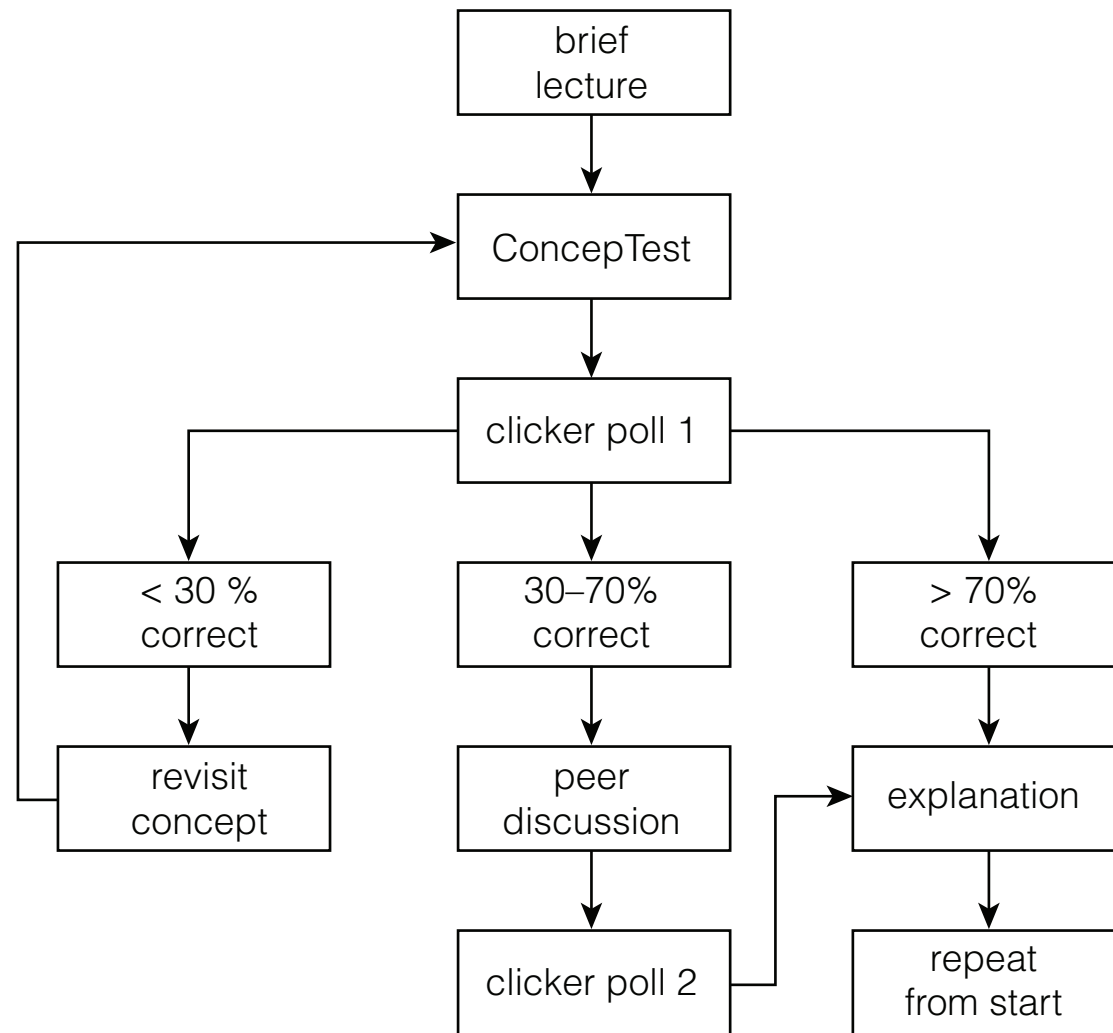
Peer Instruction



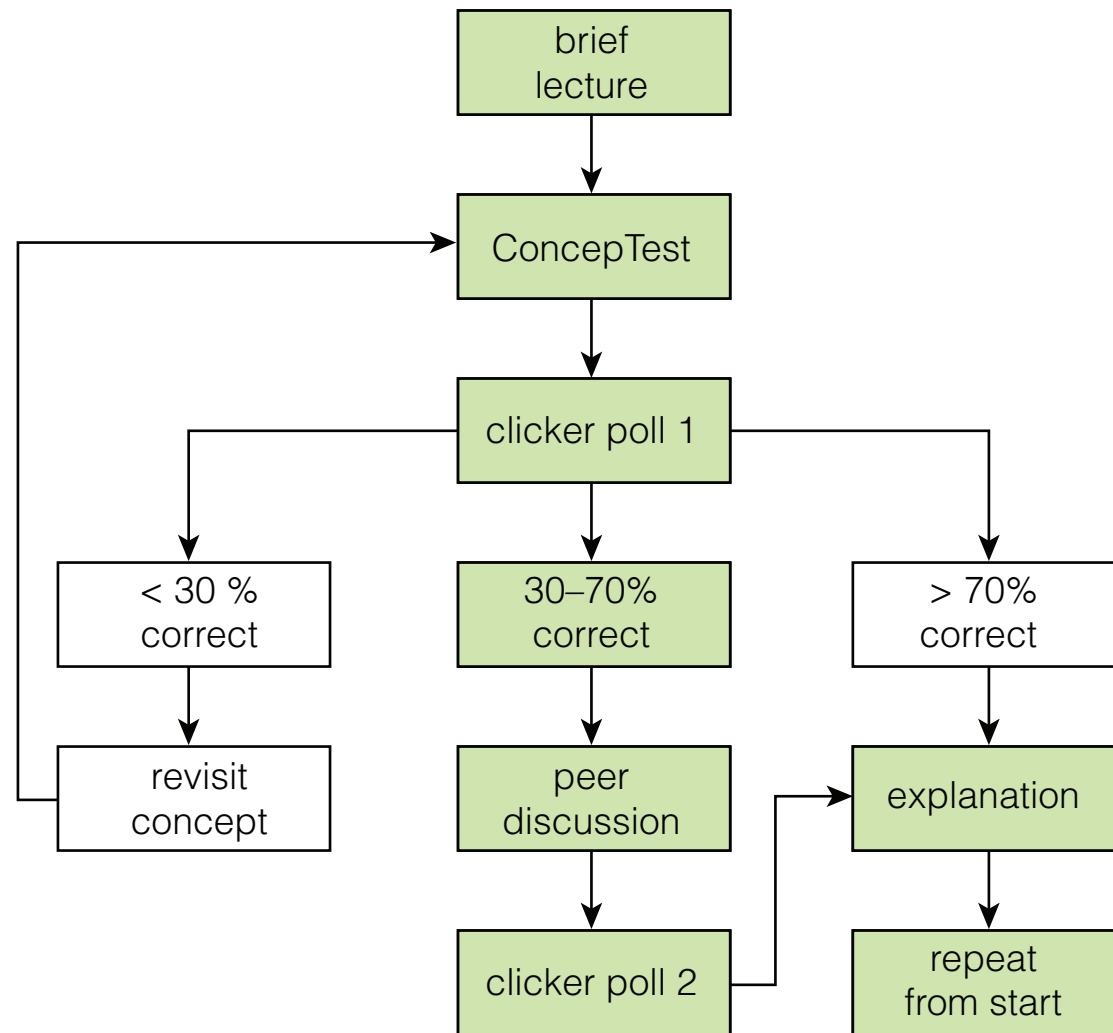
Peer Instruction



Peer Instruction



Peer Instruction

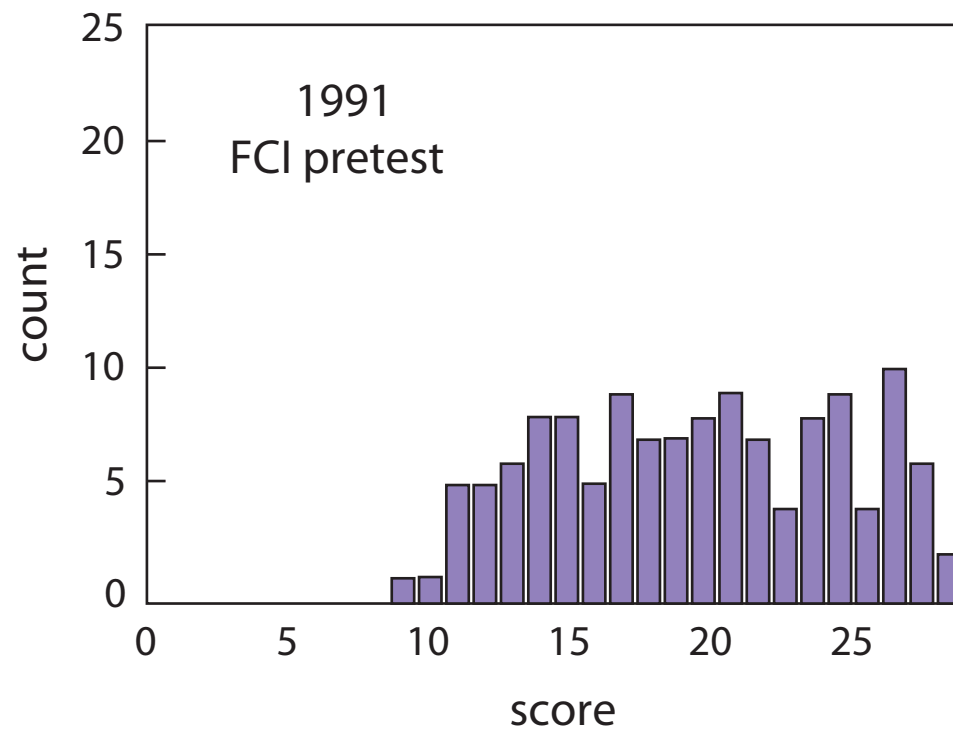


Results

is it any good?

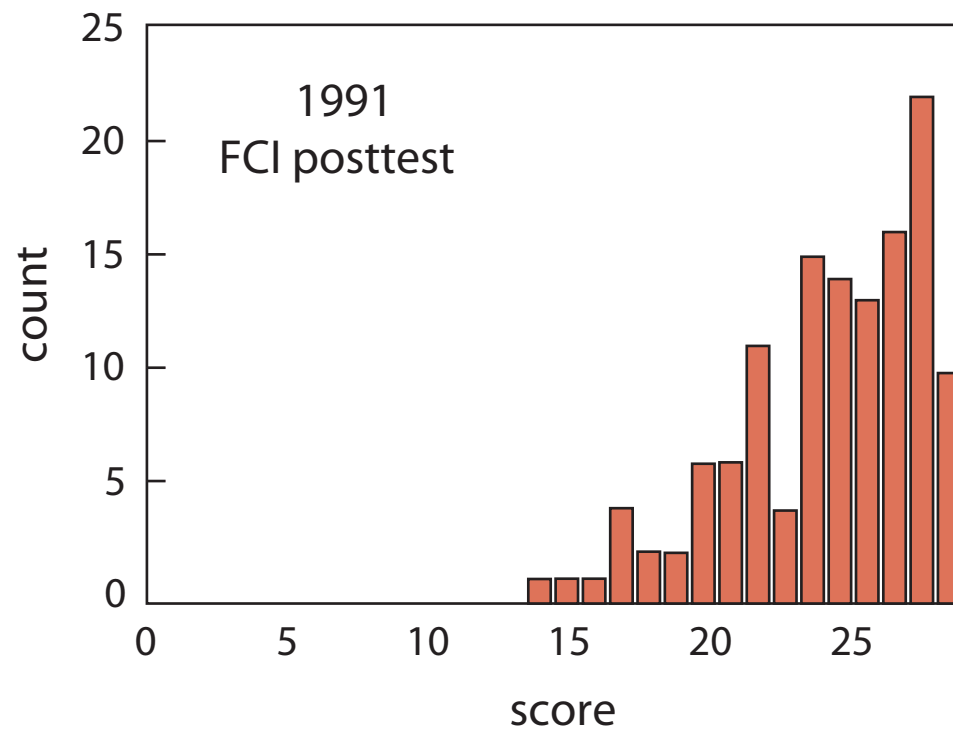
Results

first year of implementing PI



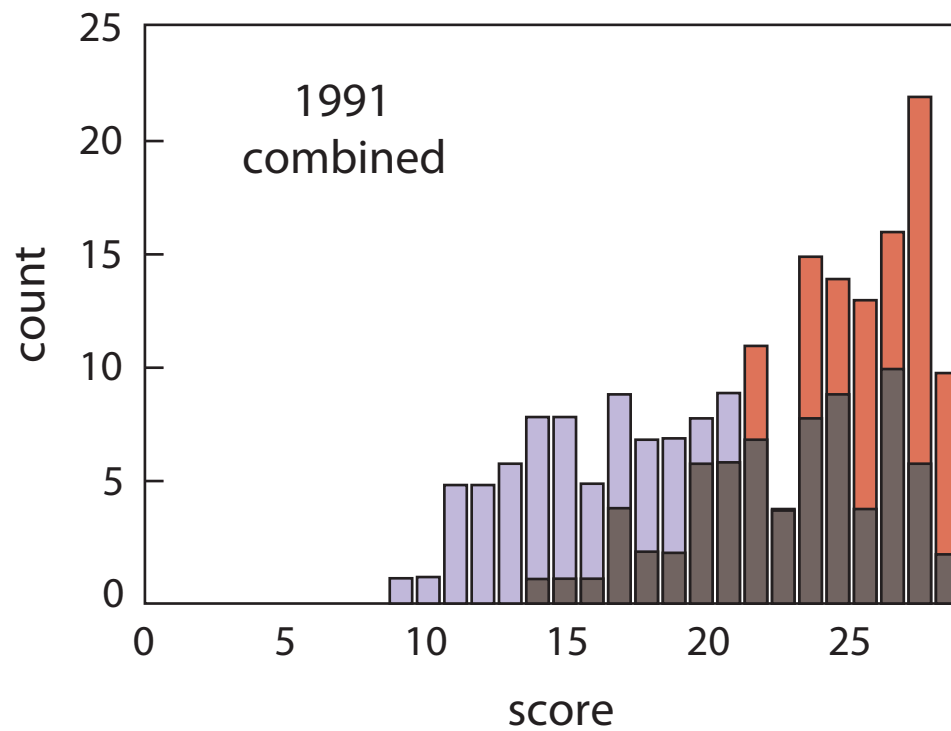
Results

first year of implementing PI

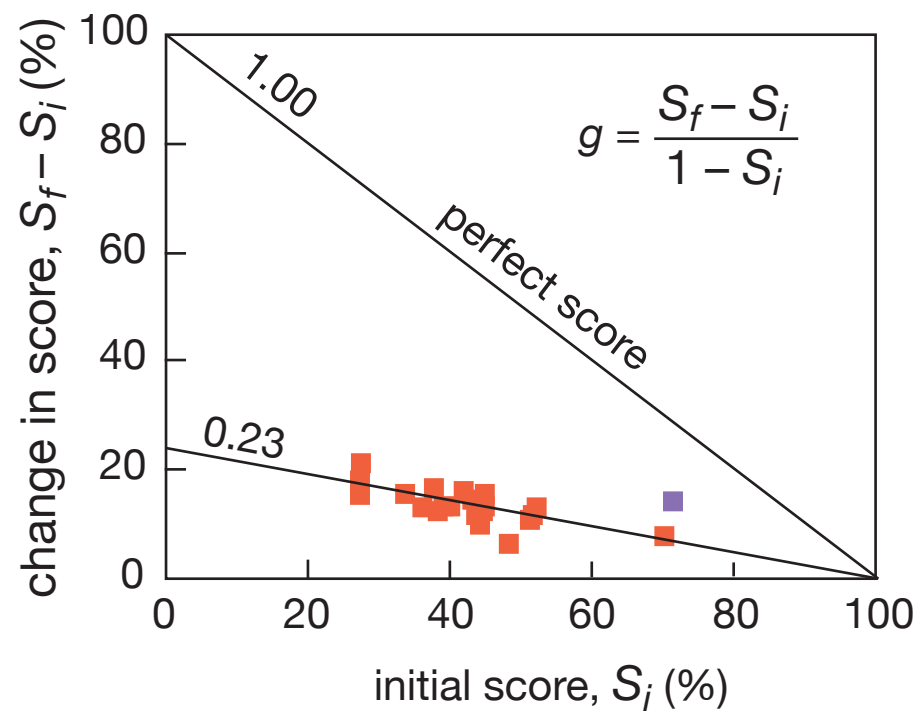


Results

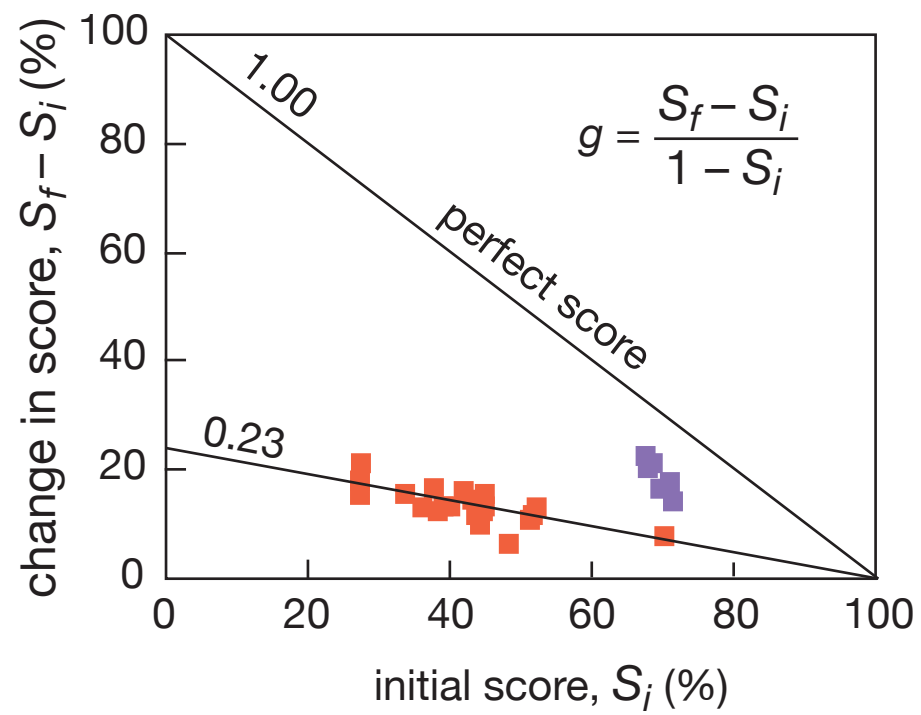
first year of implementing PI



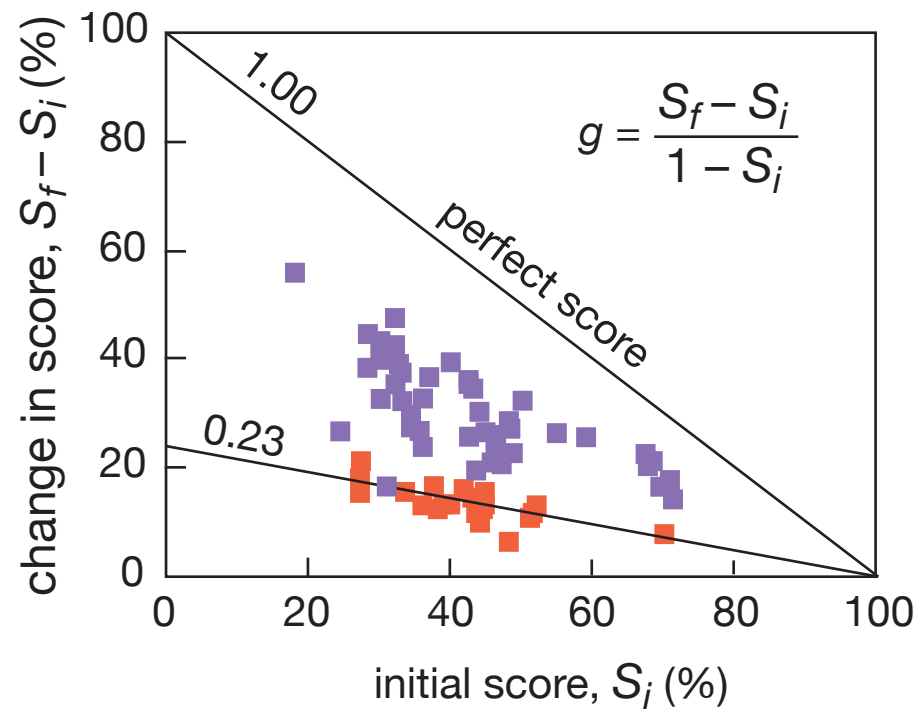
Results



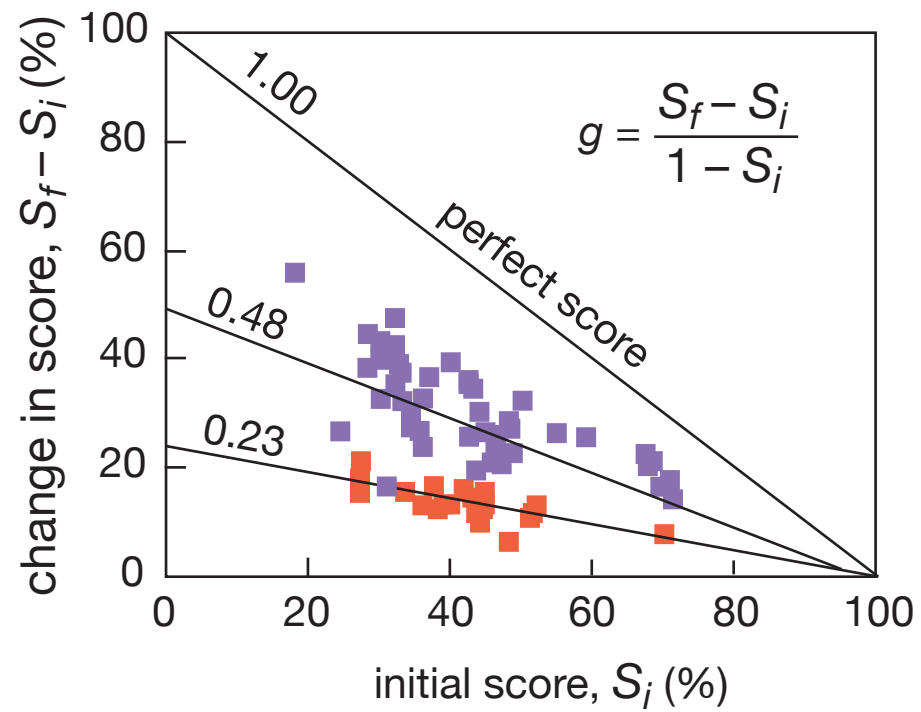
Results



Results



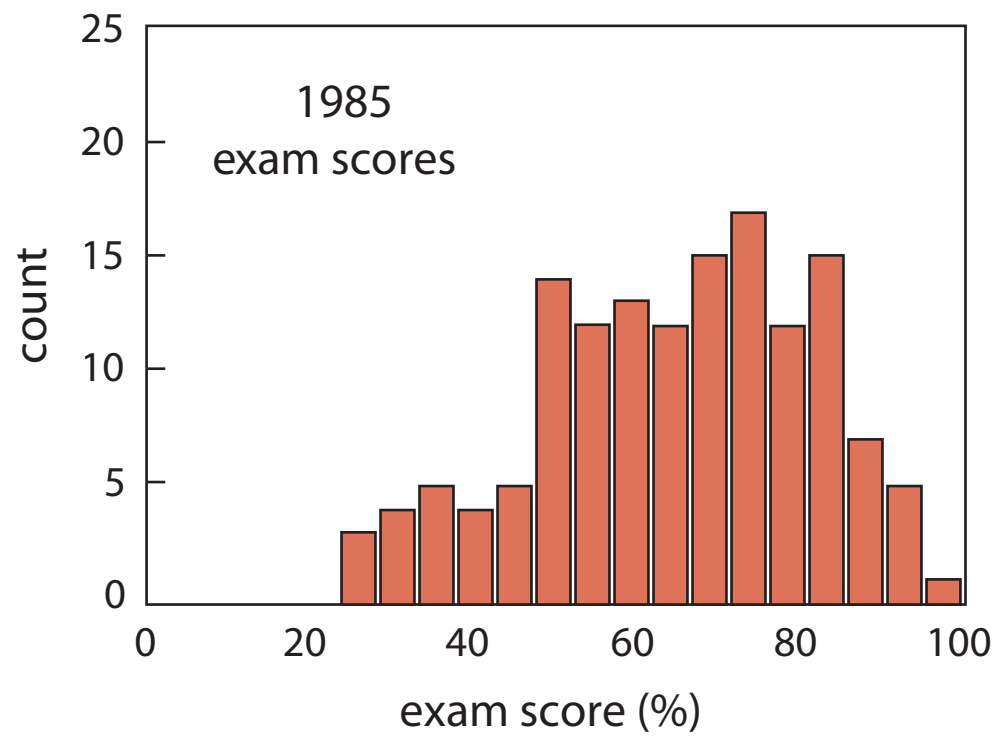
Results



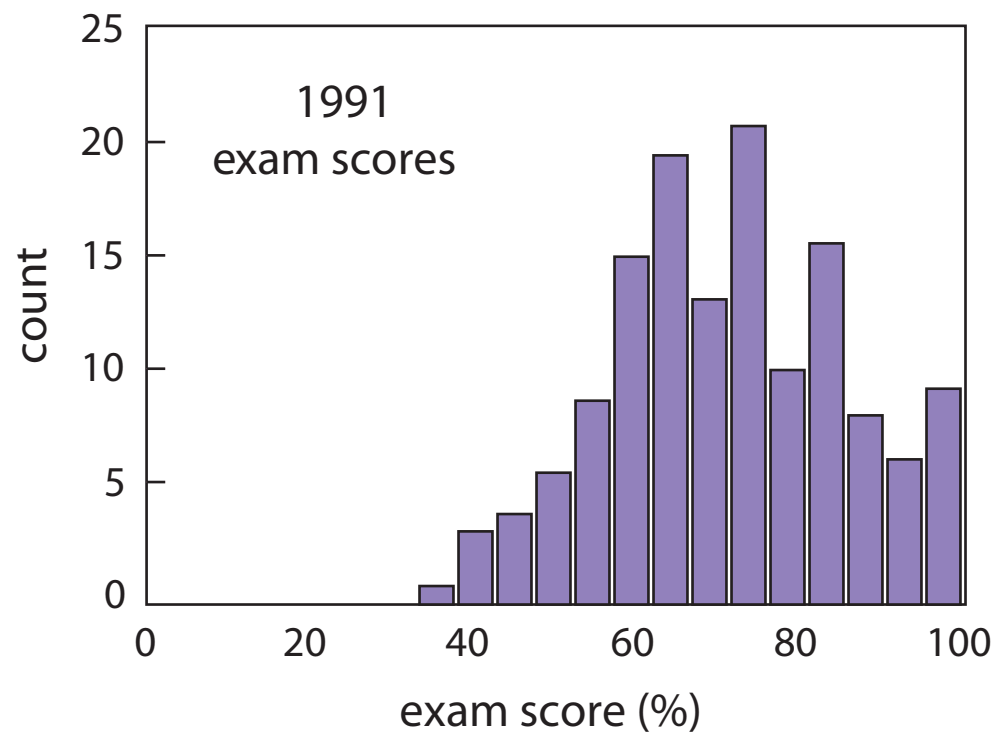
Results

what about problem solving?

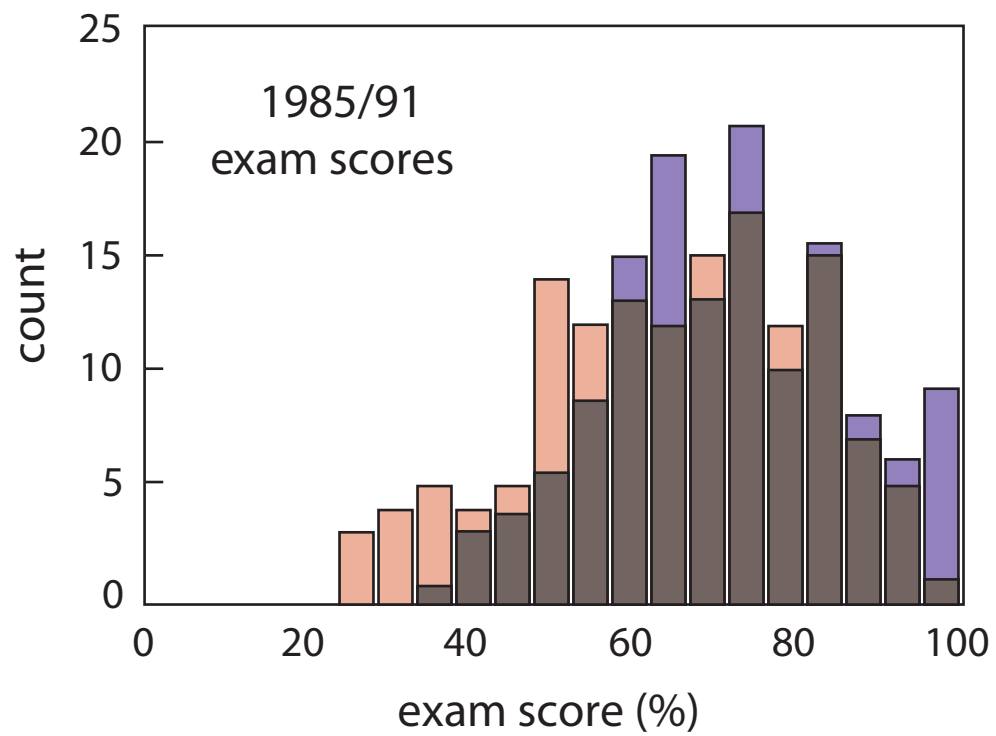
Results



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!)

Summary

Traditional indicators of success misleading

Summary

Traditional indicators of success misleading

Education is no longer about information

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