

EDUCATION: TRANSFERRING INFORMATION OR ENGAGING THE MINDS?

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Outline

▶ **Problem**

Outline

▶ **Problem**

▶ **Cause**

Outline

▶ **Problem**

▶ **Cause**

▶ **Remedy**

We have a problem

Some disturbing symptoms:

- ▶ **frustration**
- ▶ **lack of understanding**
- ▶ **lack of basic knowledge**

We have a problem

They know the jargon:

- ▶ **circular motion**
- ▶ **barometric pressure**
- ▶ **light radius**
- ▶ **something to the power times ten to the something**

We have a problem

They are aware of their lack of knowledge

- ▶ **I graduated from college but I didn't study *astronomy***
- ▶ **It's been a while since I've had physics**

We have a problem

They are aware of their lack of knowledge

- ▶ **I graduated from college but I didn't study *astronomy***
- ▶ **It's been a while since I've had physics**

...and they don't care!

We have a problem

Should we worry?

We have a problem

We'd better!

We have a problem

"I took four years of science and four years of math...

**A waste of my time,
a waste of the teacher's time,
and a waste of space...**

**You know,
I took *physics*.**

For *what?*"





Why do we have this problem?

Why do we have this problem?

- ▶ **Lectures focus on transfer of information...**

Why do we have this problem?

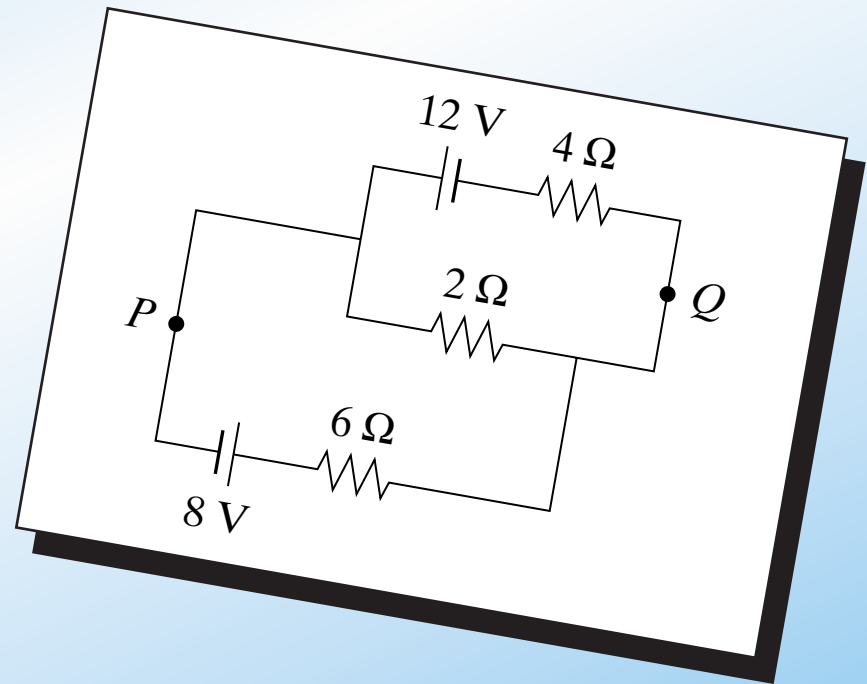
- ▶ **Lectures focus on transfer of information...**
(but education is more than information)

Why do we have this problem?

- ▶ **Lectures focus on transfer of information...**
(but education is more than information)
- ▶ **Conventional problems reinforce bad study habits**

Why do we have this problem?

Conventional problems reinforce bad study habits

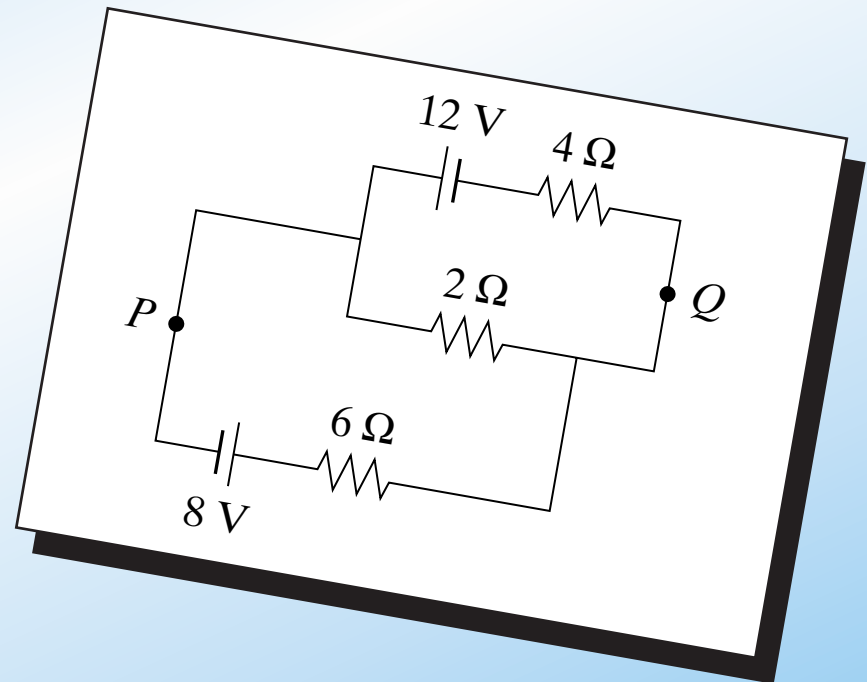


Why do we have this problem?

Conventional problems reinforce bad study habits

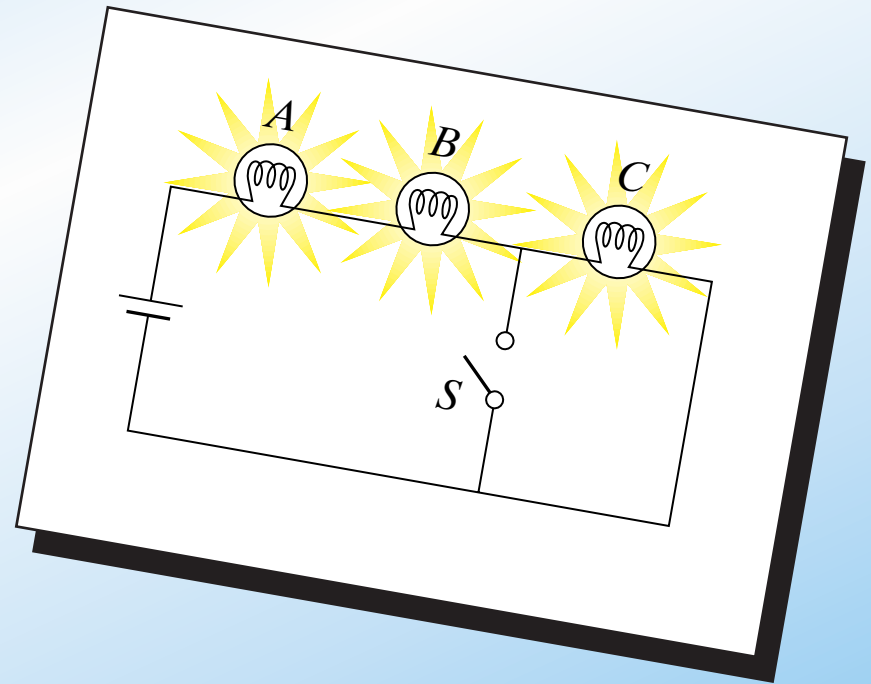
Calculate:

- (a) the current in the $2\text{-}\Omega$ resistor, and
- (b) the potential difference between points P and Q



Why do we have this problem?

Are basic principles understood?

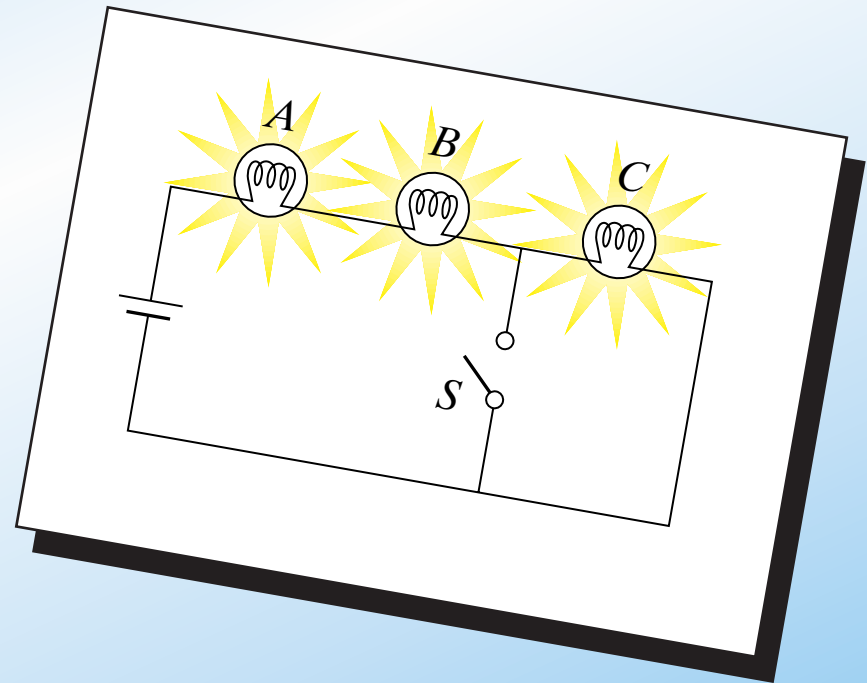


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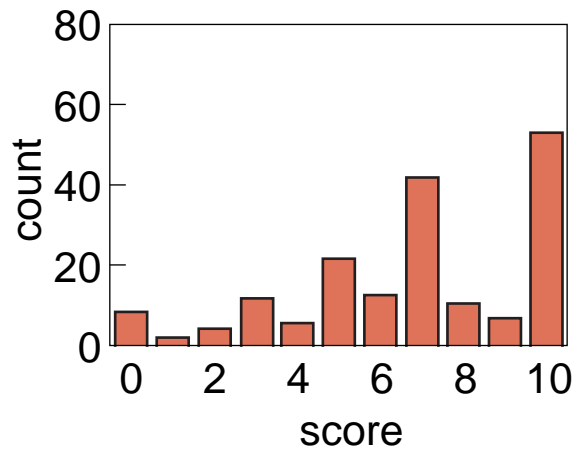
When S is closed, what happens to the:

- (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?

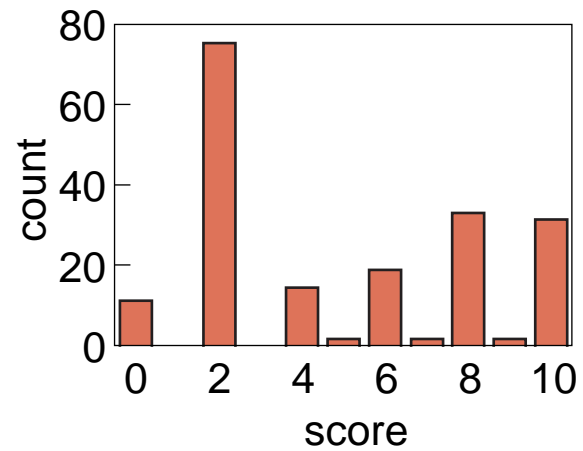


Why do we have this problem?

conventional

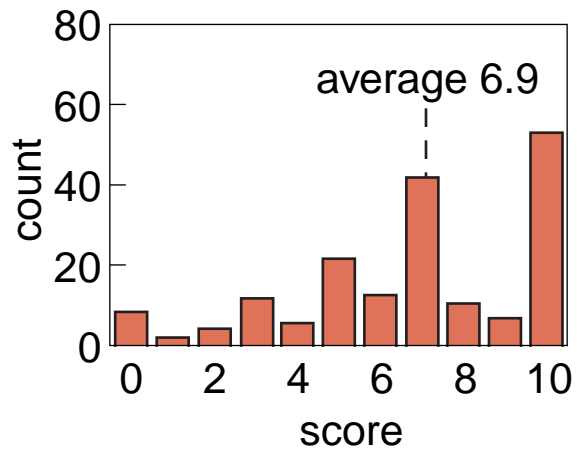


conceptual

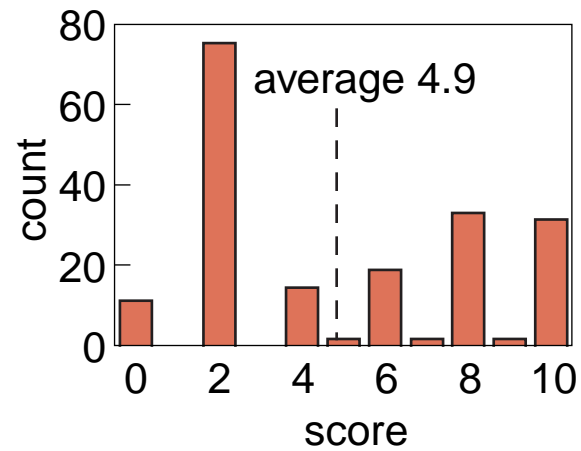


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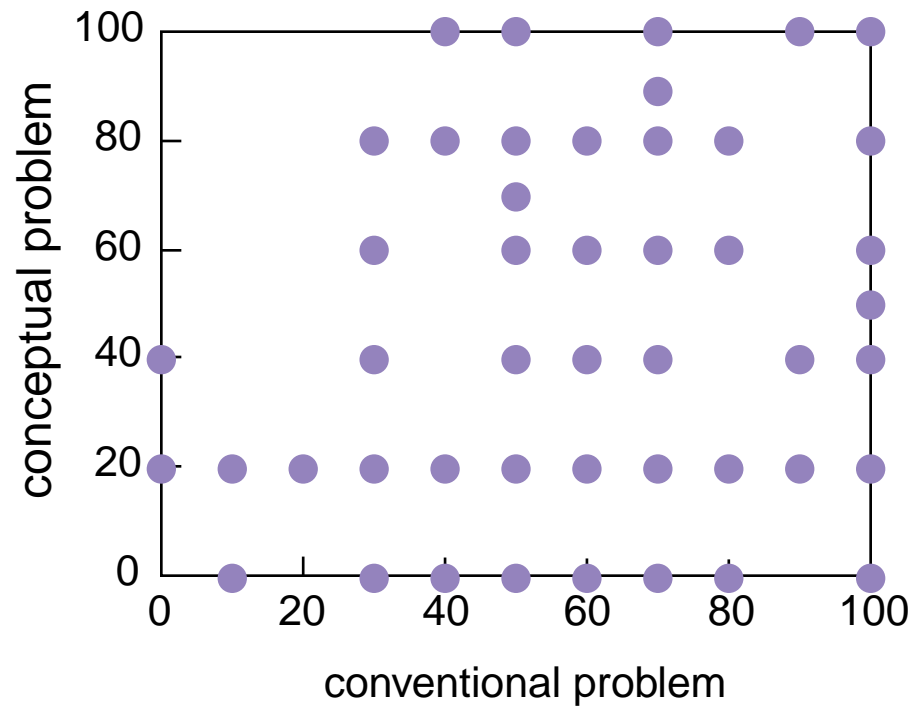
conventional



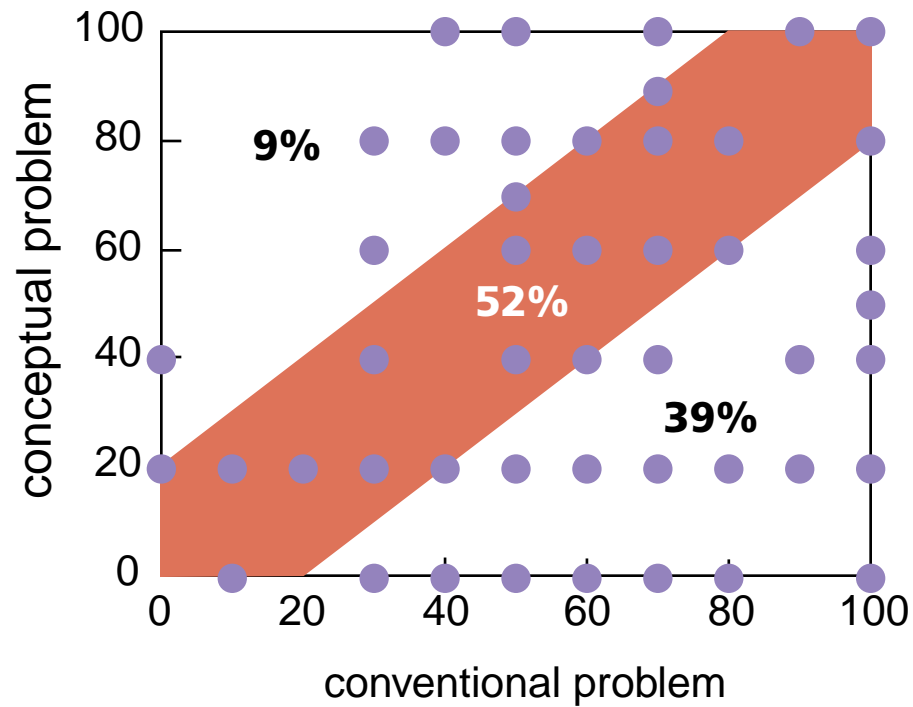
conceptual



Why do we have this problem?



Why do we have this problem?





So what should we do?

Peer Instruction

Help students take more responsibility for learning!

Peer Instruction

- ▶ **Move first exposure to the material out of the classroom...**

Peer Instruction

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Peer Instruction

- ▶ Move first exposure to the material out of the classroom: **assign reading!**
- ▶ Use class to deepen and broaden understanding
- ▶ by identifying **key ideas**
- ▶ and giving students opportunities to **think**

Peer Instruction

Main features:

- ▶ **Pre-class reading**

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- ▶ **In class: depth, not coverage**

Peer Instruction

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- ▶ **Pre-class reading**
- ▶ **In class: depth, not coverage**
- ▶ **ConcepTests**

Results

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- ▶ **focus on concepts leads to better understanding**
- ▶ **better understanding leads to better problem solving**
- ▶ **less frustration, more satisfaction**
- ▶ **no (hidden) gap between students' performance and instructor's expectation**

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Some things to think about...

- ▶ **what is taught is not necessarily learned**
- ▶ **“good” problem solving doesn’t always indicate understanding**
- ▶ **there are many ready-to-implement solutions**
- ▶ **we must act *now!***

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**For a copy of this talk and
additional information:**

<http://mazur-www.harvard.edu>