VE RI TAS

UNDERSTANDING PHYSICS CONCEPTS

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San Juan, Puerto Rico
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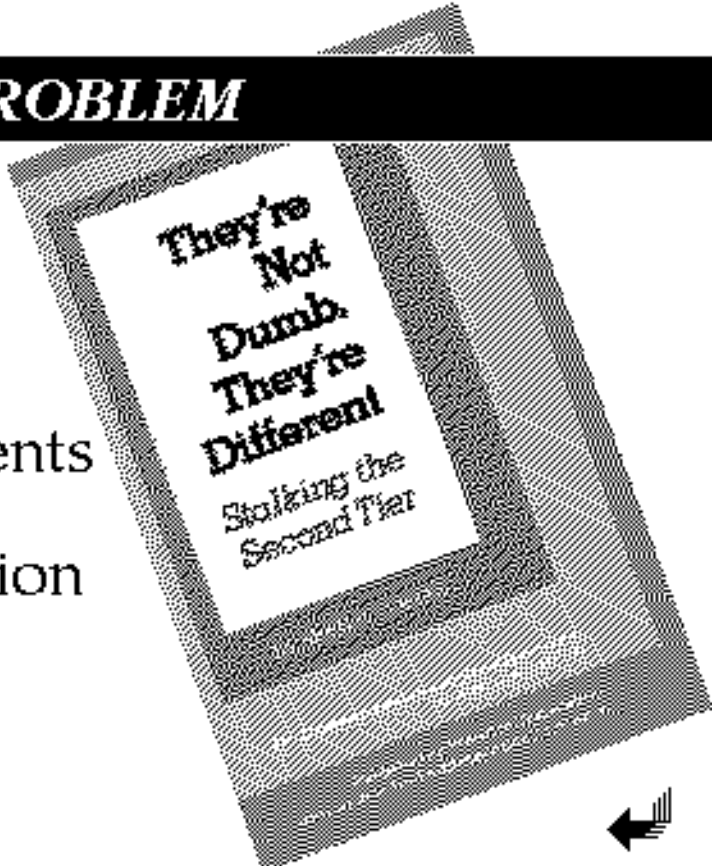
❶ Problem

❷ Cause

❸ Remedy

THE PROBLEM

- frustration
- lower enrollments
- lack of innovation



FRUSTRATION

I HATE PHYSICS

(a premed)

MUCH MORE CONVENIENT
THAN HATING YOUR
OWN MEDIOCRITY!

(a physics major)

❶ Problem

❷ Cause

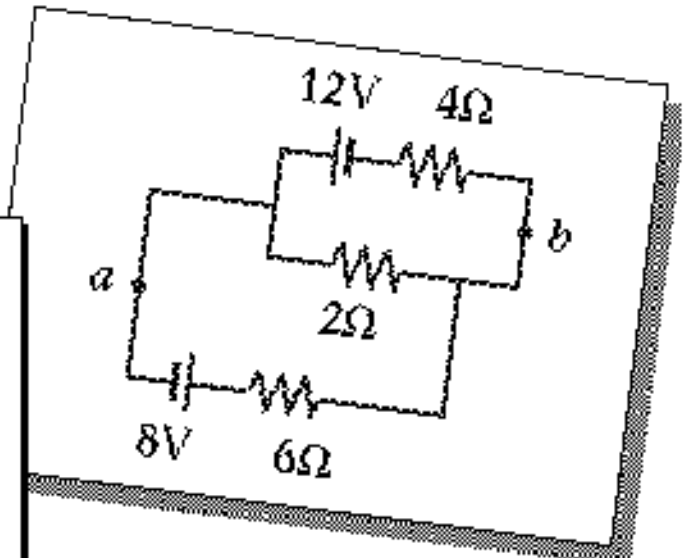
❸ Remedy

THE CAUSE

Are we teaching the right thing...?

THE CAUSE

Traditional question:



Calculate:

(*a*) the current in the 2-Ω resistor, and

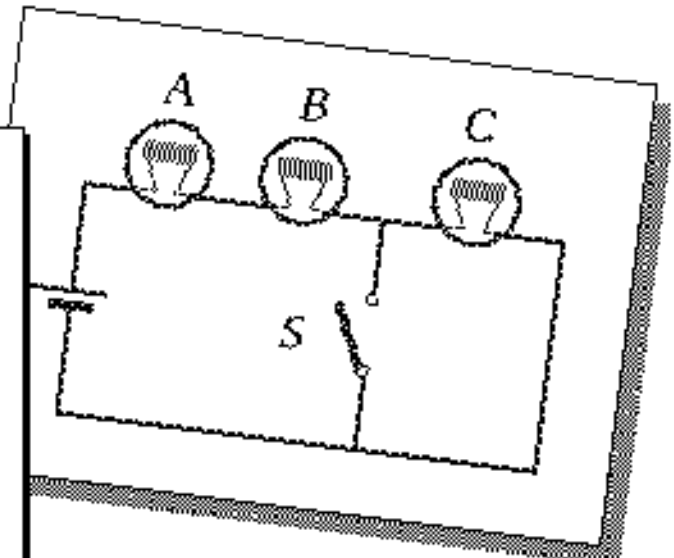
(*b*) the potential difference between points *a* and *b*.

THE CAUSE

Conceptual question:

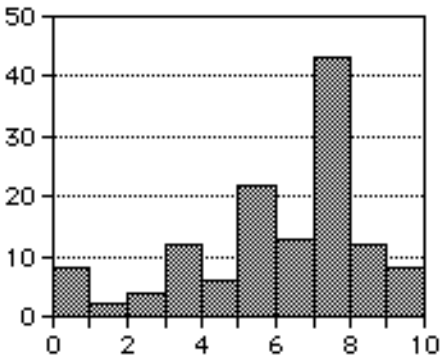
When S is closed, what happens to the:

(*a*) intensities of A and B?
(*b*) intensity of C?
(*c*) current through battery?
(*d*) voltage drop across A, B, and C?
(*e*) total power dissipated?

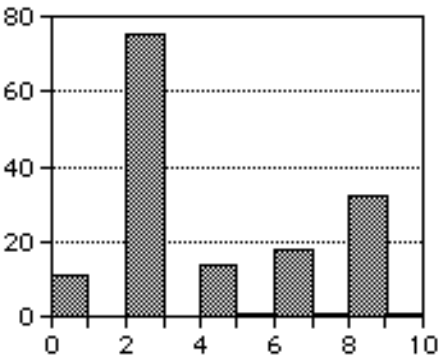


THE CAUSE

Results

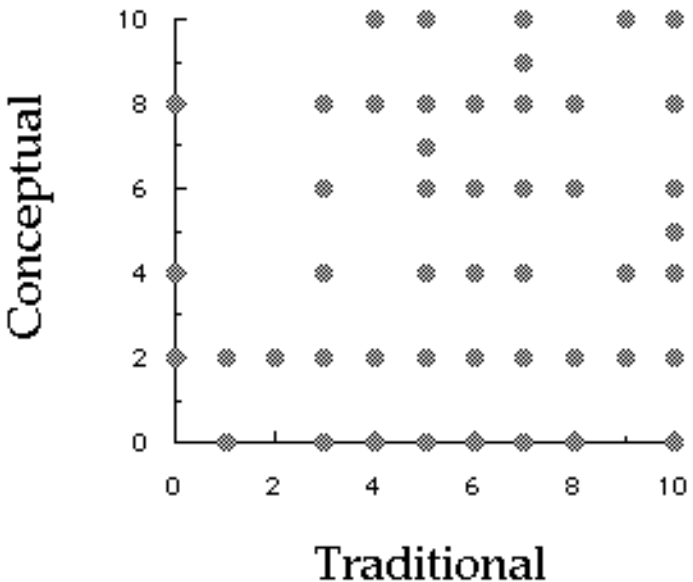


Traditional

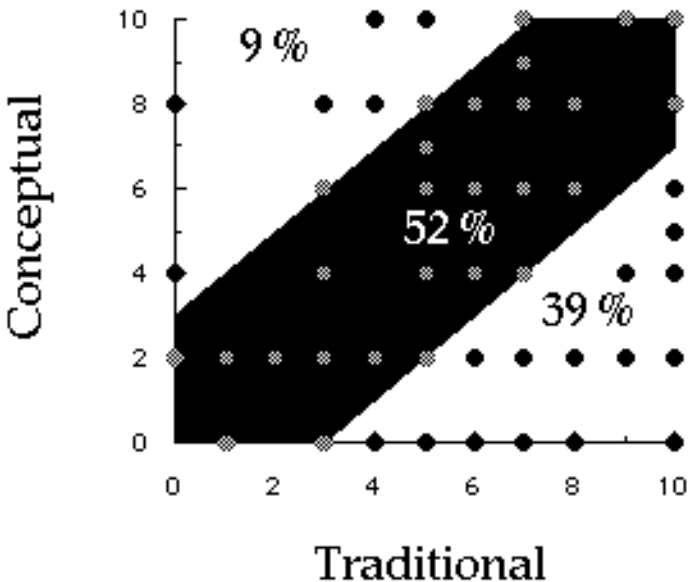


Conceptual

THE CAUSE



THE CAUSE



❶ Problem

❷ Cause

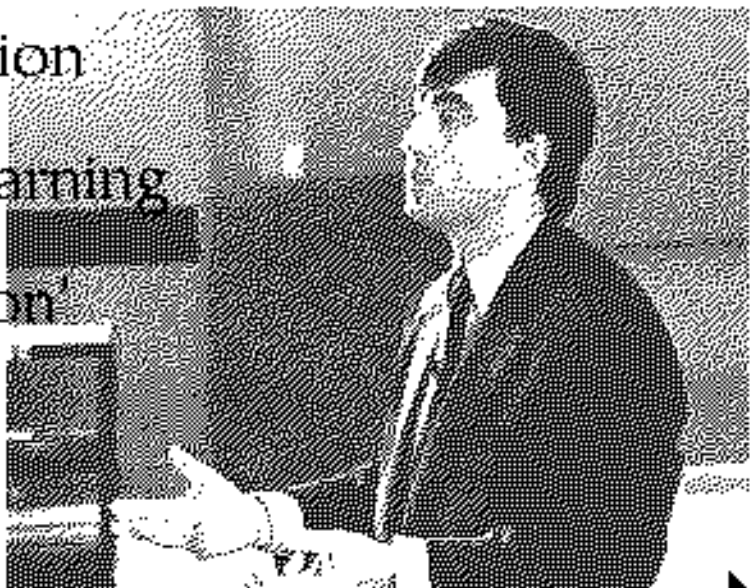
❸ Remedy

THE REMEDY

Why peer instruction?

THE REMEDY

- 1-on-1 instruction
- small group learning
- 'Peer Instruction'

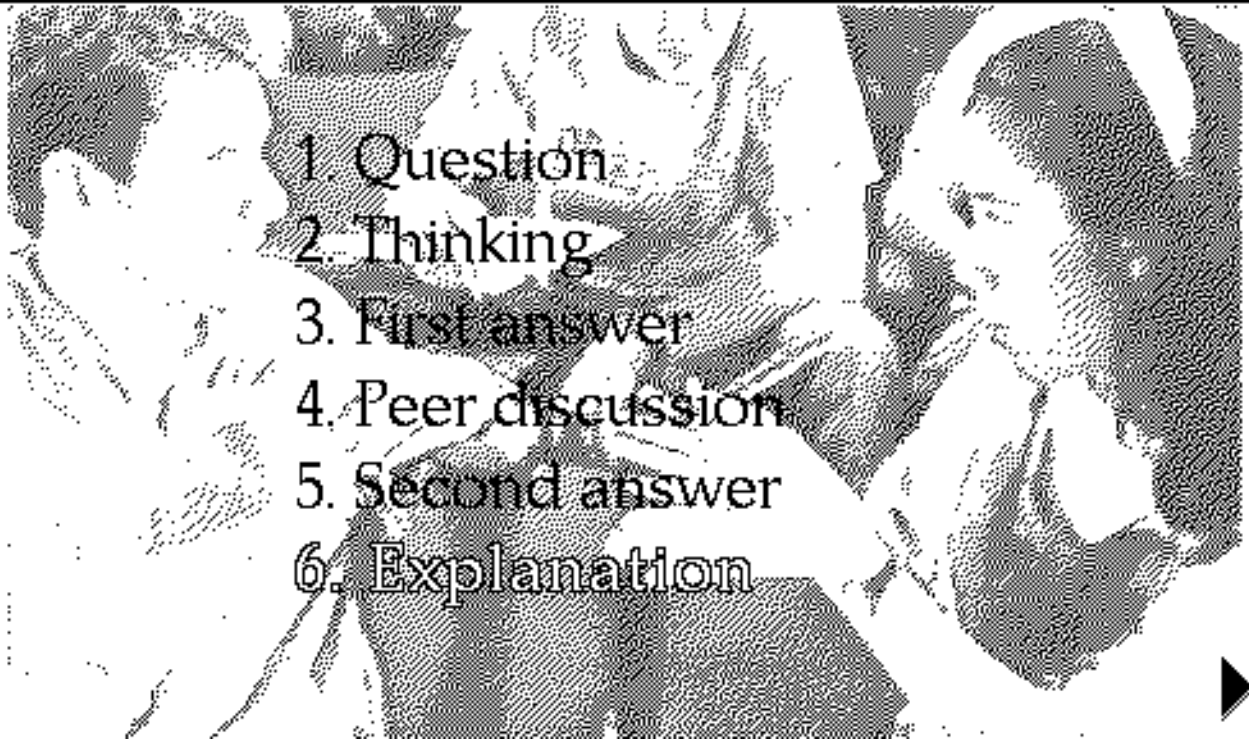


THE REMEDY

Peer Instruction:

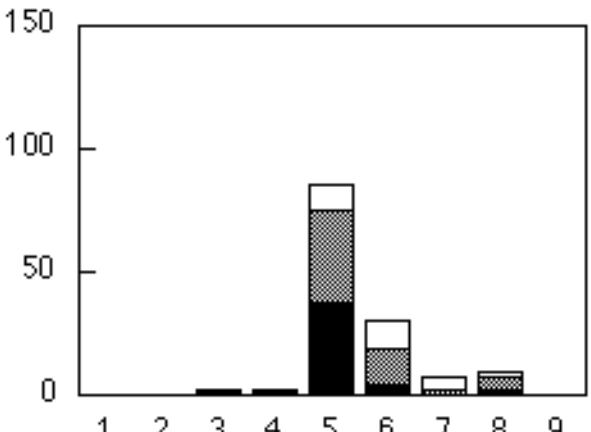
- prerequisites
- lectures
- *ConcepTest*™
- feedback

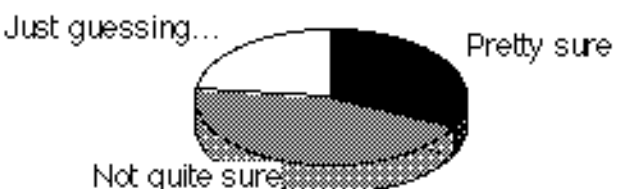
CONCEPTEST™


1. Question
2. Thinking
3. First answer
4. Peer discussion
5. Second answer
6. Explanation

PEER INSTRUCTION

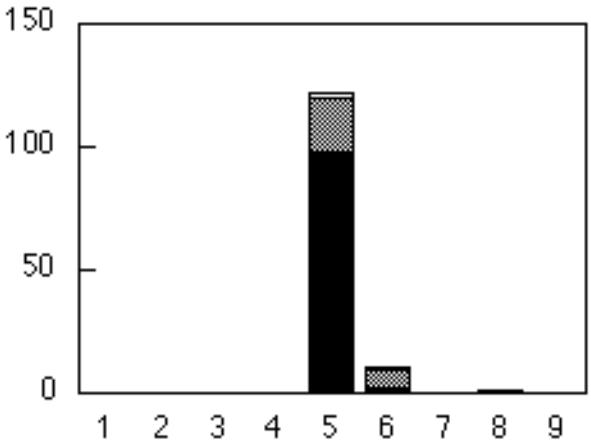
before:



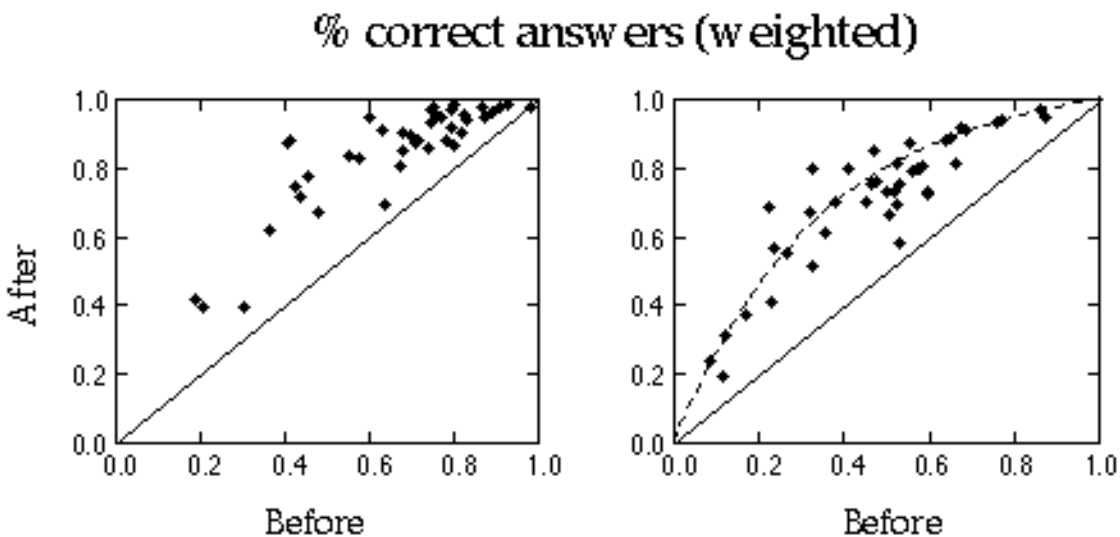


PEER INSTRUCTION

after:

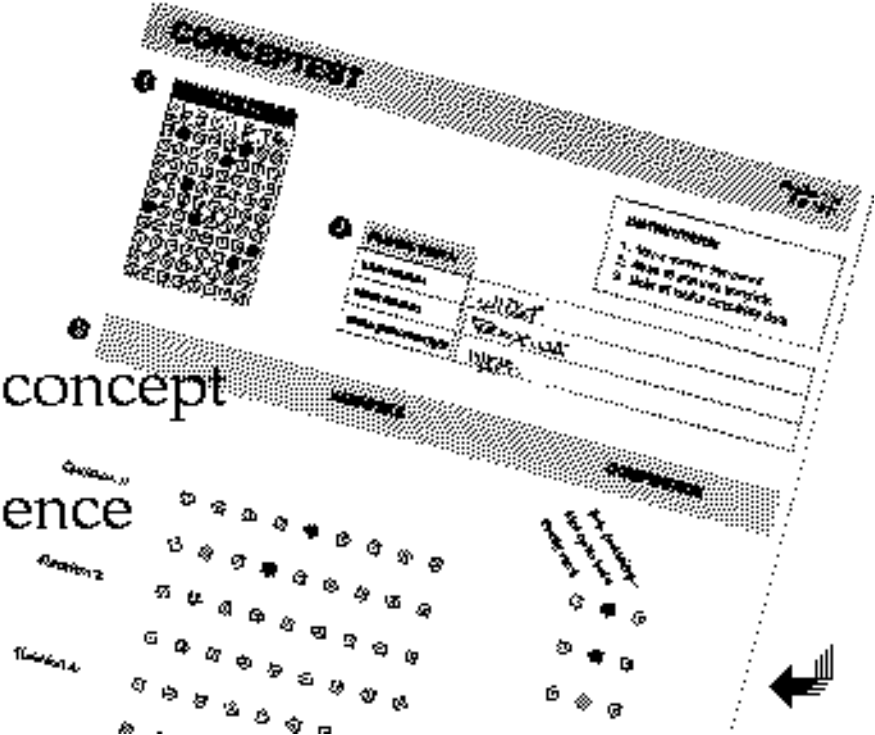


PEER INSTRUCTION



Design:

- test single concept
- test confidence



FEEDBACK

Methods:

- show of hands
- scanning forms
- hand-held computers
- computer testing

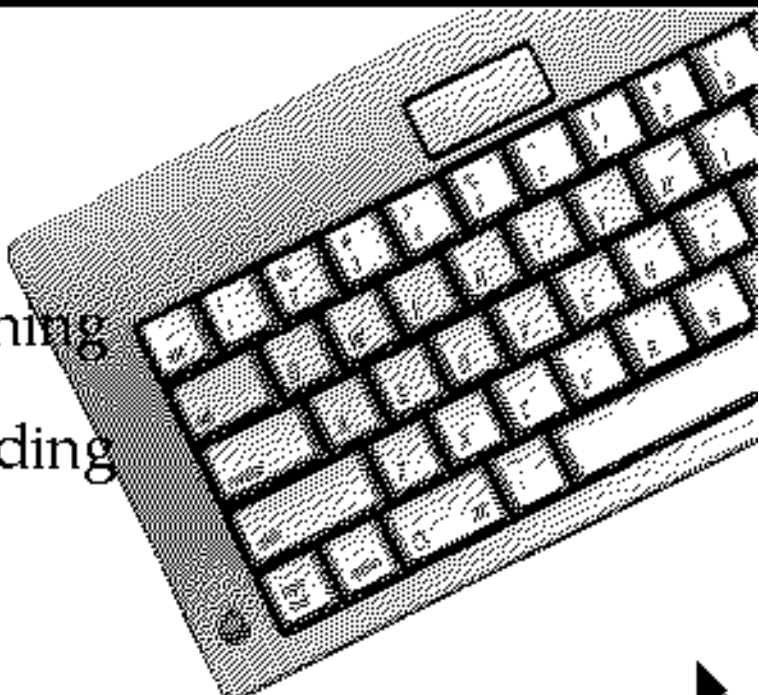
CLASSTALK

HP95LX

COMPUTER TESTING

Purpose:

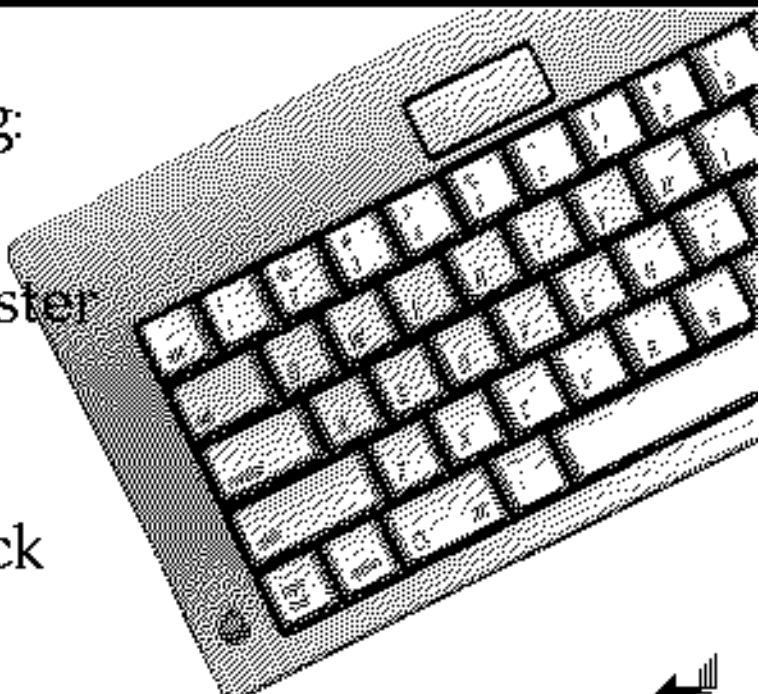
- 'measure' learning
- test understanding



COMPUTER TESTING

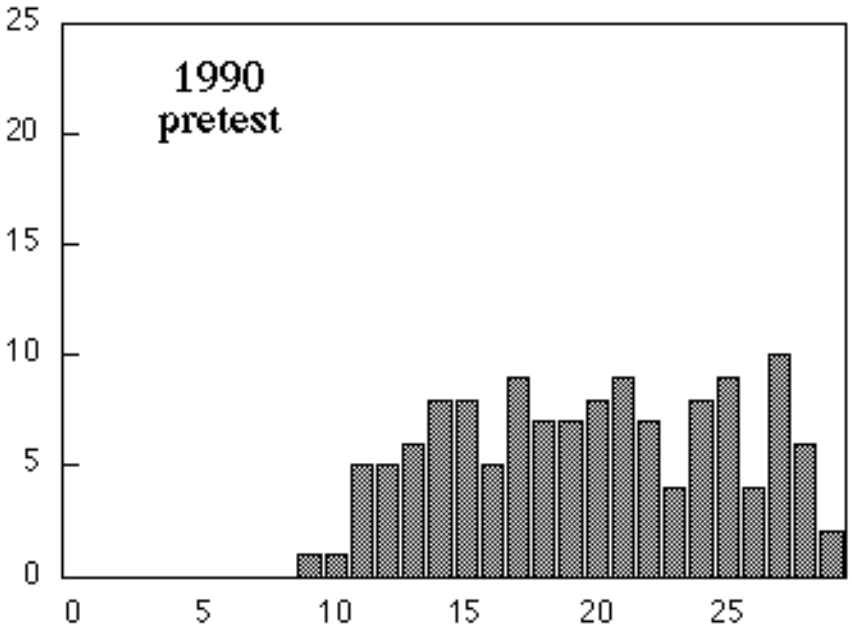
Automate testing:

- Easy to administer
- Instant results
- Instant feedback

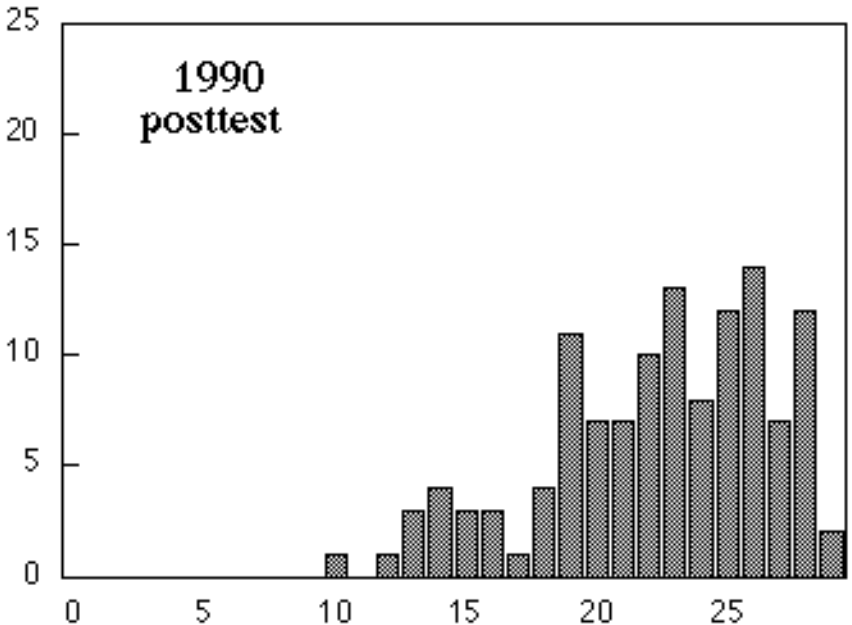


1. Results
2. Student reactions

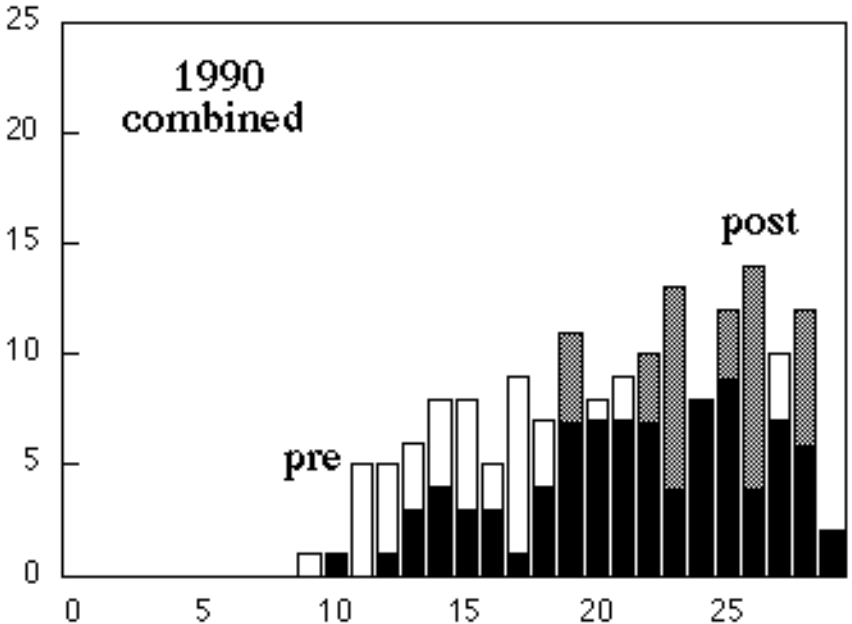
Results



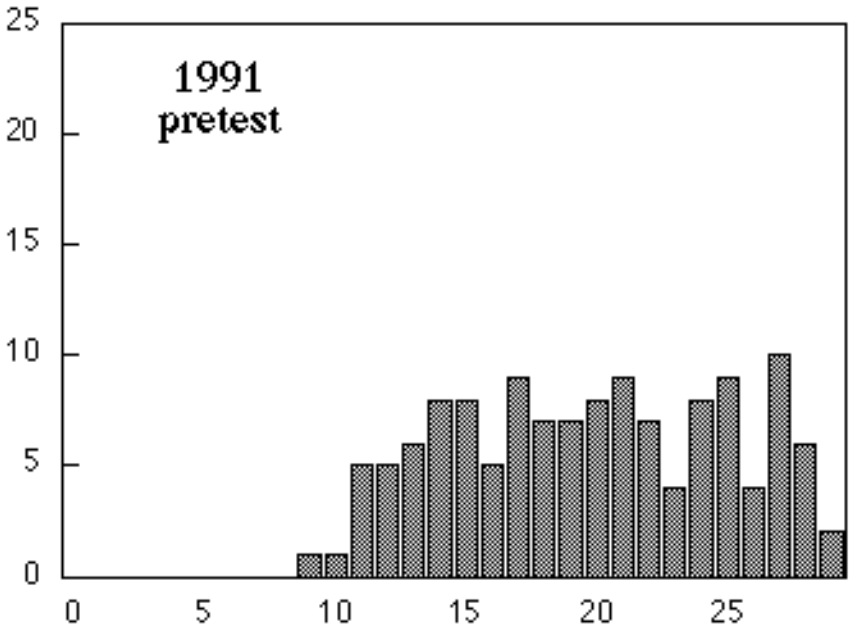
Results



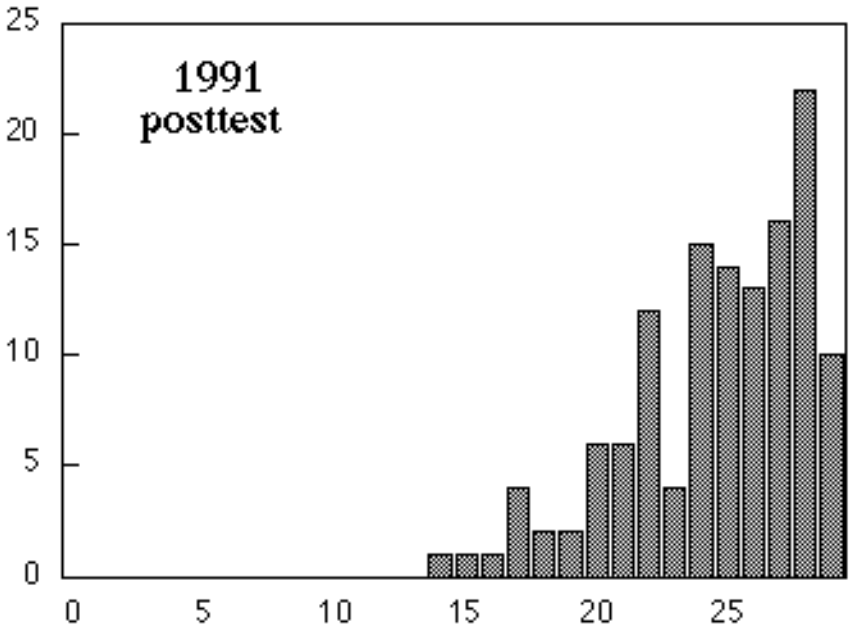
Results



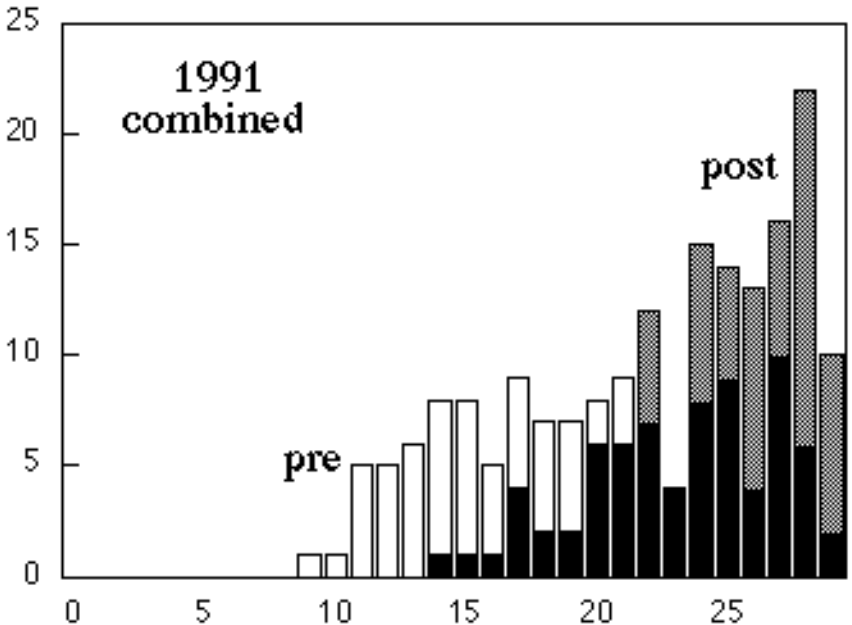
Results



Results



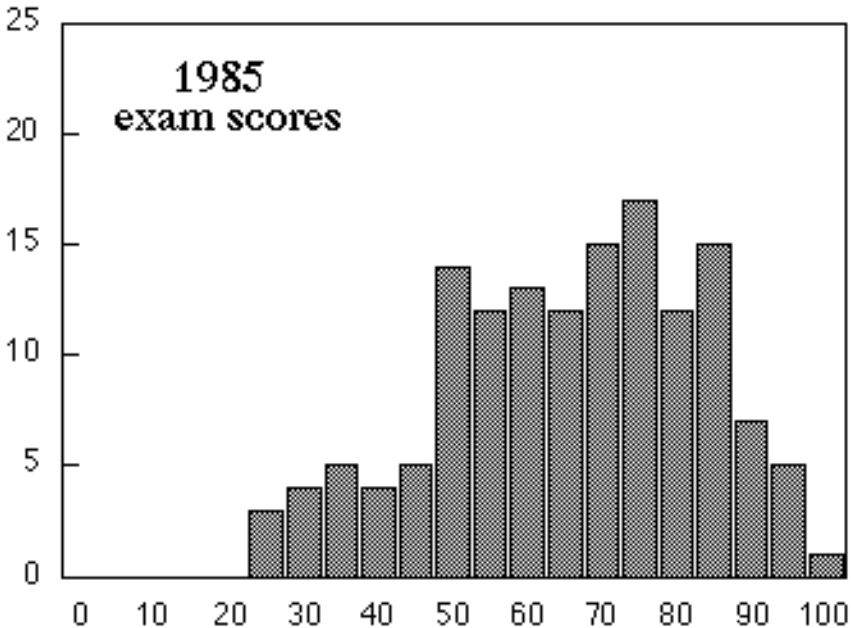
Results



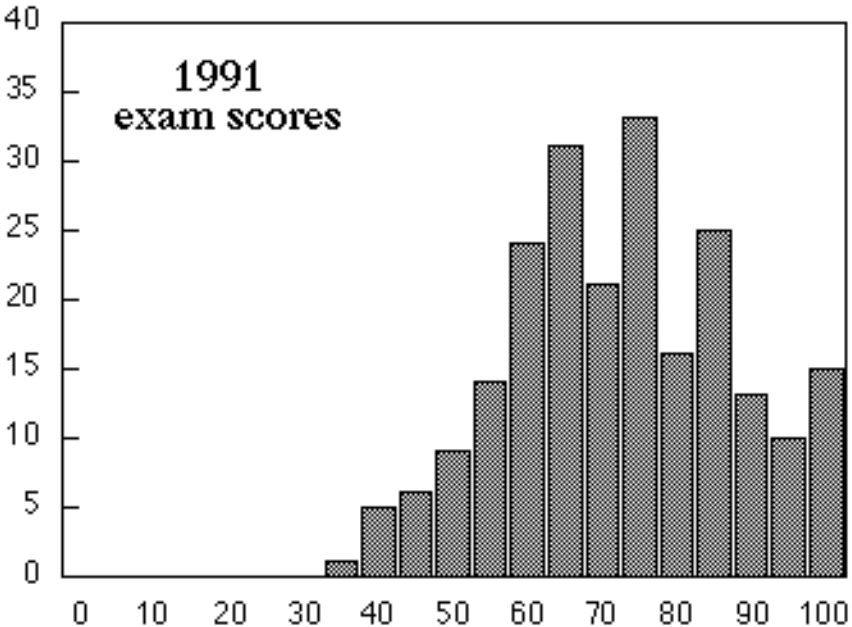
Results

What about problem solving...?

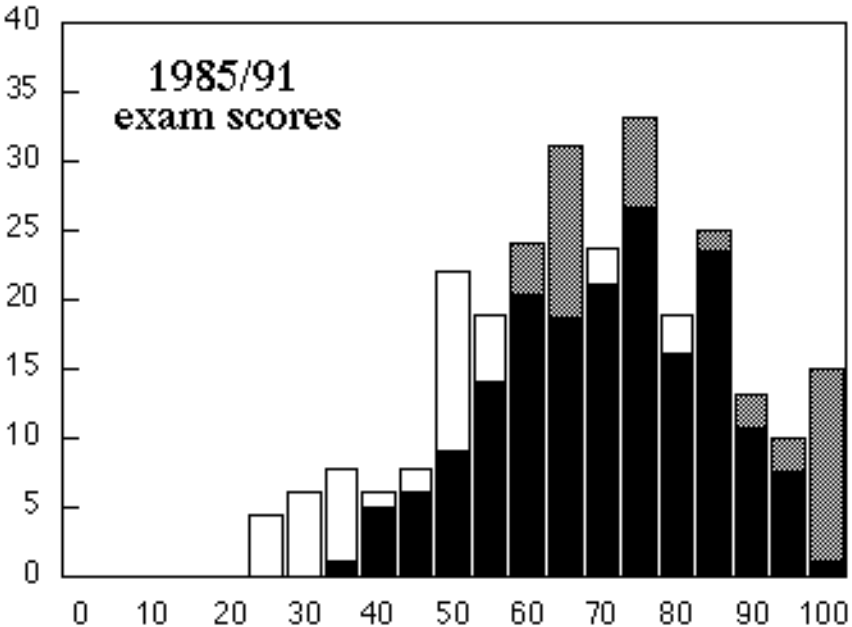
Results



Results


1991
exam scores
40
35
30
25
20
15
10
5
0
0
10
20
30
40
50
60
70
80
90
100

Results


1985/91
exam scores
40
35
30
25
20
15
10
5
0
0
10
20
30
40
50
60
70
80
90
100

Acknowledgments

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Web Site: http://mazur-www.harvard.edu

Thank you!