

Turning lectures into learning



Turning Technologies User Conference
Guildford, Surrey, UK, 27 October 2011



Turning Technologies, LLC
turning ideas into solutions

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Get your clickers ready!

I heard you speak about Peer Instruction:

- 1. yesterday**
- 2. on YouTube**
- 3. some other place**
- 4. I heard you so many times, I could give your talk**
- 5. Peer Instruction?**

How do we learn?

Think of something you are good at — something that you know you do well.

How do we learn?

Think of something you are good at — something that you know you do well.

How did you become good at this?

How do we learn?

Became good at it by:

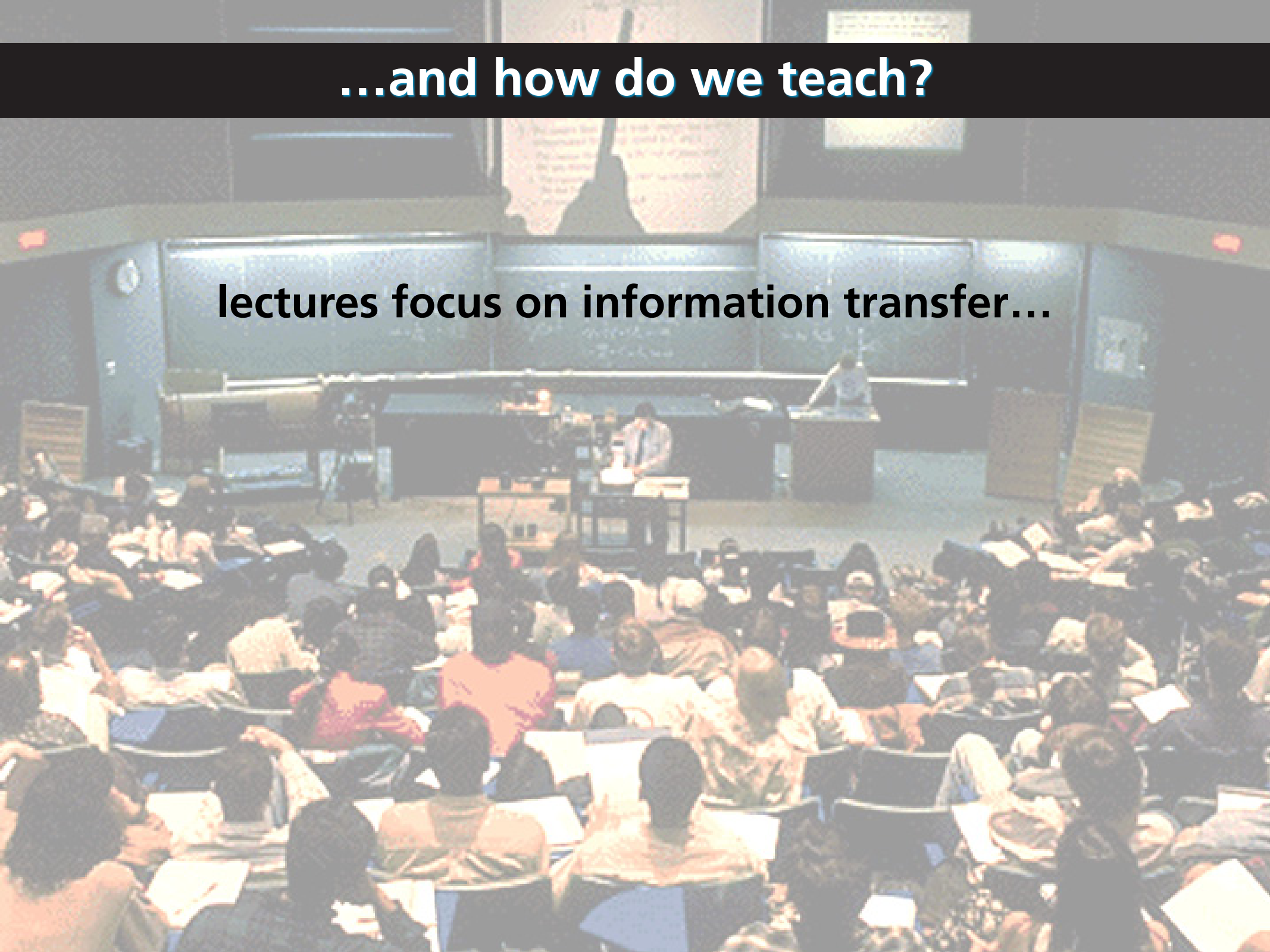
- 1. trial and error**
- 2. lectures**
- 3. practicing**
- 4. apprenticeship**
- 5. other**

...and how do we teach?



...and how do we teach?

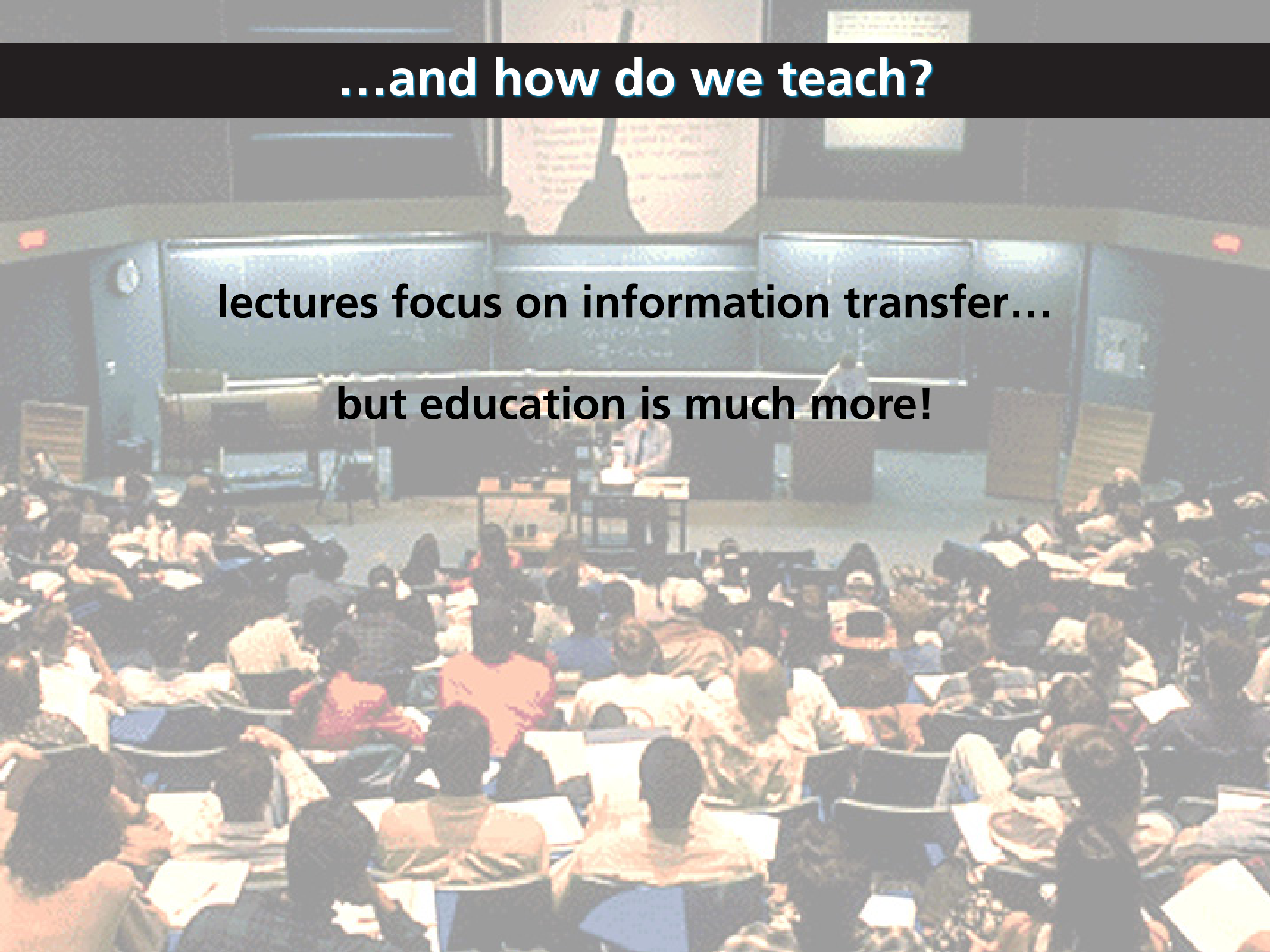
lectures focus on information transfer...



...and how do we teach?

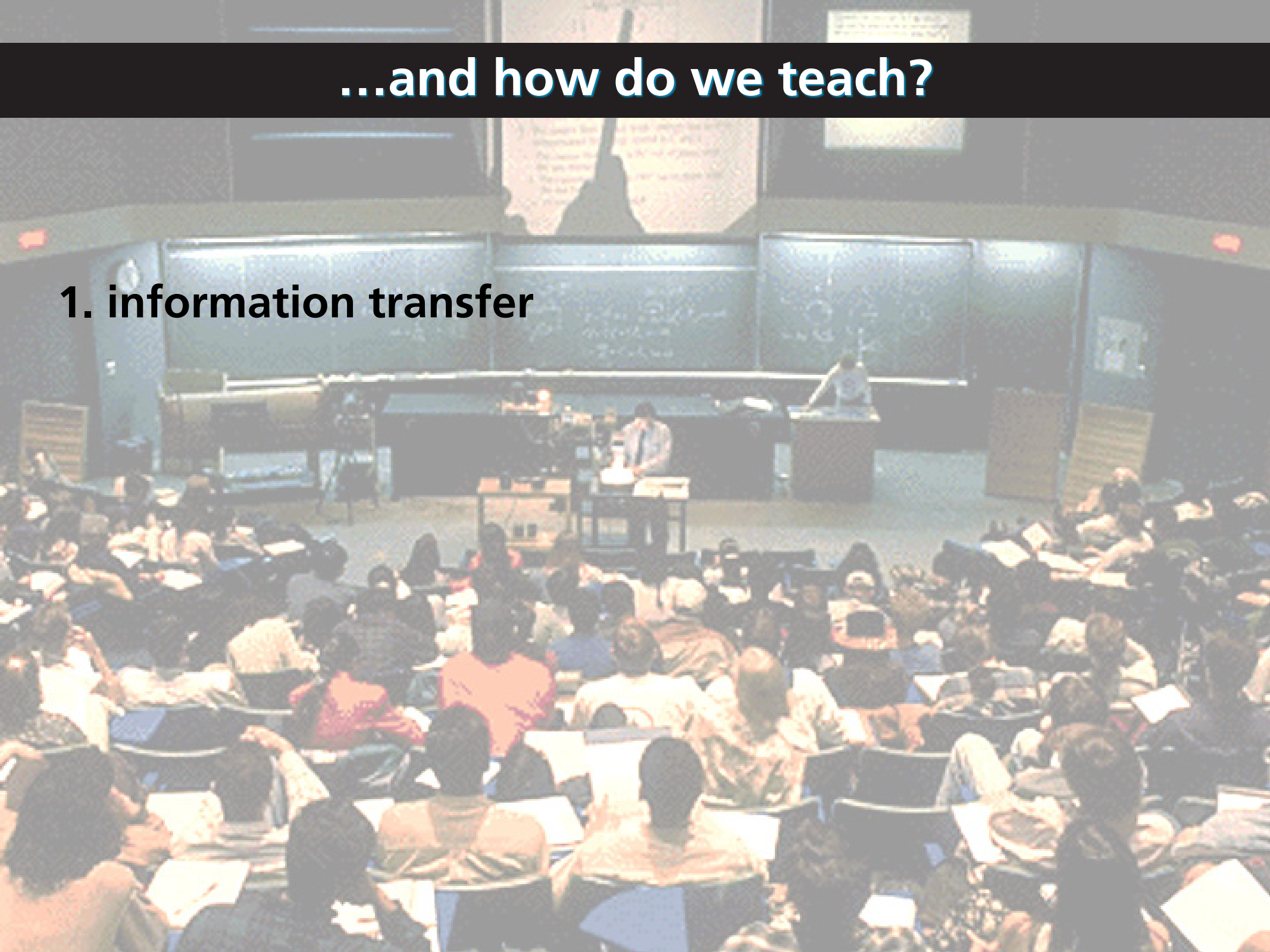
lectures focus on information transfer...

but education is much more!



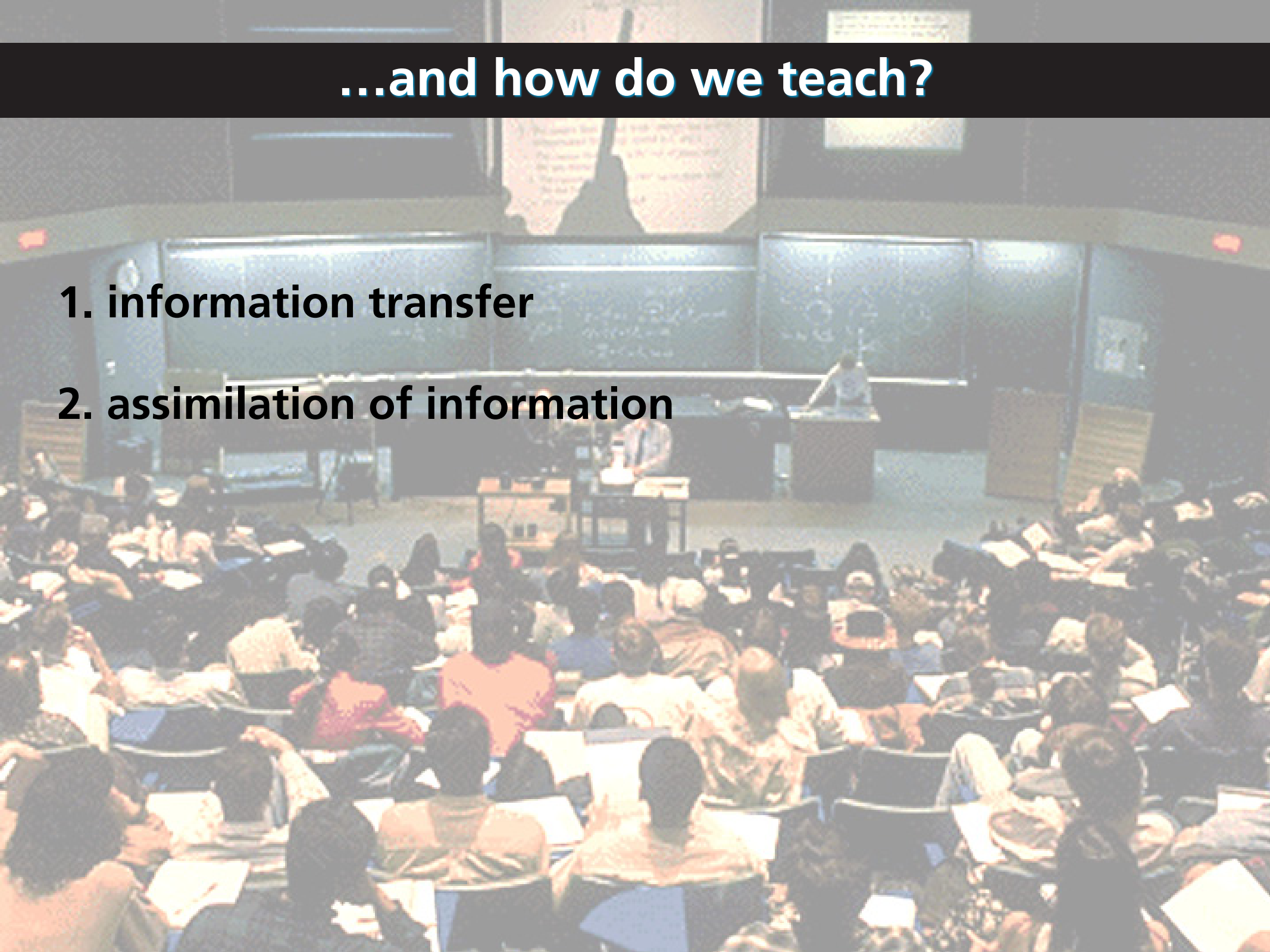
...and how do we teach?

1. information transfer



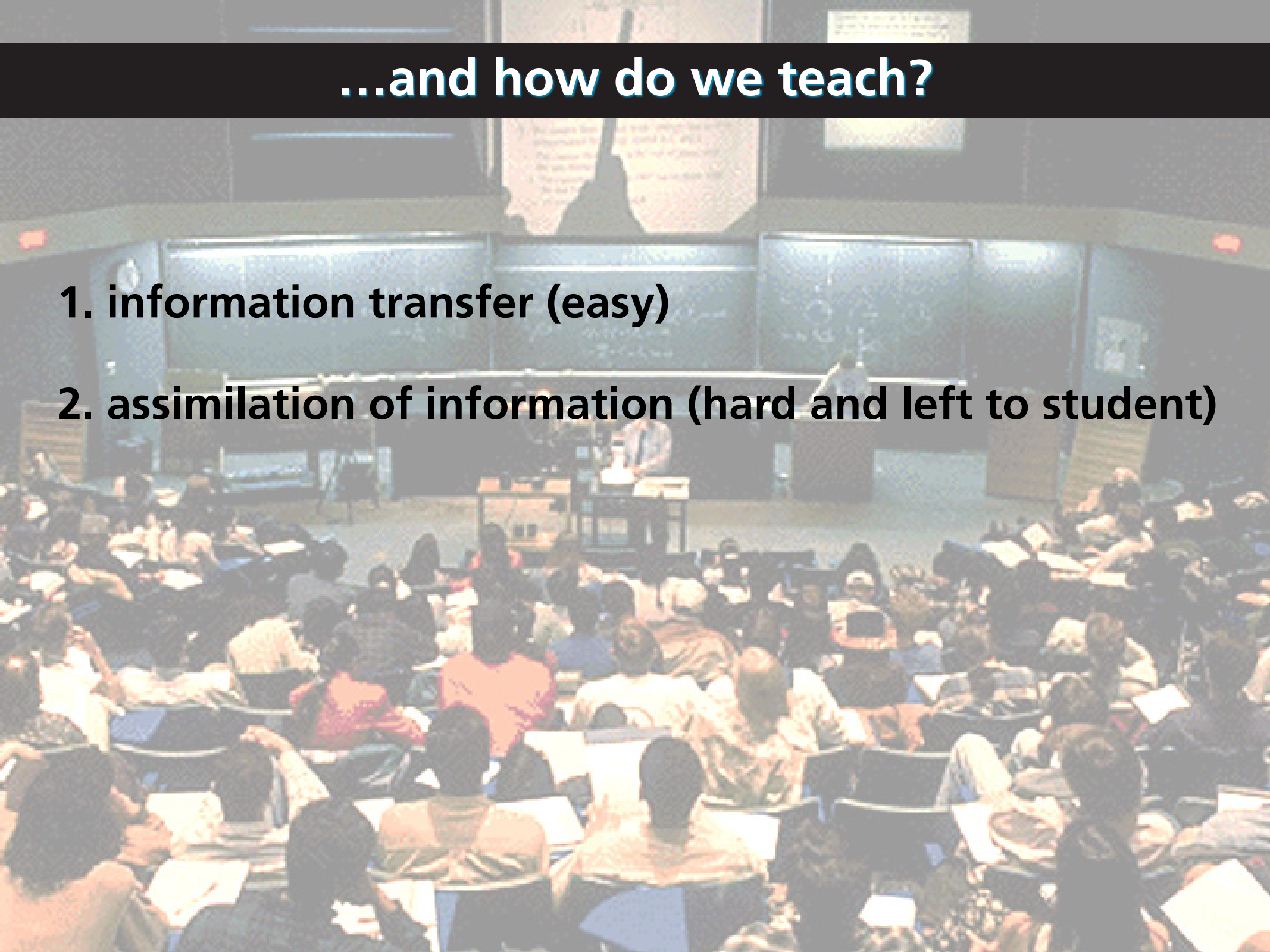
...and how do we teach?

1. information transfer
2. assimilation of information



...and how do we teach?

1. information transfer (easy)
2. assimilation of information (hard and left to student)



Outline



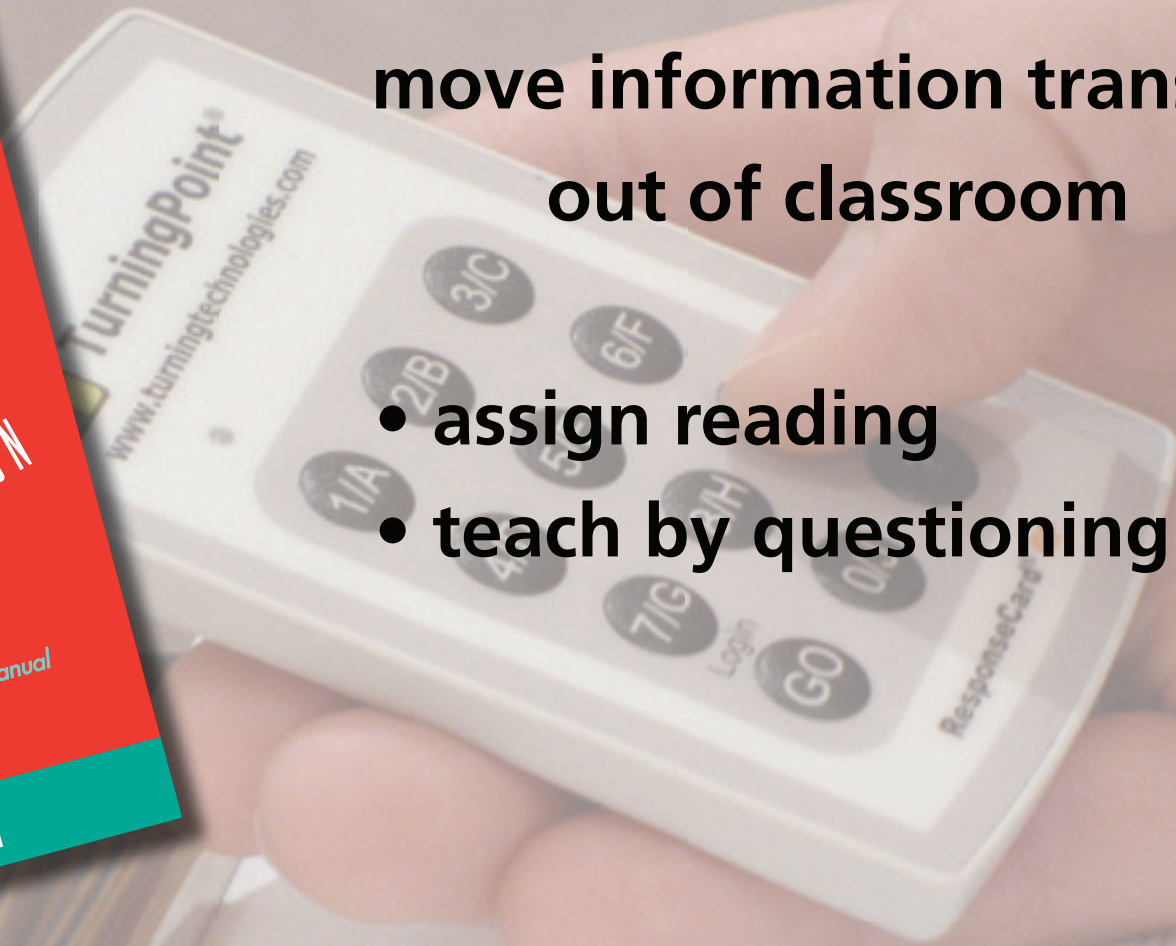
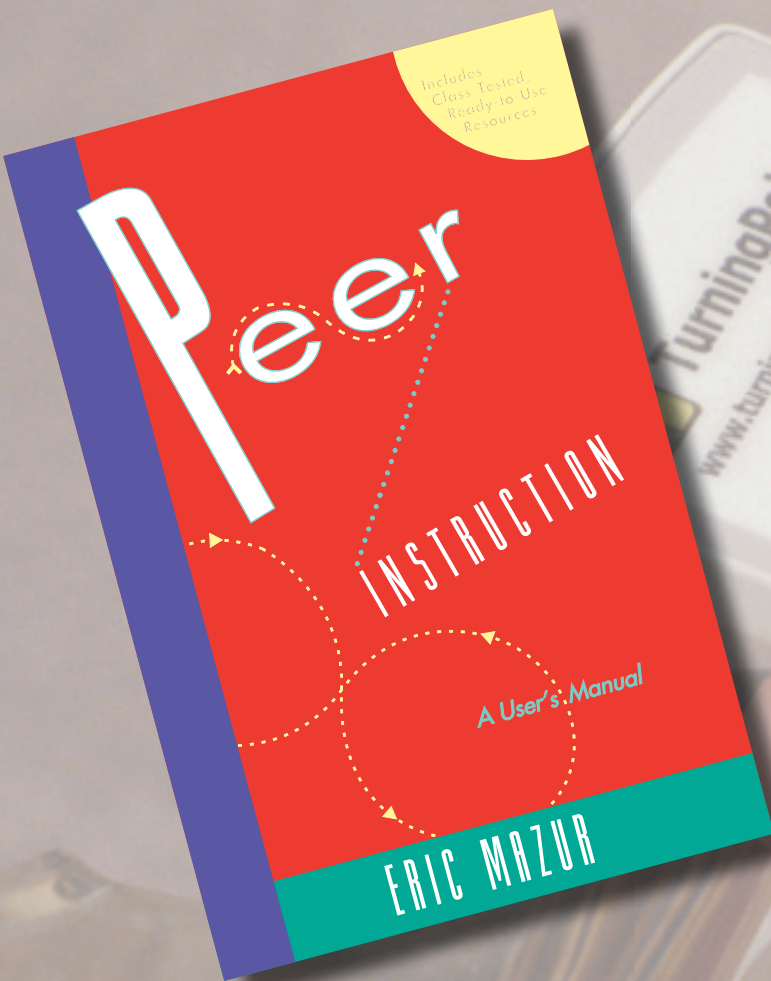
Outline

- Peer Instruction
- Let's try it!
- Results

Peer Instruction

move information transfer
out of classroom

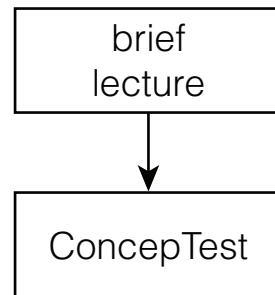
- assign reading
- teach by questioning



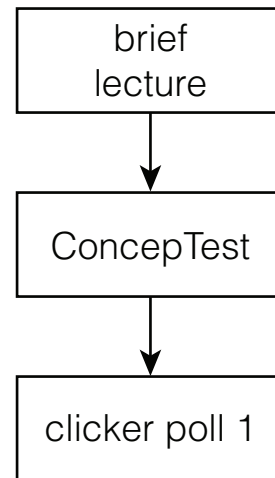
Peer Instruction

brief
lecture

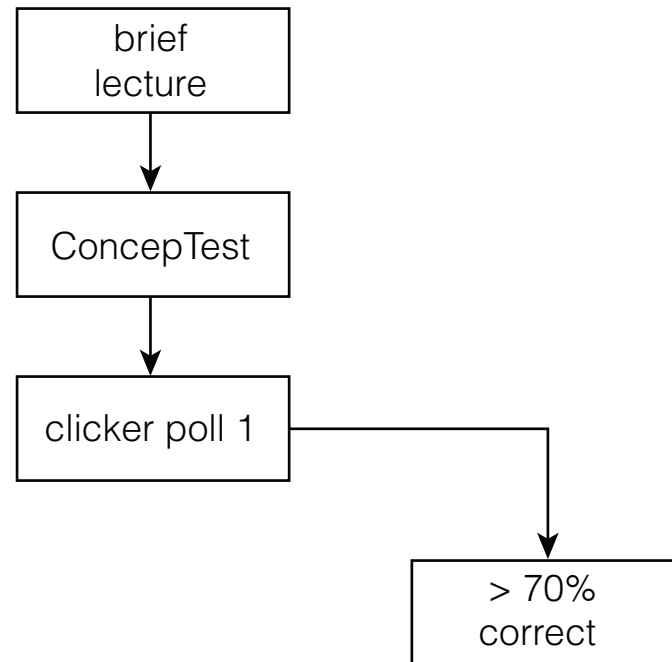
Peer Instruction



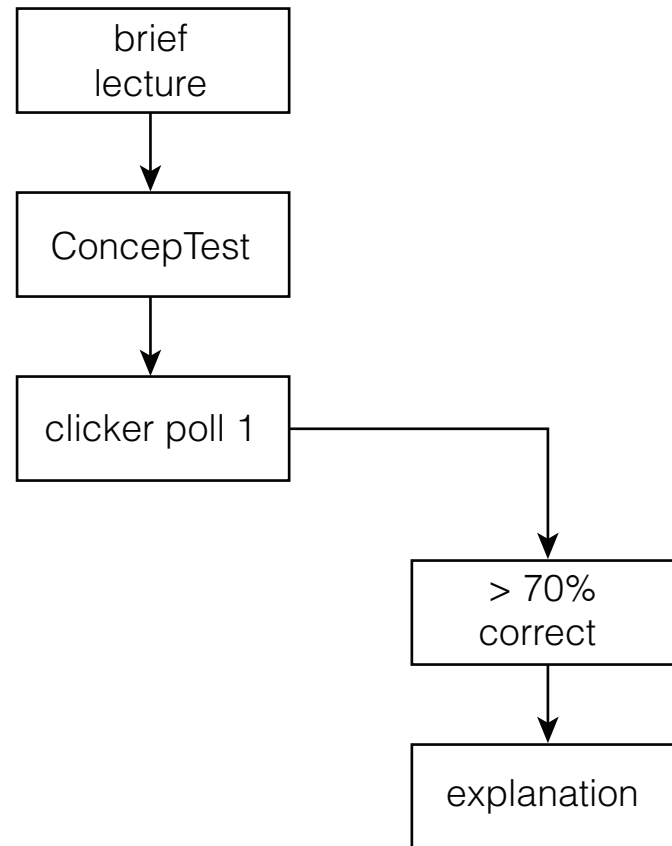
Peer Instruction



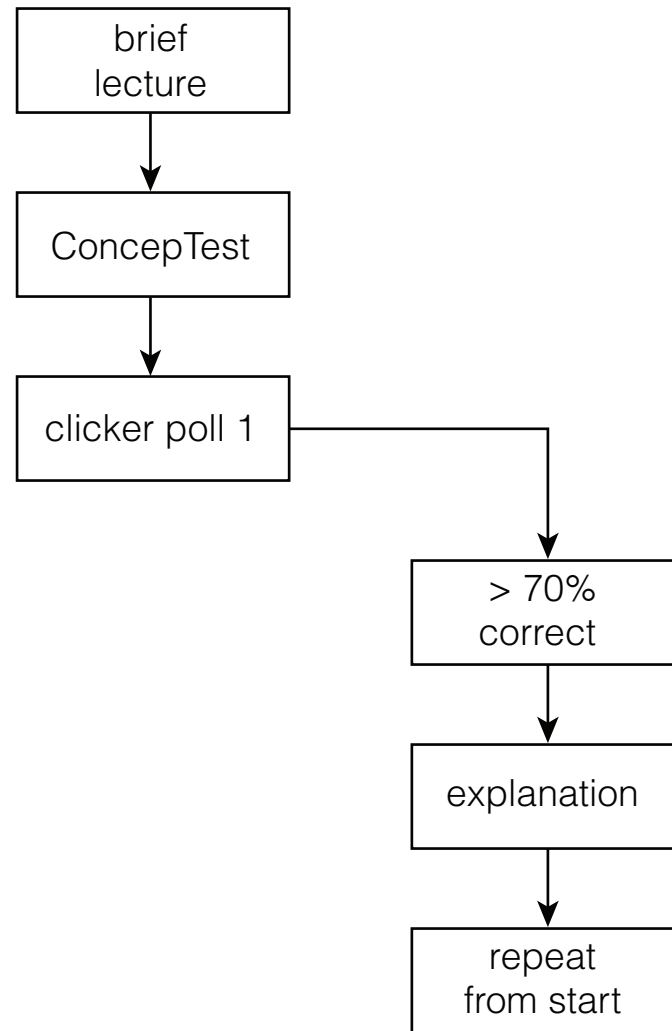
Peer Instruction



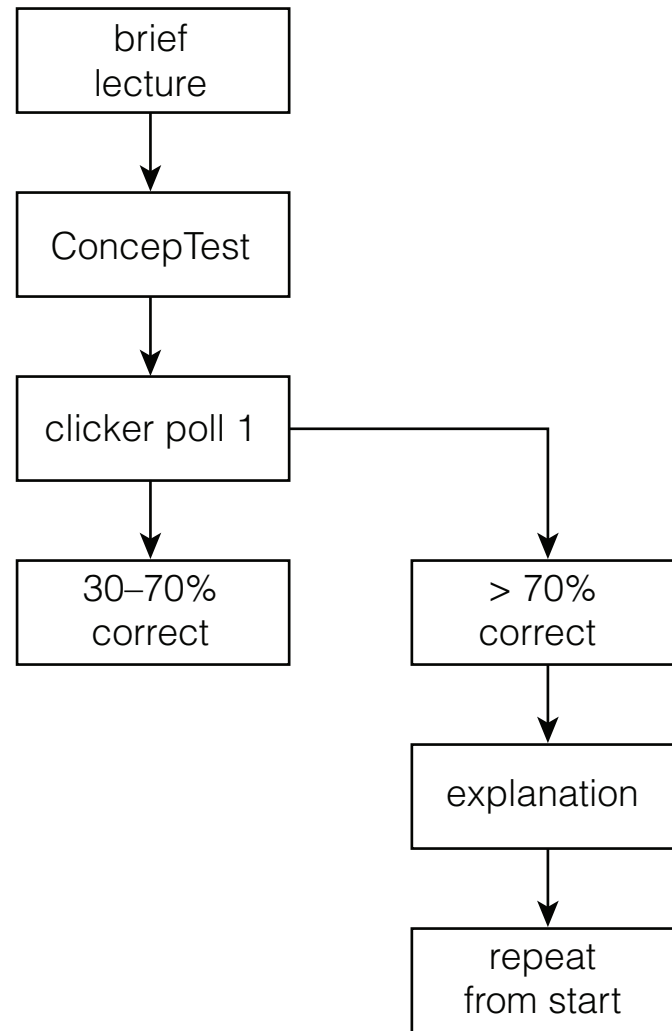
Peer Instruction



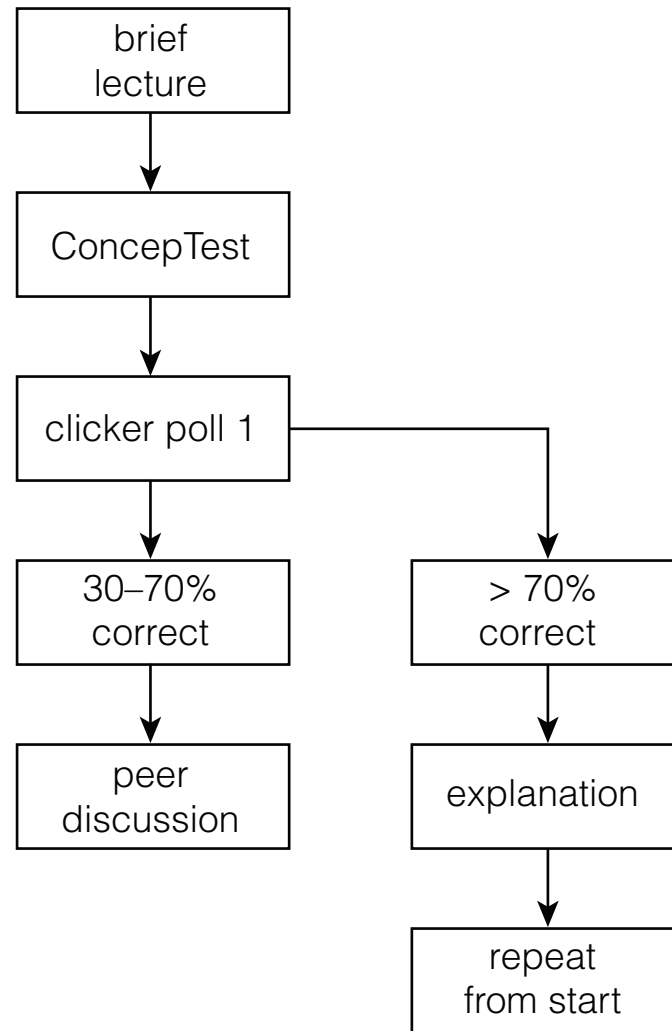
Peer Instruction



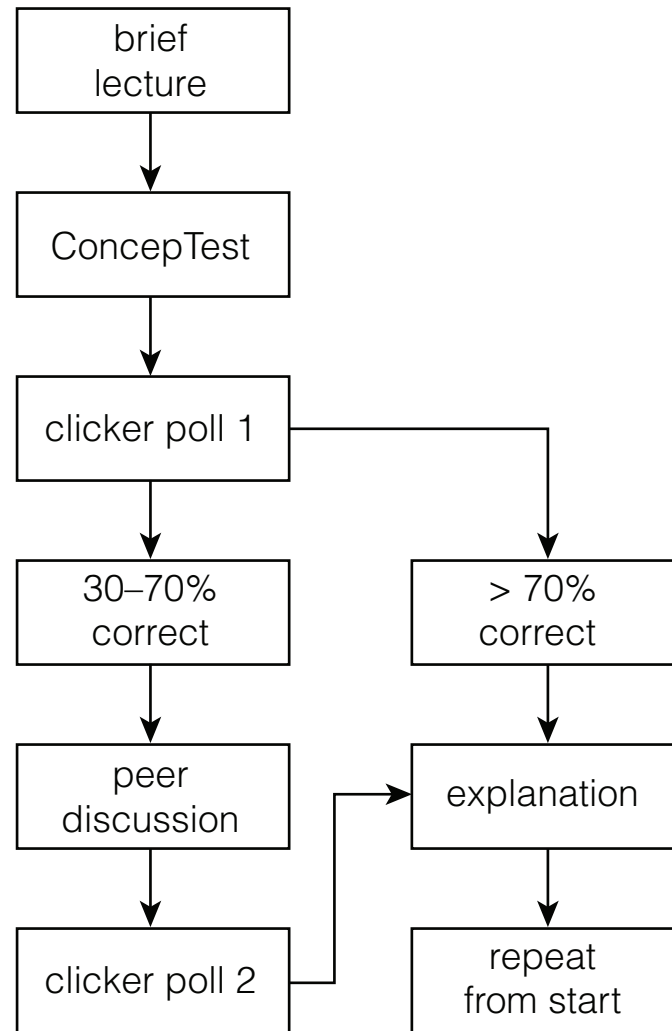
Peer Instruction



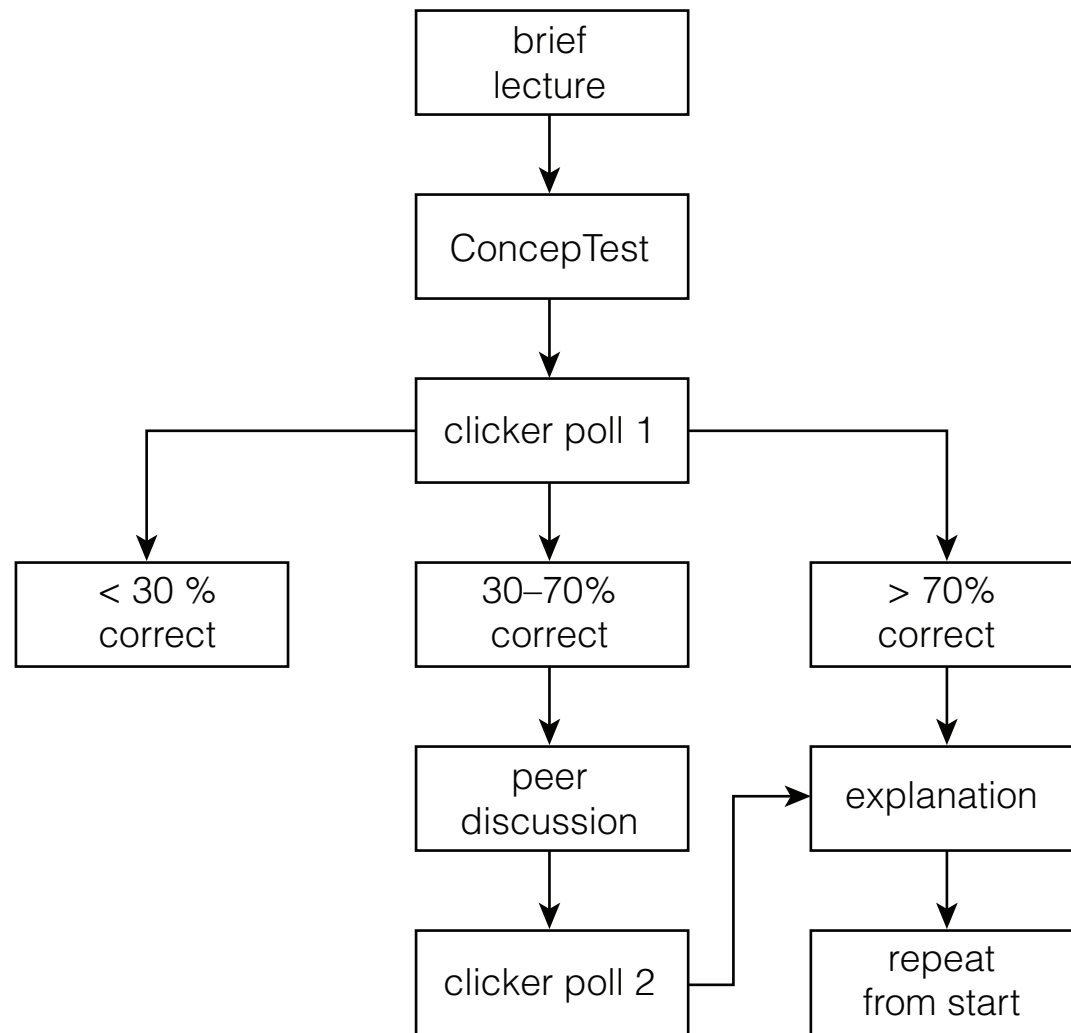
Peer Instruction



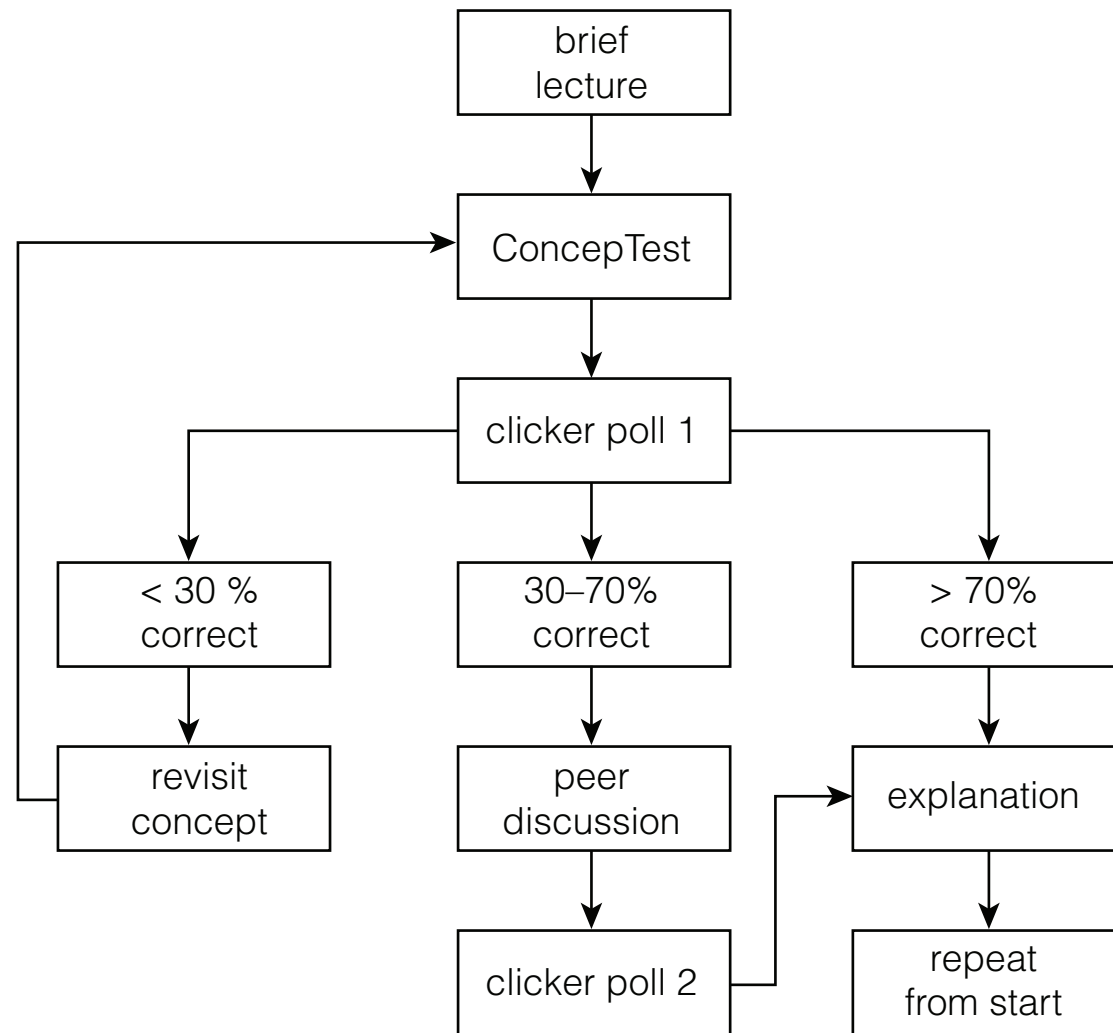
Peer Instruction



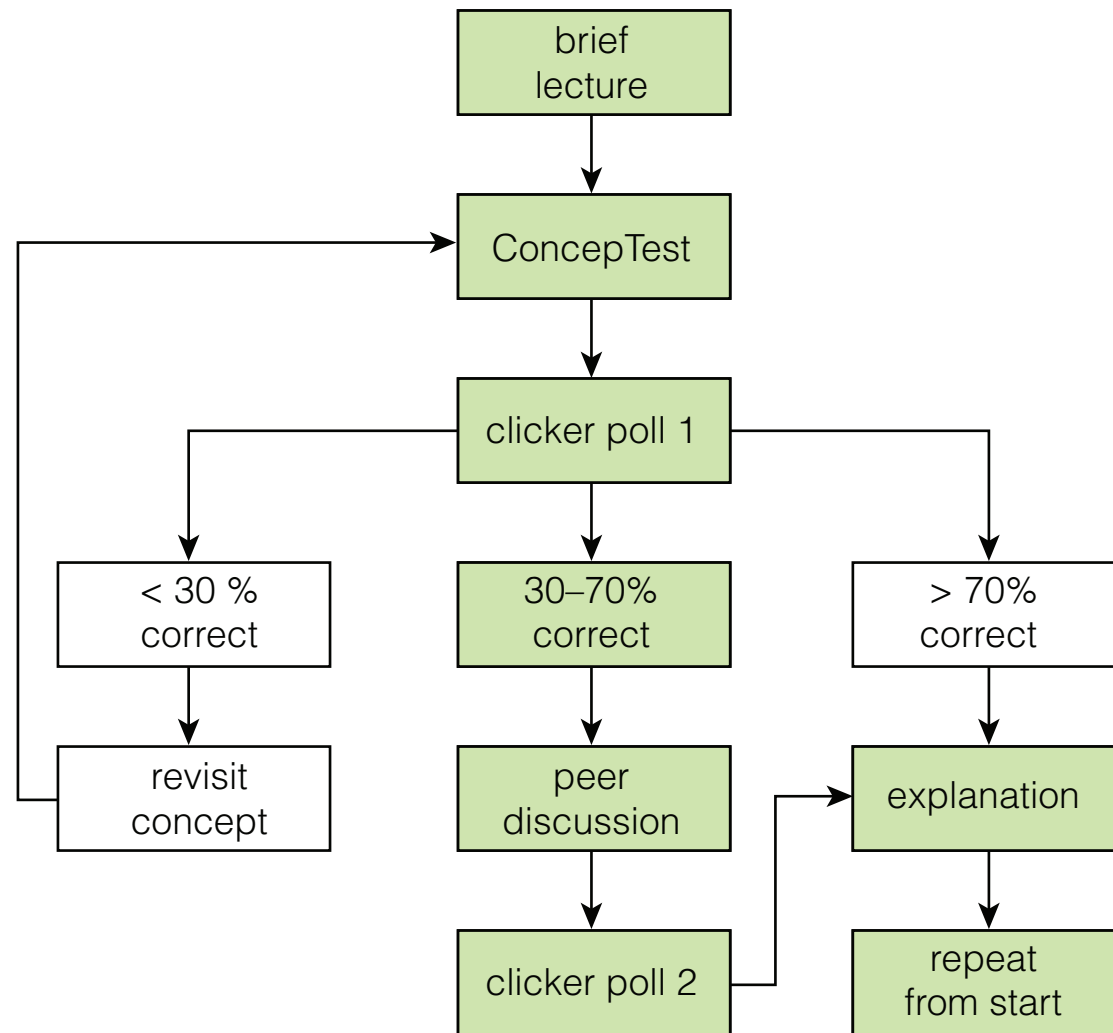
Peer Instruction



Peer Instruction



Peer Instruction



Outline

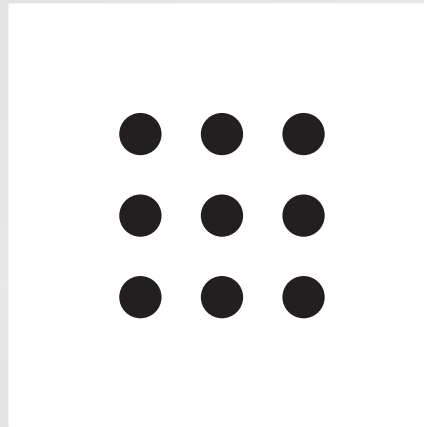
- Peer Instruction
- Let's try it!
- Results

Let's try it!

thermal expansion

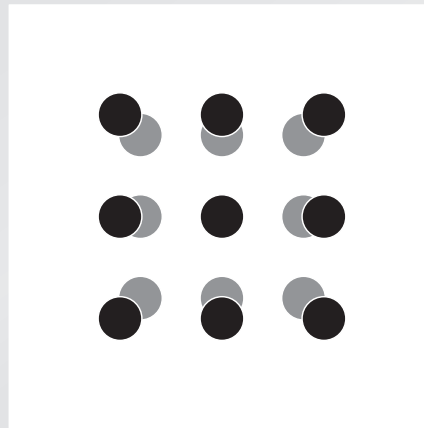
Let's try it!

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



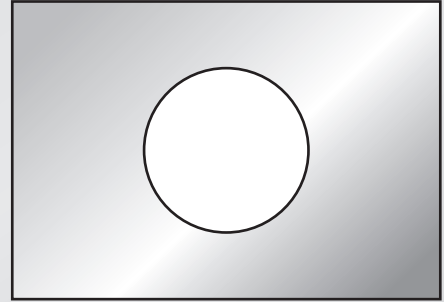
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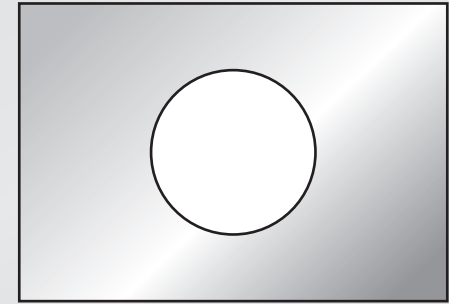
Let's try it!

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



Let's try 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.

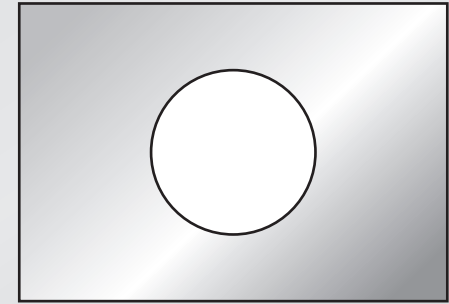


Let's try it!

It's easy to fire up the audience!

Let's try it!

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



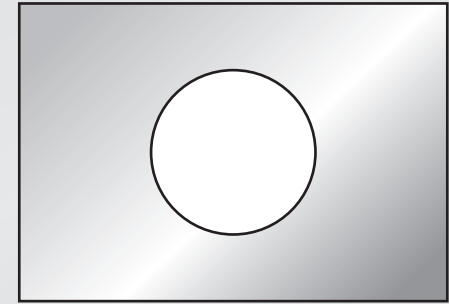
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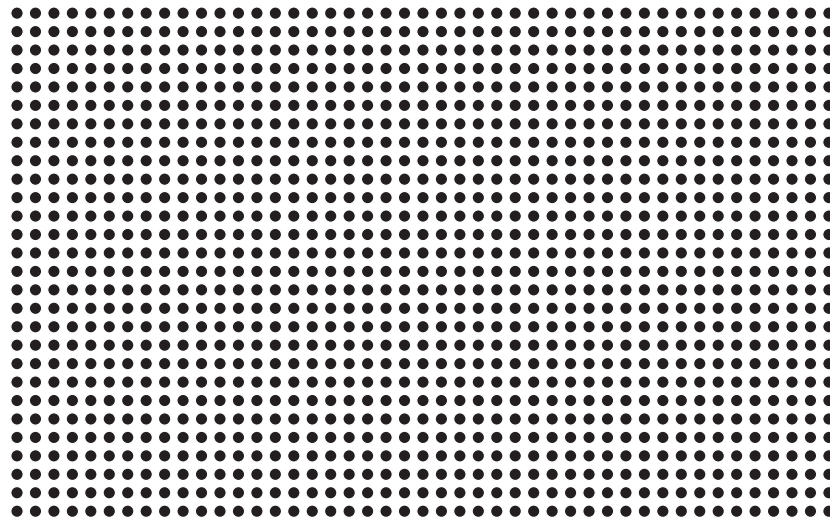
When the plate is uniformly heated, the diameter of the hole

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



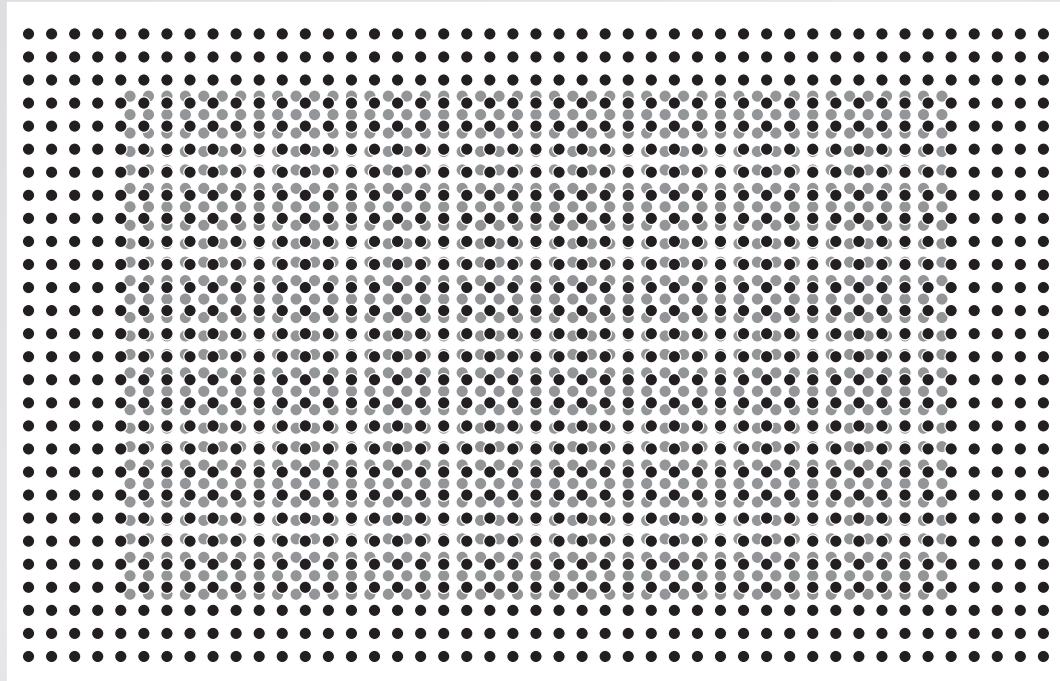
Let's try it!

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



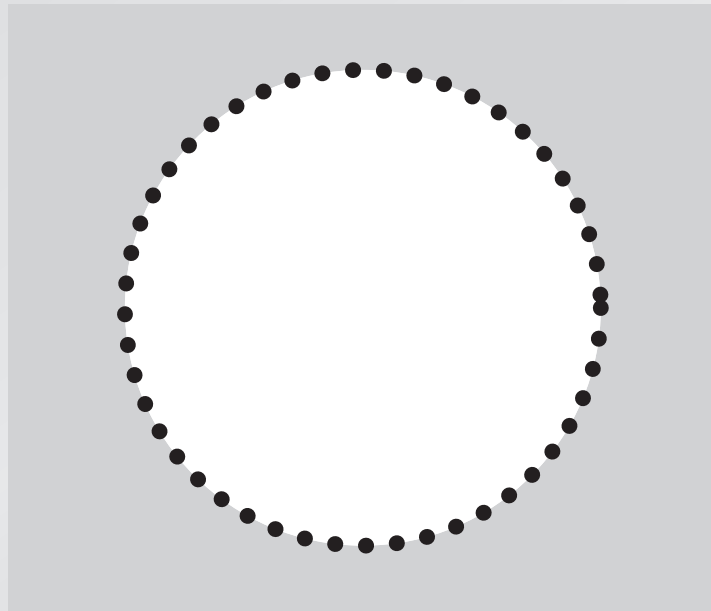
Let's try it!

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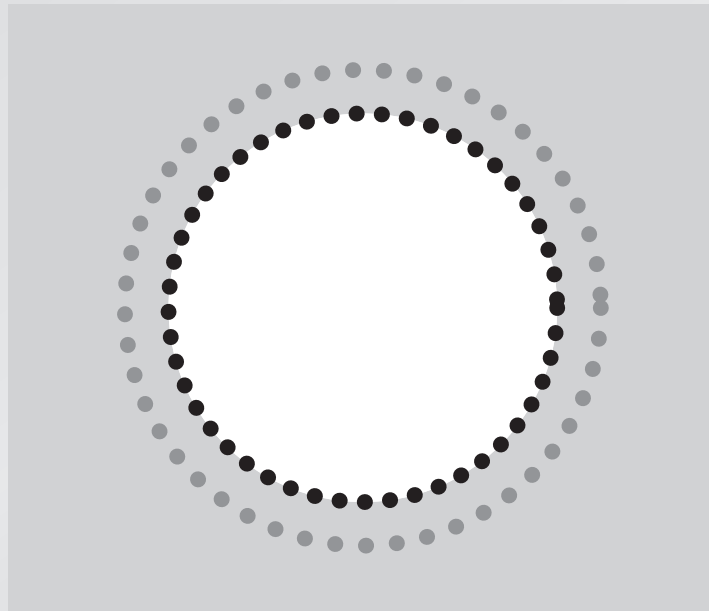
Let's try it!

consider the atoms at the rim of the hole



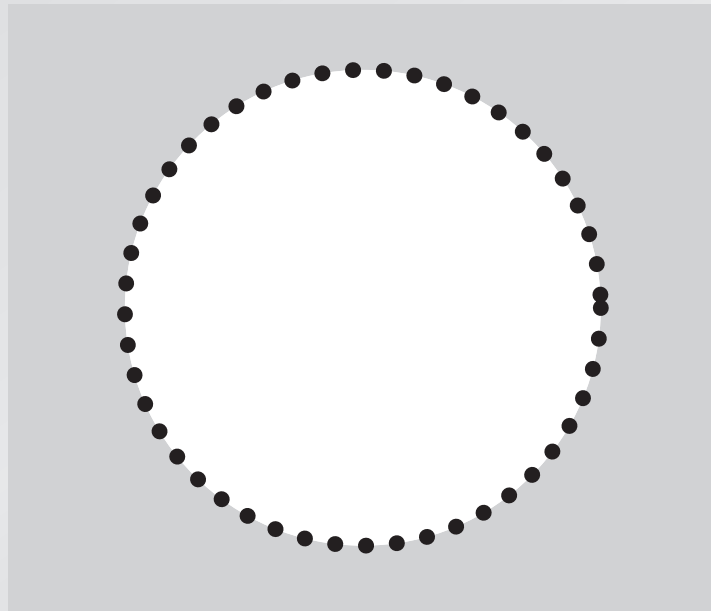
Let's try it!

consider the atoms at the rim of the hole



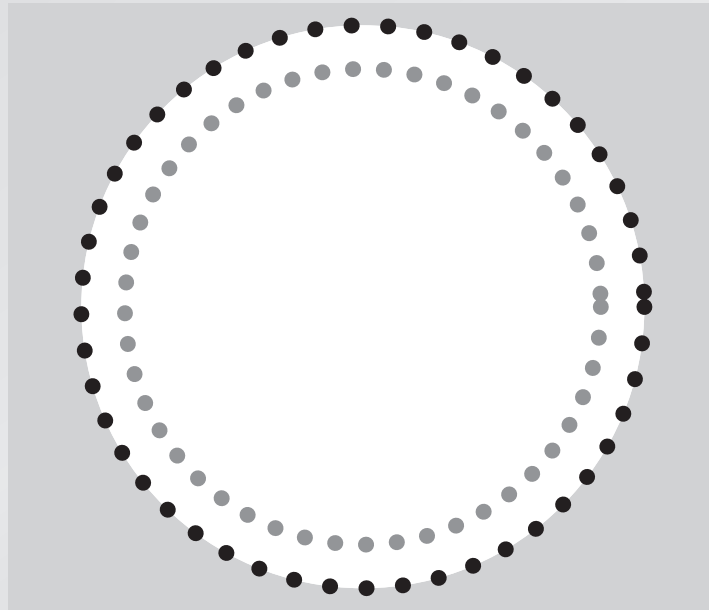
Let's try it!

consider the atoms at the rim of the hole



Let's try it!

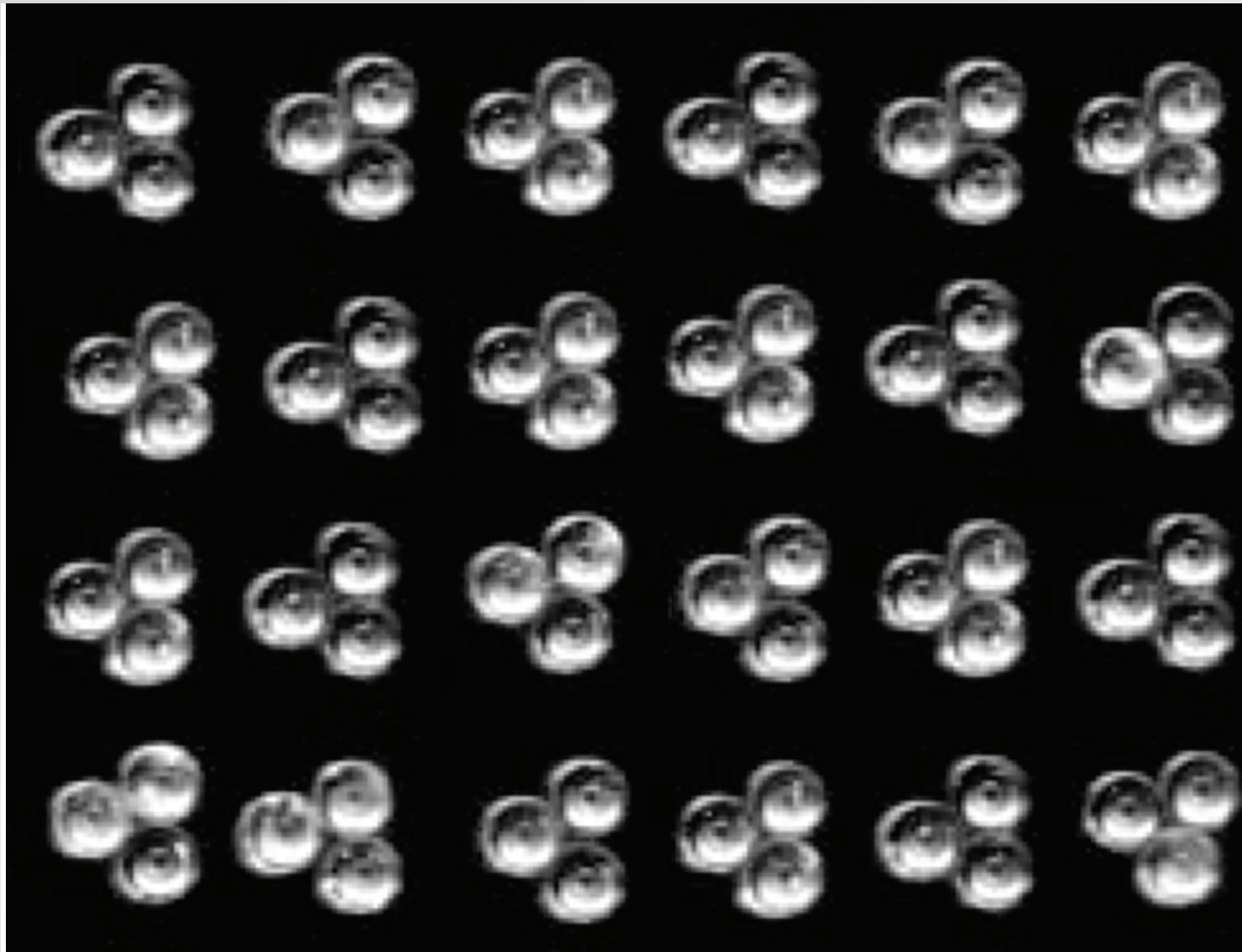
consider the atoms at the rim of the hole



Let's try it!

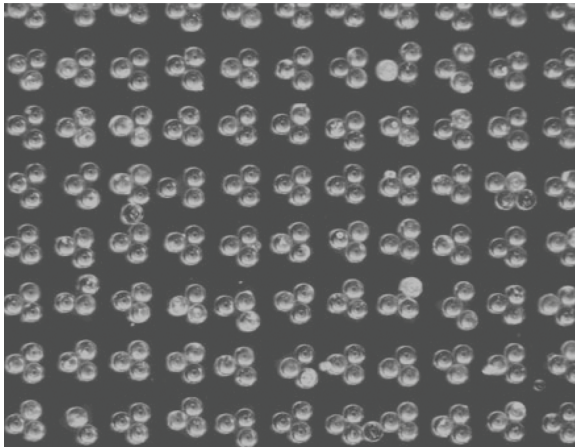
***“Does this method work only with questions
that have a correct answer?”***

Let's try it!

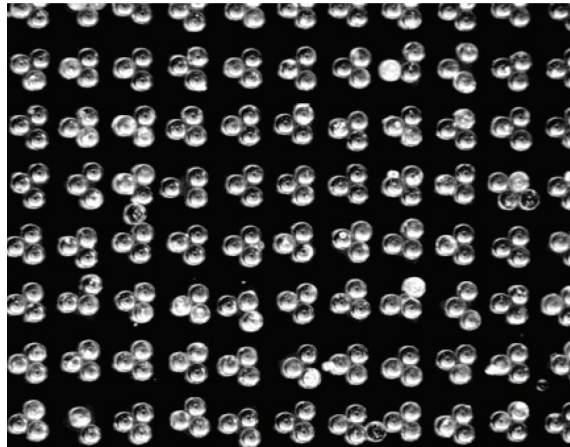


Let's try it!

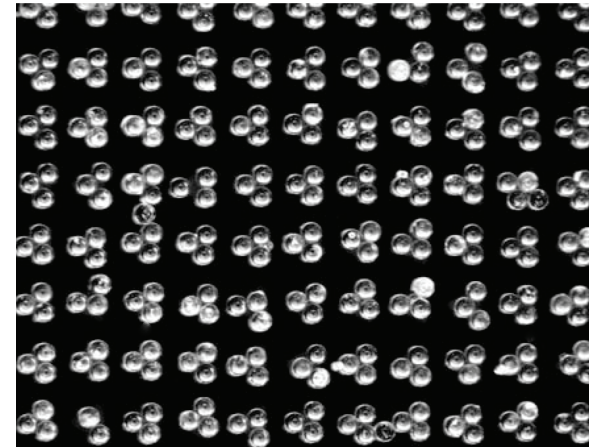
original



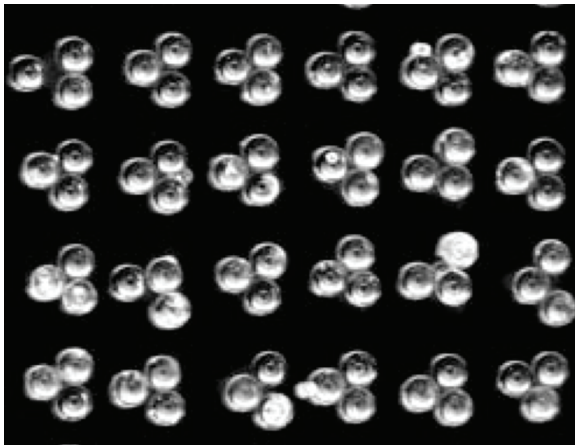
1. adjust contrast



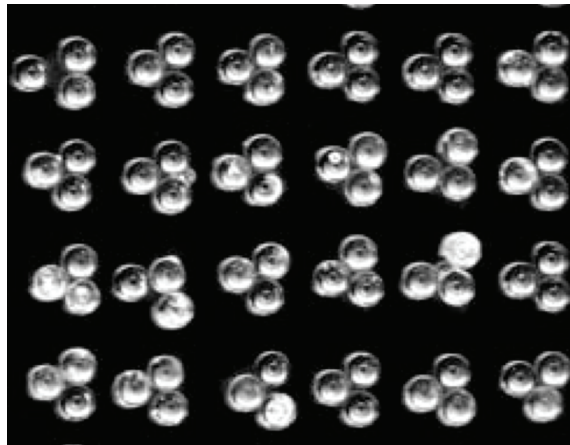
2. remove blemishes



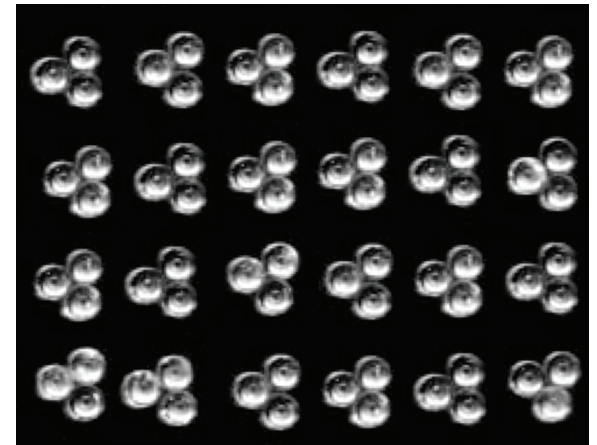
3. crop



4. remove outliers



5. reconstruct



Consider this

a couple of points worth noting:

Consider this

a couple of points worth noting:

- 1. you got engaged**

Consider this

a couple of points worth noting:

- 1. you got engaged**
- 2. no “correct” answer**

Consider this

a couple of points worth noting:

- 1. you got engaged**
- 2. no “correct” answer**
- 3. you got engaged**

Consider this

a couple of points worth noting:

- 1. you got engaged**
- 2. no “correct” answer**
- 3. you got engaged**
- 4. you don’t need a correct answer!**

Let's try it!

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.

Let's try it!

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

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Let's try it!

hole in plate

model

microscopy image

discussion

airline

fact

Let's try it!

hole in plate

model

microscopy image

discussion

airline

fact

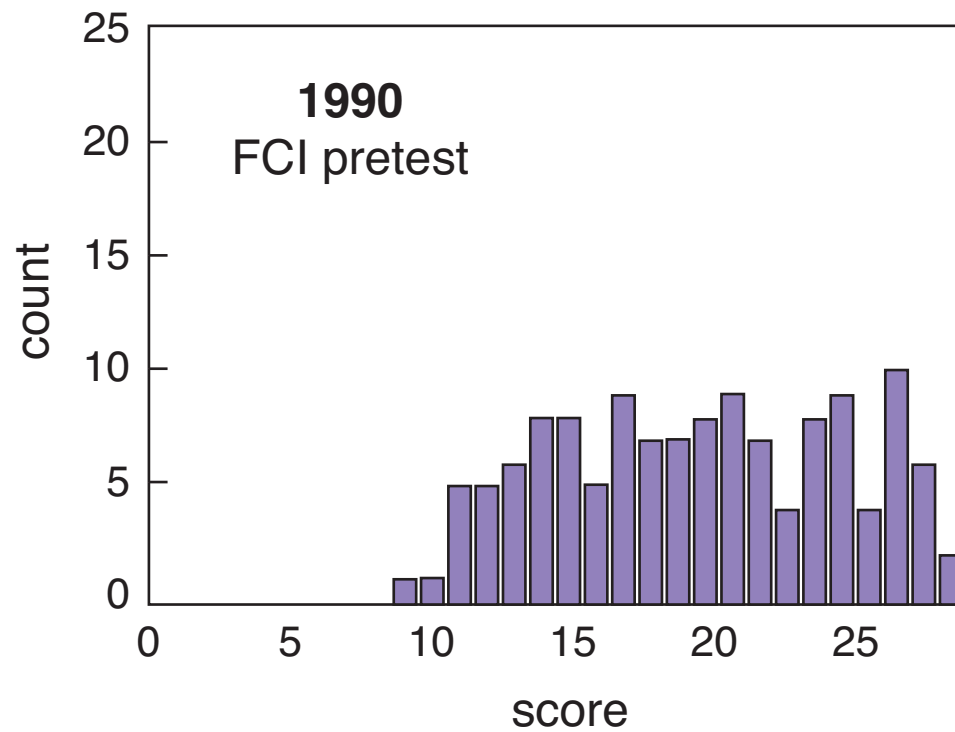
need to test mental model!

Outline

- Peer Instruction
- Let's try it!
- Results

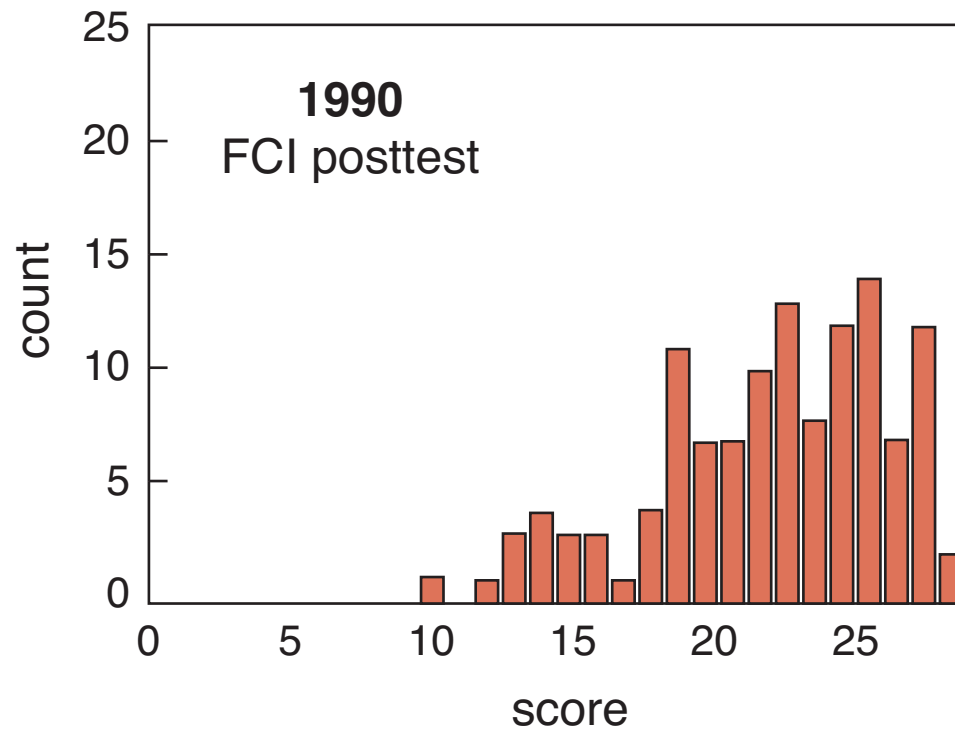
Results

traditional instruction



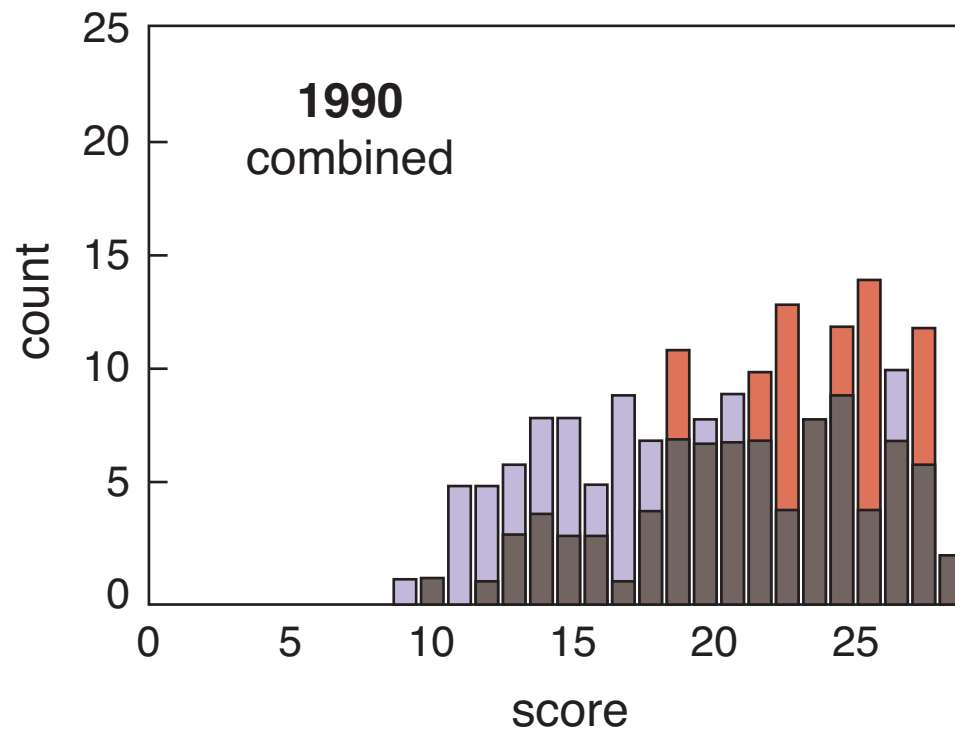
Results

traditional instruction



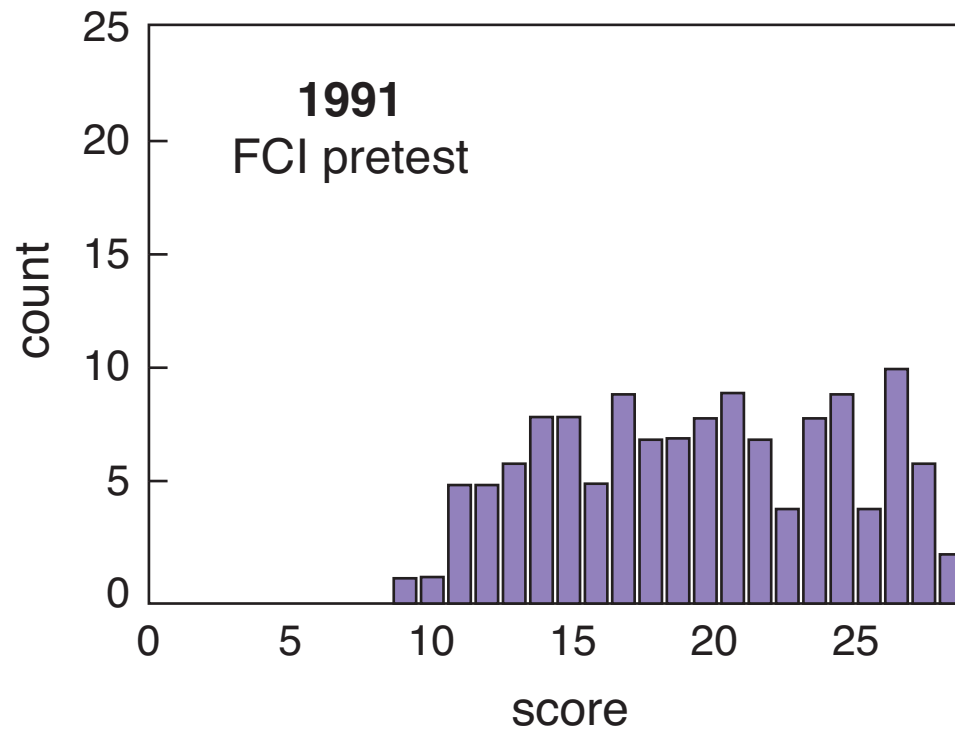
Results

traditional instruction



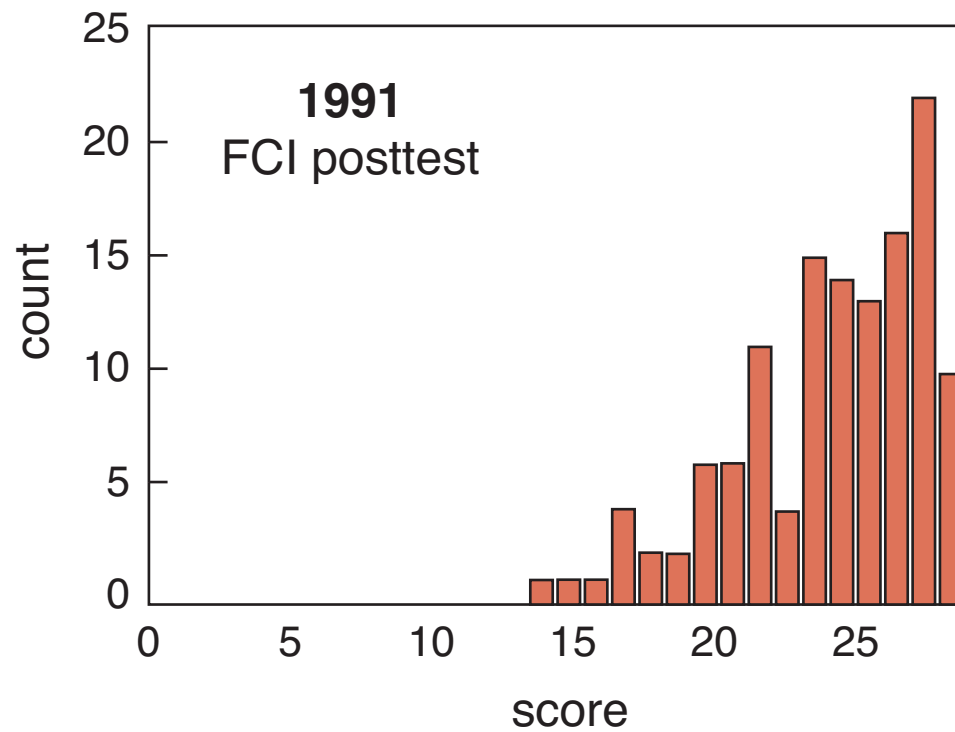
Results

first year of implementing PI



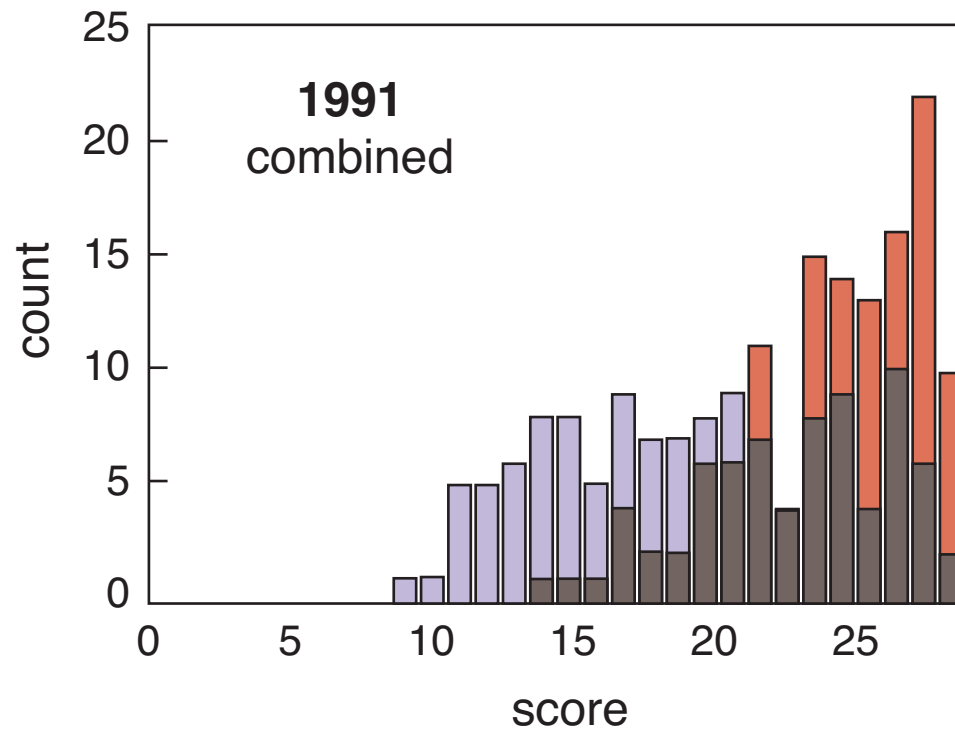
Results

first year of implementing PI



Results

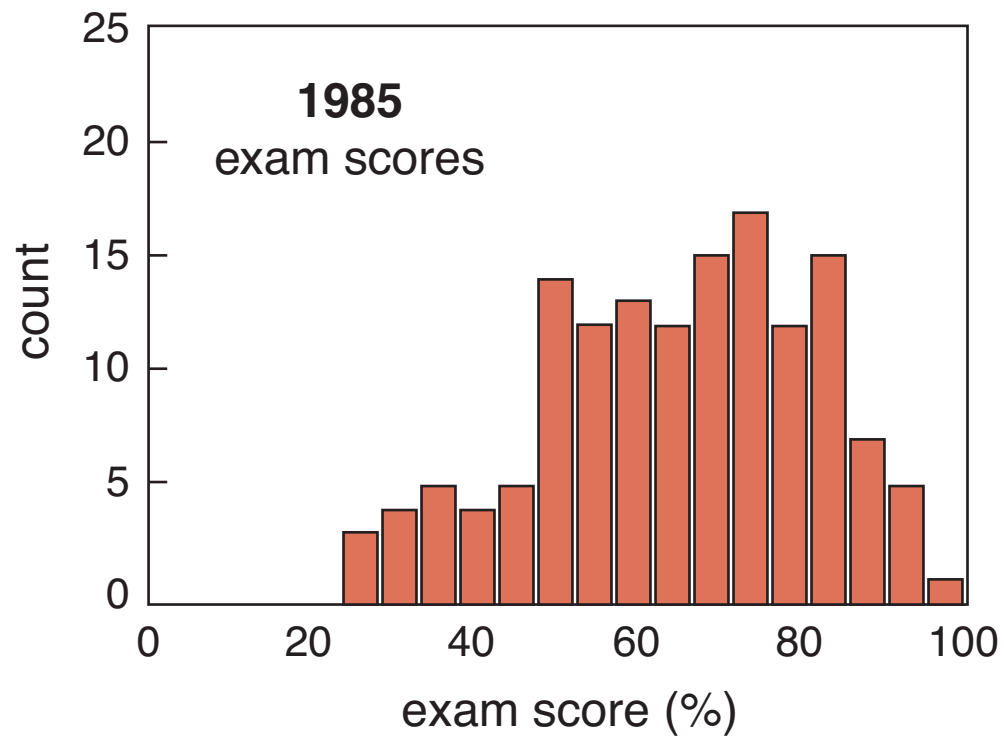
first year of implementing PI



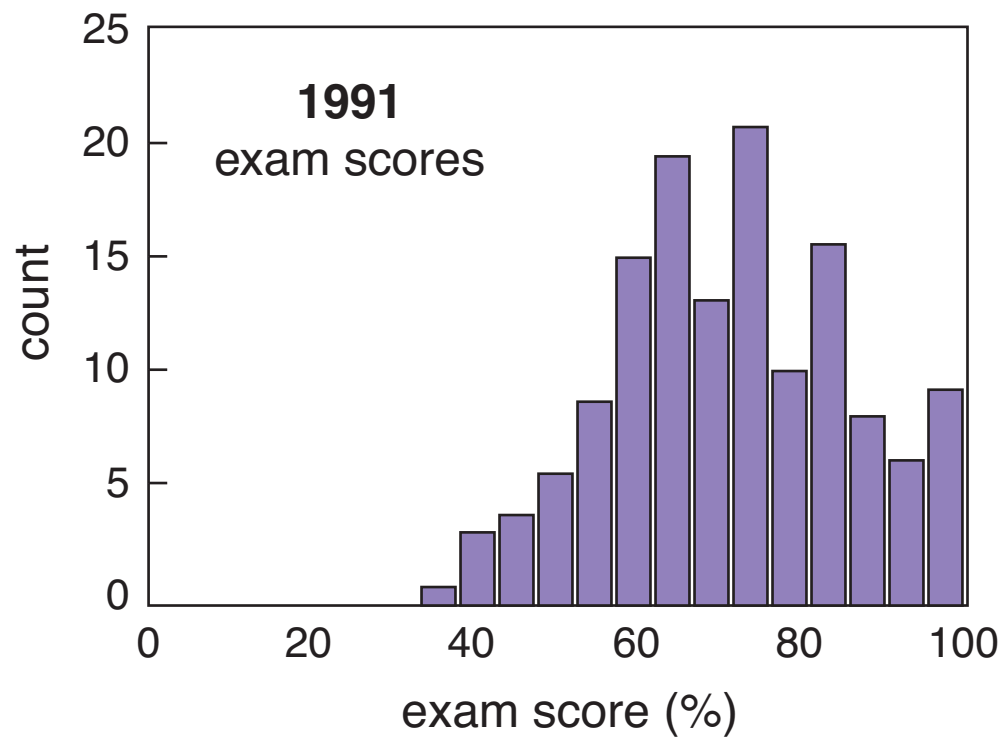
Results

what about problem solving?

Results

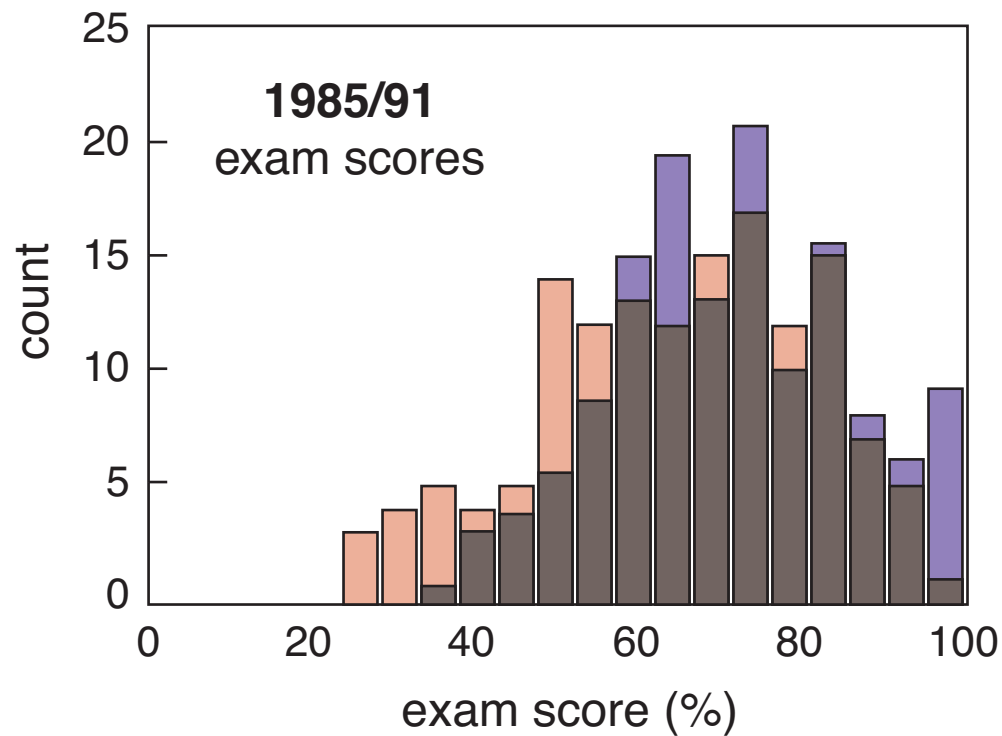


Results



Results

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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Pew Charitable Trust, Pearson/Prentice Hall, Davis Foundation, Engineering Information Foundation, Derek Bok Center for Teaching and Learning, National Science Foundation

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