Confessions of a converted lecturer



Fulbright Workshop on Effective University Teaching Harvard University Cambridge, MA, 30 June 2010

My message

shift focus from "teaching" to helping students learn



• Education

Outline

• Education

Peer Instruction

Outline

• Education

Peer Instruction

Results



lectures focus on delivery of information

education is not just information transfer



education is not just information transfer



education is not just information transfer











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

only one quarter of maximum gain realized



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

not transfer but assimilation of information is key



conventional problems misleading



conventional problems misleading

Calculate:

(a) current in 2- Ω resistor

(b) potential difference

between *P* and *Q*





are the basic principles understood?



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?













Give students more responsibility for gathering information...

Give students more responsibility for gathering information... so we can better help them assimilate it.

Includes Class-Tested, Ready-to-Use Resources

FRIC MALUA

A User's Manual

Main features:

- pre-class reading
- in-class: depth, not 'coverage'
- ConcepTests

ConcepTest:

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



is it any good?

first year of implementing PI



first year of implementing PI



first year of implementing PI








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



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



what about problem solving?









So better understanding leads to better problem solving!



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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Traditional indicators of success misleading



Traditional indicators of success misleading

Education is no longer about information

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Peer Instruction: a hands-on workshop



Ready-to-1 Resources C.C. MSTRUCTION N te : Equat -5/5 Fulbright Workshop on Effective University Teaching SIE Harvard University EBIC MAZUA Cambridge, MA, 30 June 2010 10 0

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- only last "click" counts
- display shows recorded answer

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When metals heat up, they expand because all atoms get farther away from each other.



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Consider a rectangular metal plate with a circular hole in it.



Consider a rectangular metal plate with a circular hole in it.

When the plate is uniformly heated, the diameter of the hole

- 1. increases.
- 2. stays the same.
- 3. decreases.




It's easy to fire up the audience!

Let's try it!

remember: all atoms must get farther away from each other!



Let's try it!

remember: all atoms must get farther away from each other!



















What constitutes a good problem?

On a Saturday afternoon, you pull into a parking lot with unmetered spaces near a shopping area. You circle around, but there are no empty spots. You decide to wait at one end of the lot, where you can see (and command) about 20 spaces.

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How long do you have to wait before someone frees up a space?

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Requires:

Assumptions Developing a model Applying that model

On a Saturday afternoon, you pull into a parking lot with unmetered spaces near a shopping area. You circle around, but there are no empty spots. You decide to wait at one end of the lot, where you can see (and command) about 20 spaces. On average people shop for 2 hours.

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Requires:

Applying a (new) model

On a Saturday afternoon, you pull into a parking lot with unmetered spaces near a shopping area, where people are known to shop, on average, for 2 hours. You circle around, but there are no empty spots. You decide to wait at one end of the lot, where you can see (and command) about 20 spaces.

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Requires:

Using a calculator

 $t_{wait} = \frac{T_{shop}}{N_{snar}}$

Need to test meaningful skills!

Setting learning goals



Setting learning goals



approach, not content

focus on understanding

Traditional approach to course planning



Traditional approach to course planning



Traditional approach to course planning













Let's try it!

A boat carrying a large boulder is floating on a small pond. The boulder is thrown overboard and sinks to the bottom of the pond.



Let's try it!

A boat carrying a large boulder is floating on a small pond. The boulder is thrown overboard and sinks to the bottom of the pond.



After the boulder sinks to the bottom of the pond, the level of the water in the pond is

- 1. higher than
- 2. the same as
- 3. lower than

it was when the boulder was in the boat.



We all make mistakes!

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