Turning lectures into learning



Turning Technologies User Conference **Harvard University** Cambridge, MA, 10 October 2010

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Introduction



Introduction

lectures focus on delivery of information

Introduction

lectures focus on delivery of information

but education is more than information transfer

Outline

No



Outline

Peer Instruction

• Let's try it!

• Results



move information transfer out of classroom

assign readingteach by questioning

brief presentation























Outline

Peer Instruction

• Let's try it!

Results

Get your clickers ready!



- no ON/OFF button
- 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.



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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!

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



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





















circumference of a circle = $2\pi \times radius$

Imagine a rope that fits snugly along the equator.



Imagine a rope that fits snugly along the equator.

Suppose the rope is cut and 1 m of rope is inserted between the cut ends. If the rope were to maintain a circular shape, how far off the surface of the Earth would it float?

- 1. the width of a few atoms
- 2. the width of a few hairs
- 3. the height of a curb
- 4. exactly 1 m
- 5. more than 1 m





You all got worked up again!

circumference at equator:

 $2\pi R_{\rm E}$

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 $2\pi R_{\rm E}$

new circumference:

 $2\pi R_{\rm E} + 1 \,{\rm m}$

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 $2\pi R_{\rm E}$

new circumference:

 $2\pi R_{\rm E} + 1 \,{\rm m}$

radius of circle with new circumference:

 $2\pi R = 2\pi R_{\rm E} + 1 \,\mathrm{m}, \text{ and so } R = R_{\rm E} + \frac{1 \,\mathrm{m}}{2\pi}.$

Which of the following airlines tries to save fuel by suggesting that its passengers use the bathroom before boarding?

- **1. Delta Airlines**
- 2. Lufthansa
- 3. All Nippon Airways
- 4. British Midland Airways
- 5. Air France
- 6. JAL
- 7. Aboriginal Air Services
- 8. Aeroflot
- 9. Are you kidding me? None of the above.

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hole in plate

model

circumference

model

airline

fact



hole in plate

model

circumference

model

airline

fact

need to test mental model!

Outline



• Let's try it!

Results

traditional instruction



traditional instruction



traditional instruction



first year of implementing PI



first year of implementing PI



first year of implementing PI





what about problem solving?





better understanding leads to better problem solving



Conclusion

active engagement greatly improves learning gains

Conclusion

active engagement greatly improves learning gains

technology facilitates active engagement

Conclusion

not just a polling tool, but an engagement tool!

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