

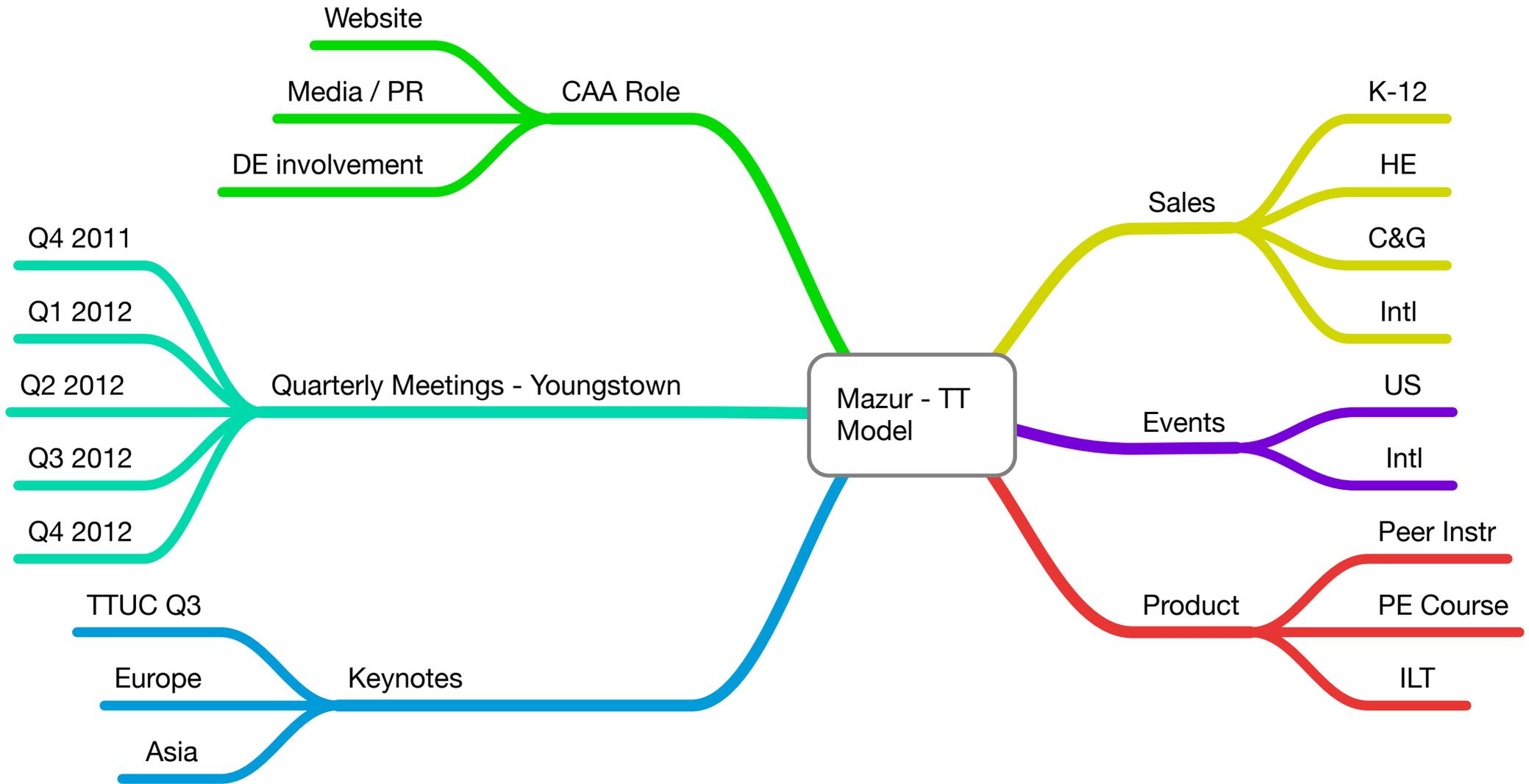
# Turning lectures into learning



Youngstown State University  
Youngstown, OH, 15 December 2011



**Turning Technologies, LLC**  
turning ideas into solutions



# 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:**

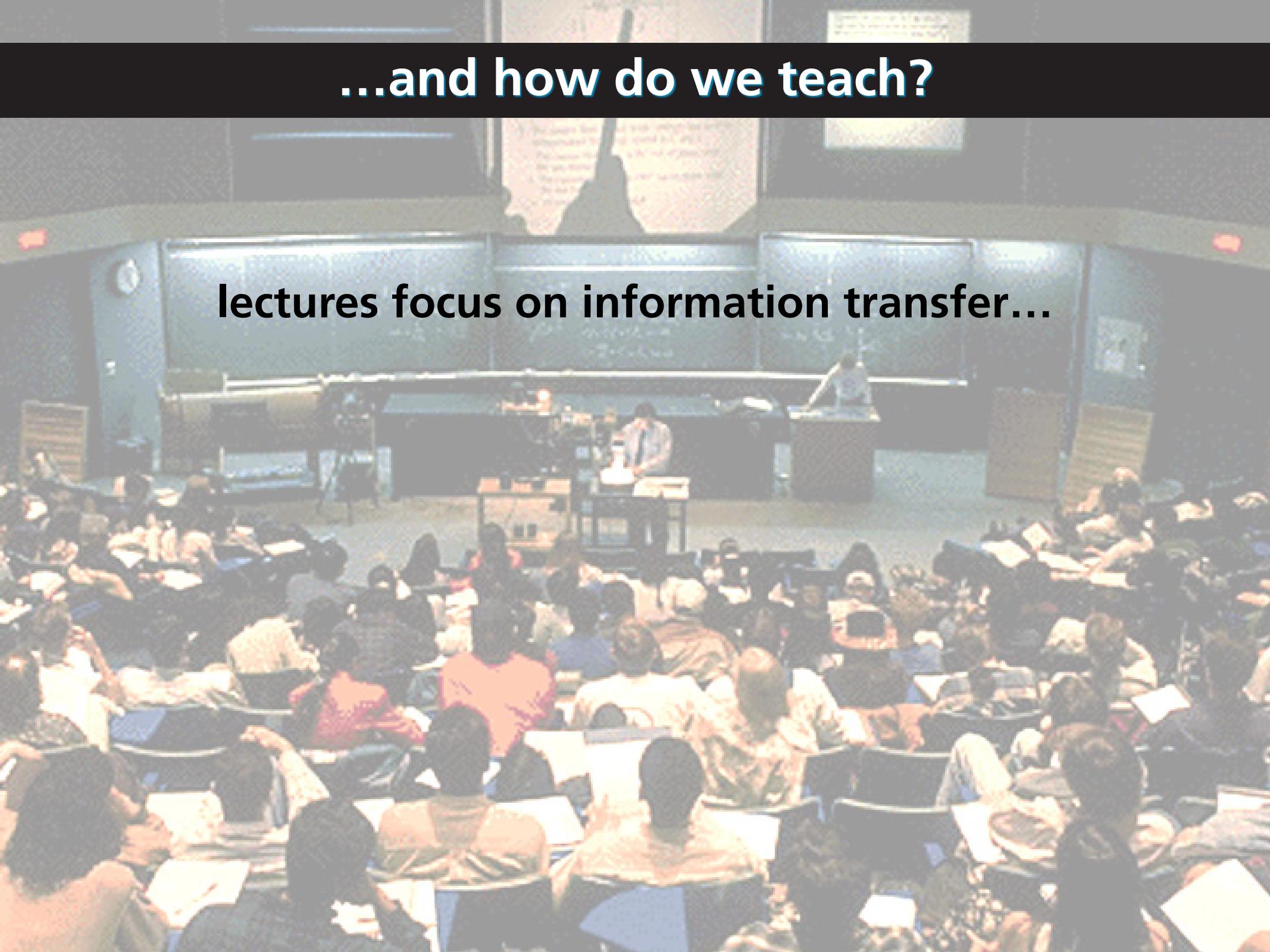
- 1. trial and error**
- 2. lectures**
- 3. practicing**
- 4. apprenticeship**
- 5. other**

...and how do we teach?



**...and how do we teach?**

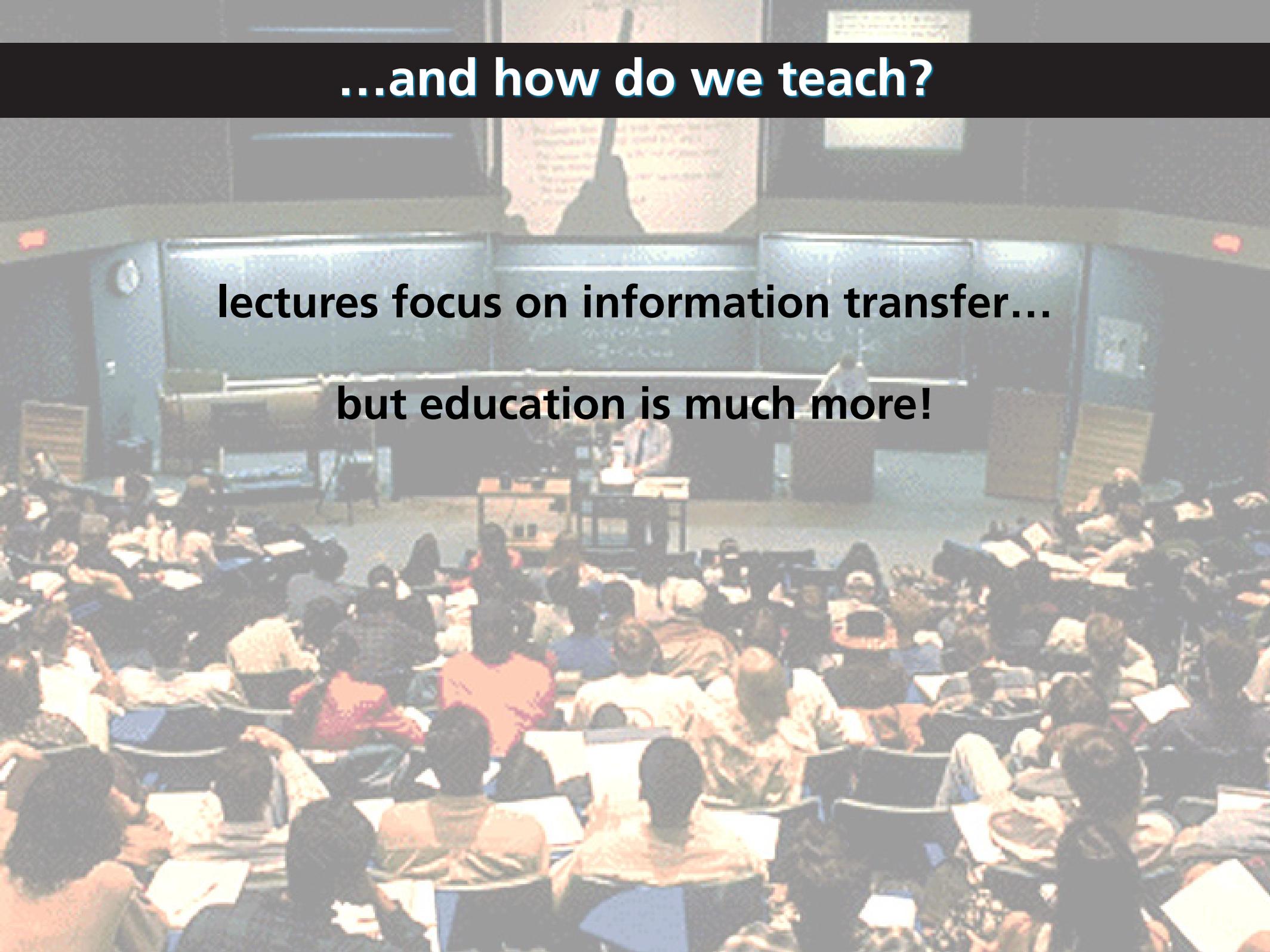
**lectures focus on information transfer...**



**...and how do we teach?**

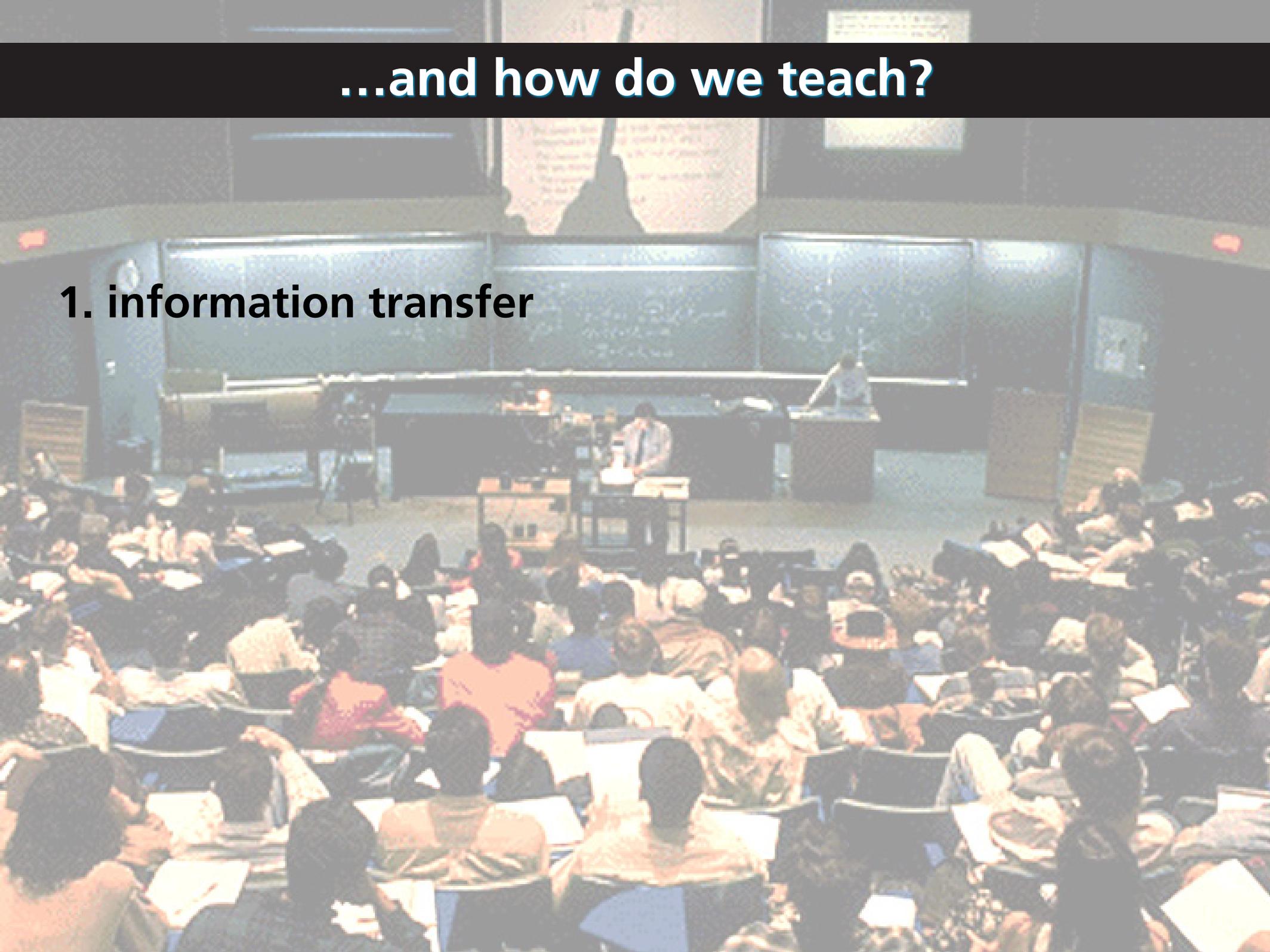
**lectures focus on information transfer...**

**but education is much more!**



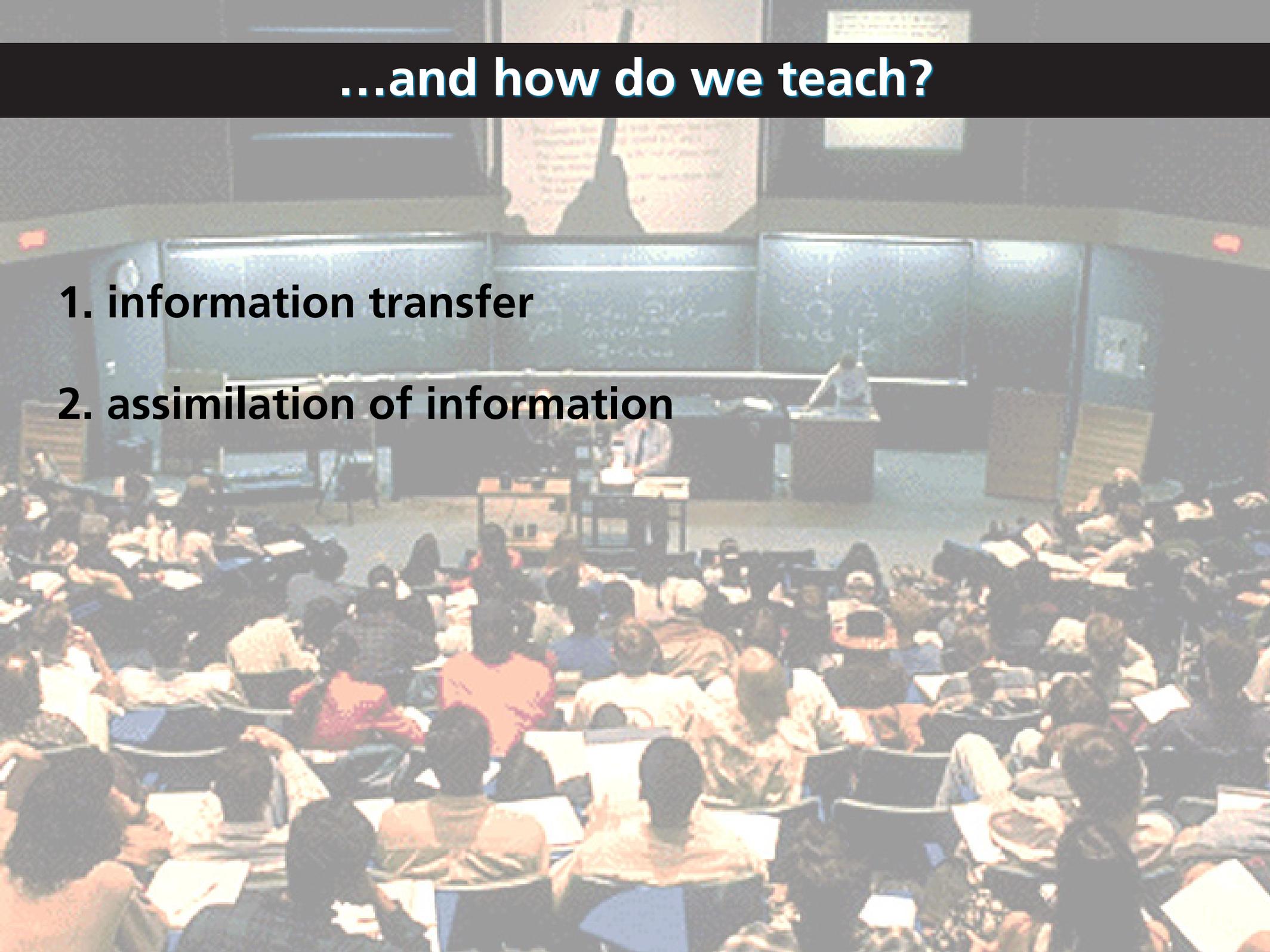
**...and how do we teach?**

**1. information transfer**

A wide-angle photograph of a large lecture hall. At the front of the room, a professor stands at a podium, addressing the class. Behind the podium is a large chalkboard with some faint writing. The room is filled with students seated at long desks, many of whom are looking towards the front. The lighting is somewhat dim, with the main focus on the front of the room.

# ...and how do we teach?

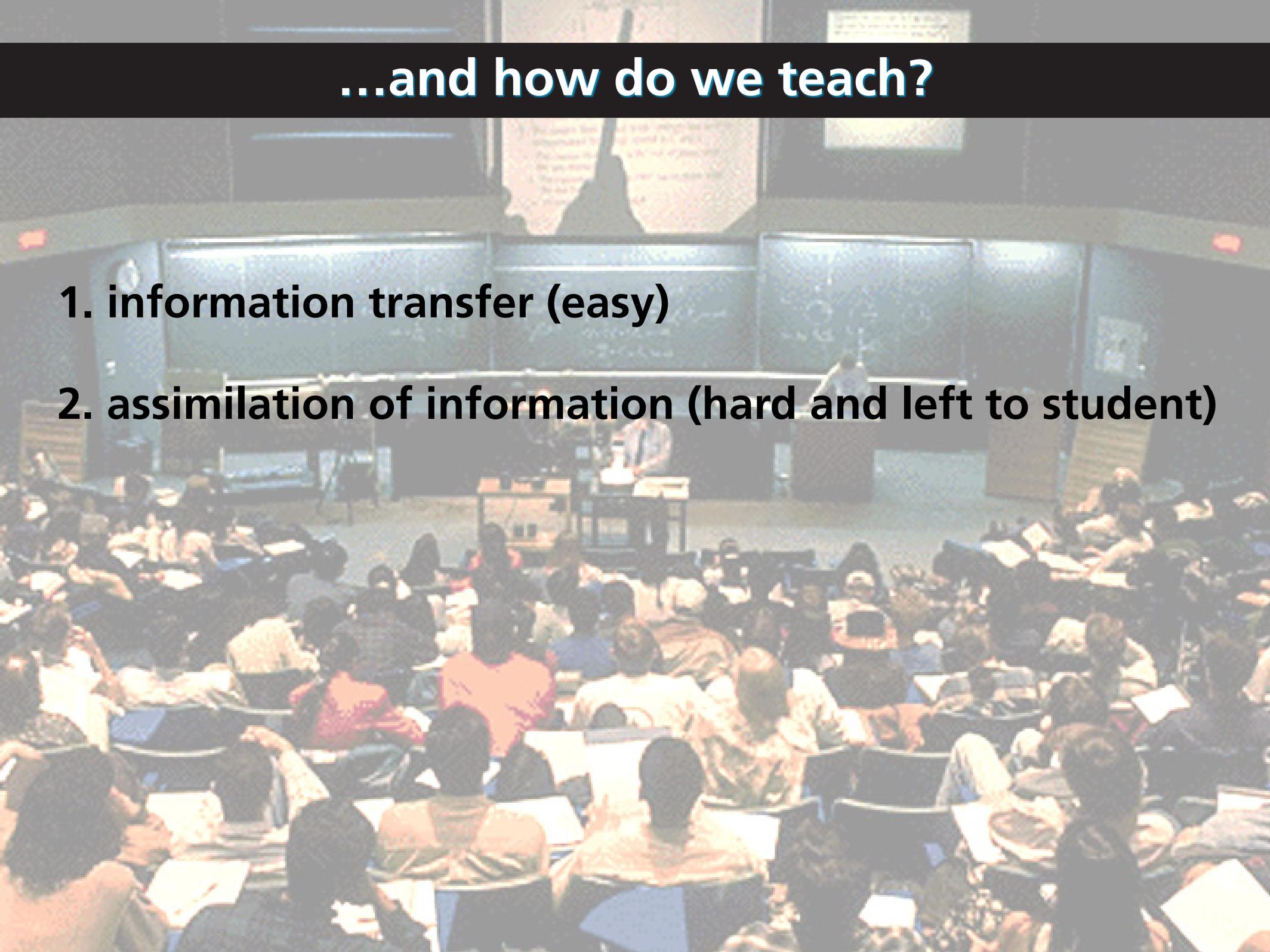
1. information transfer
2. assimilation of information



# ...and how do we teach?

1. information transfer (easy)

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



# Outline



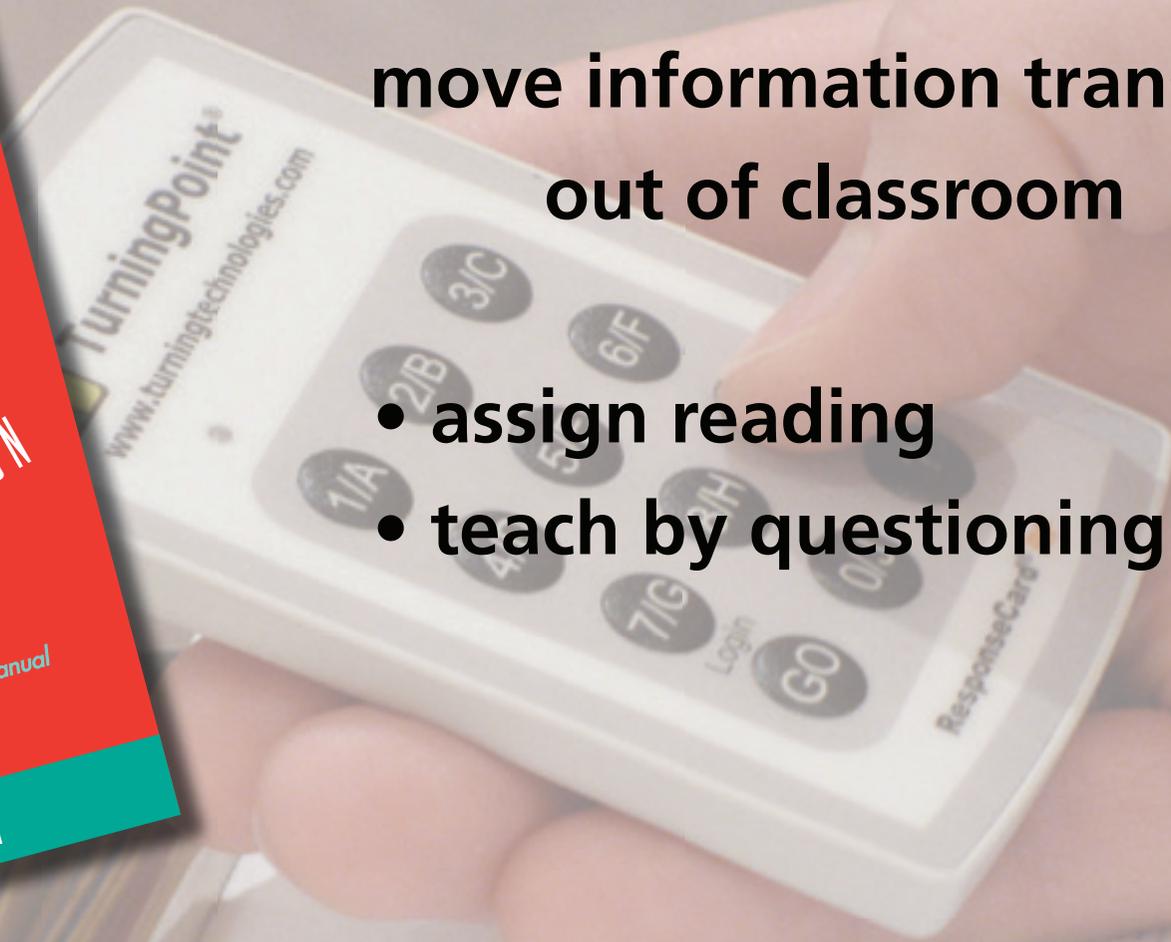
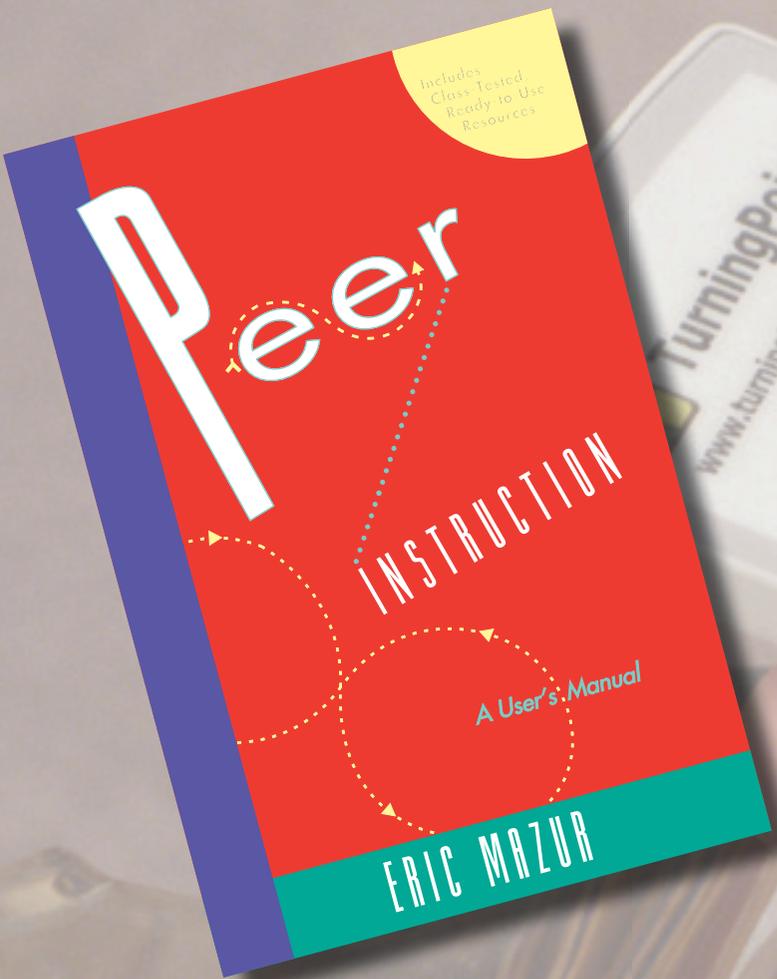
# Outline

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

# Peer Instruction

move information transfer  
out of classroom

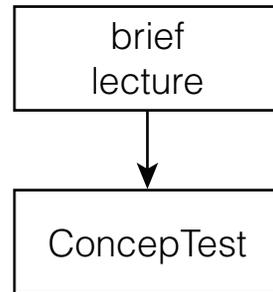
- assign reading
- teach by questioning



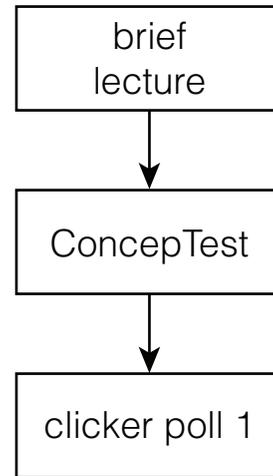
# Peer Instruction

brief  
lecture

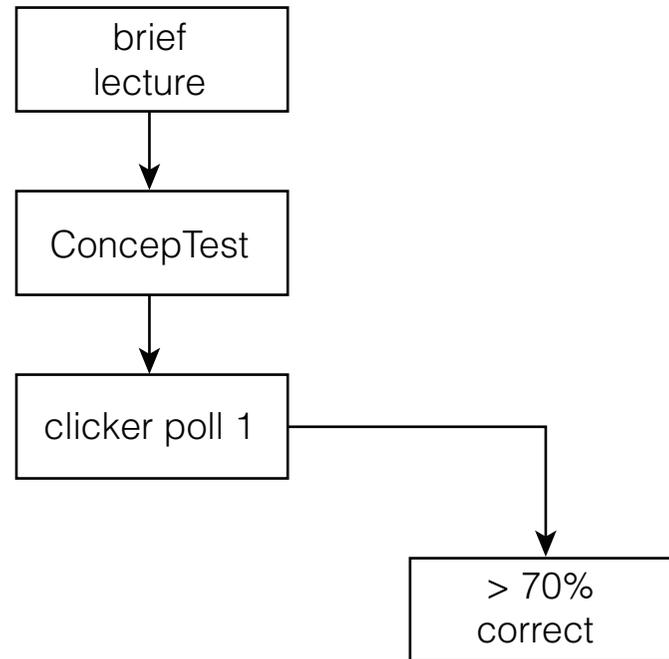
# Peer Instruction



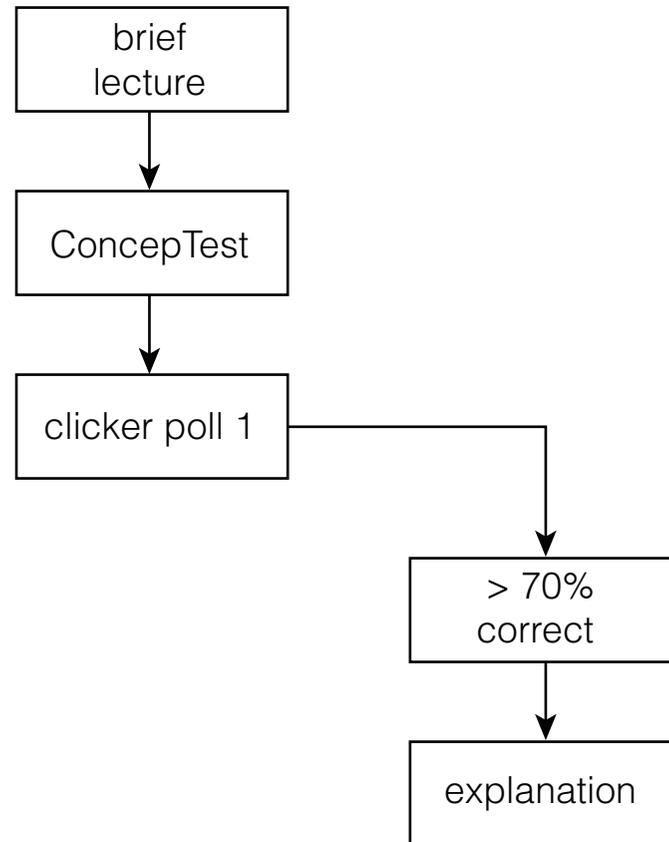
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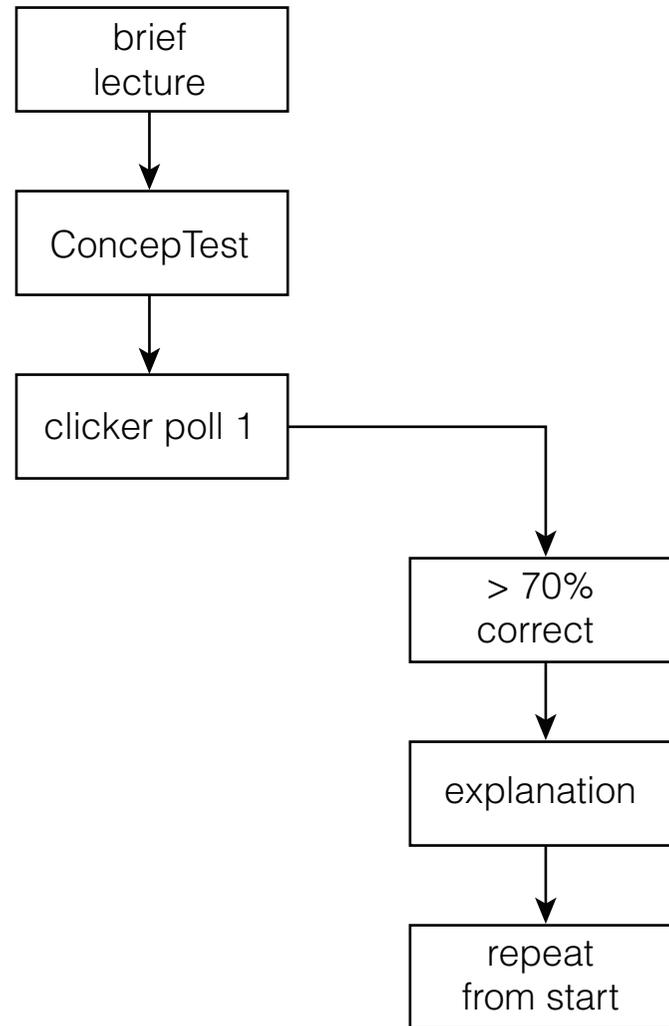
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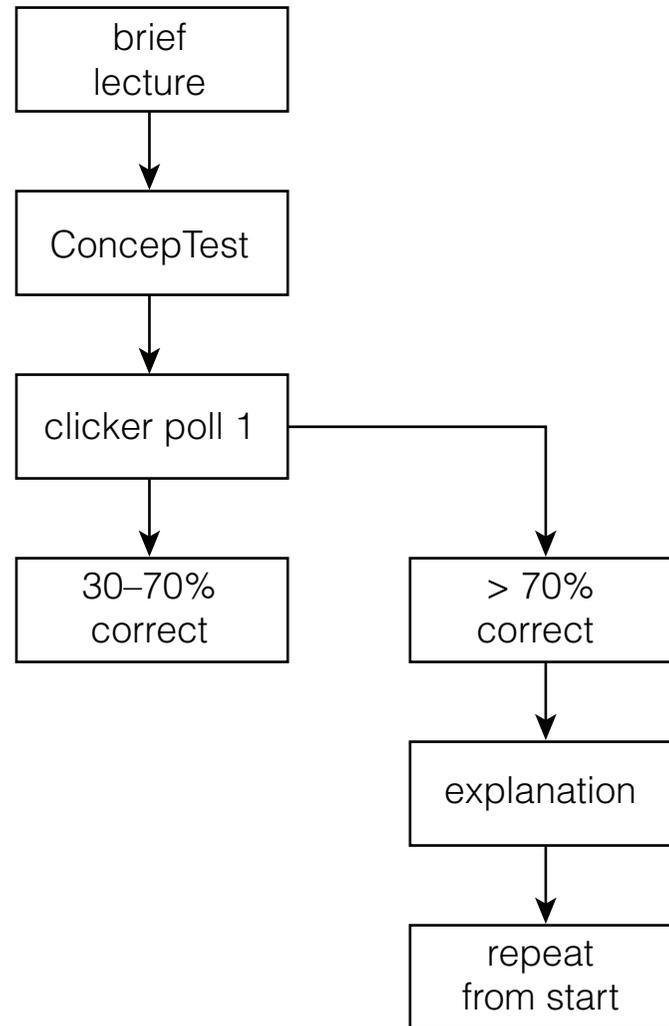
# Peer Instruction



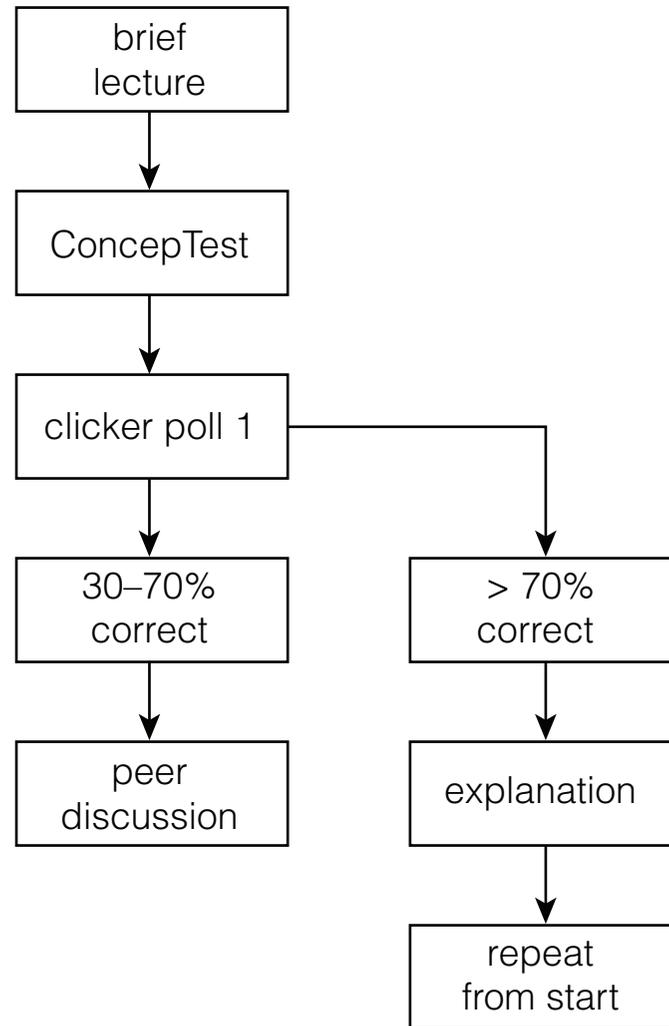
# Peer Instruction



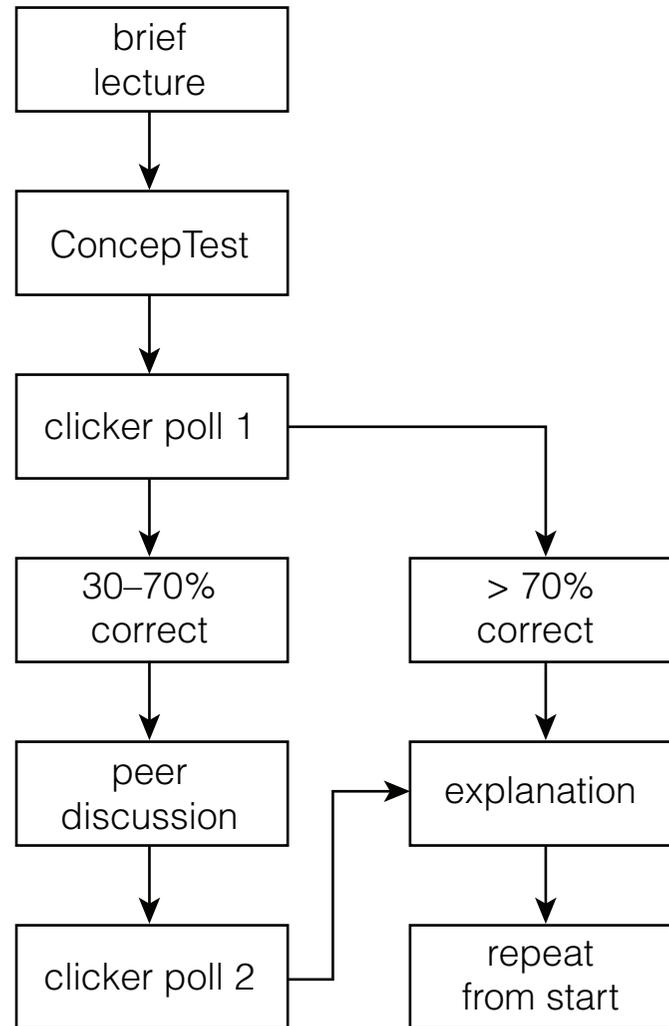
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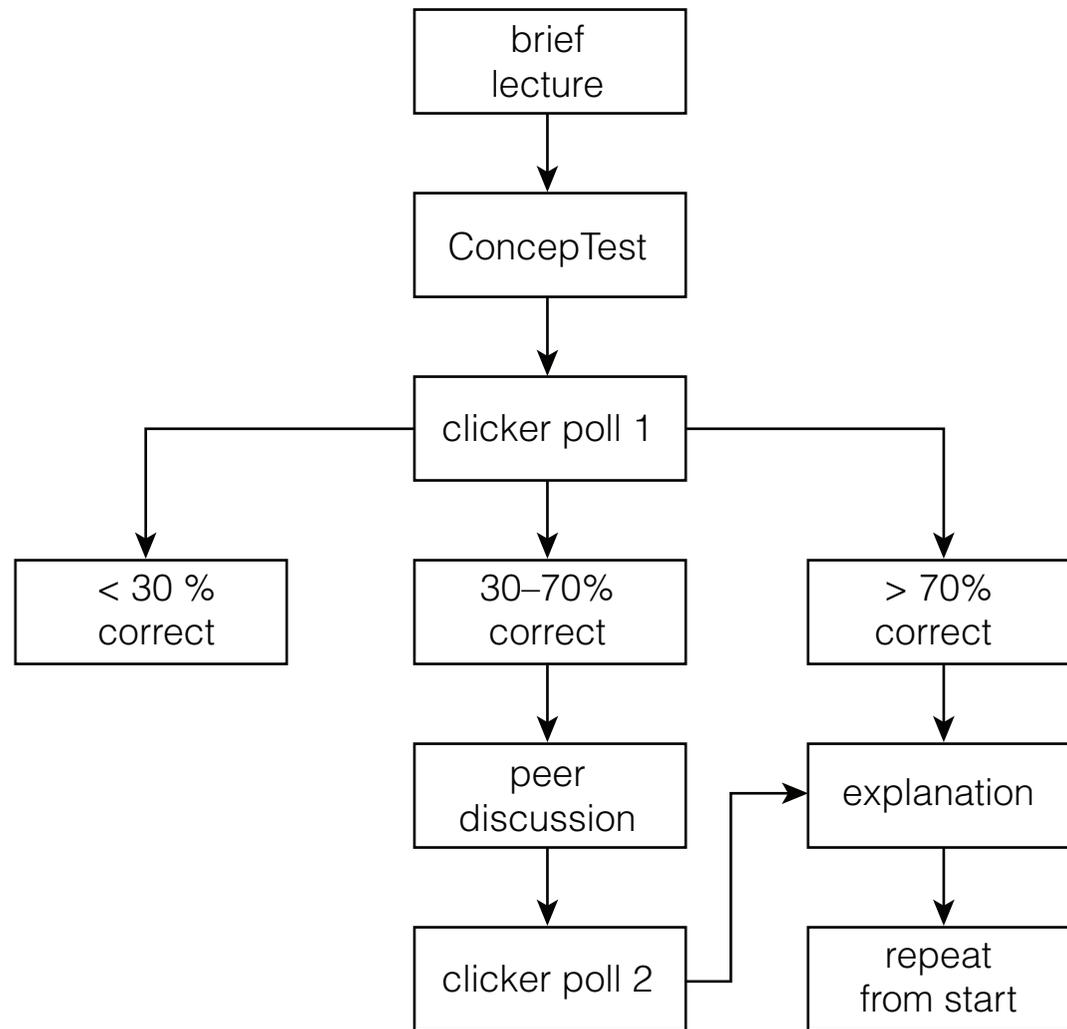
# Peer Instruction



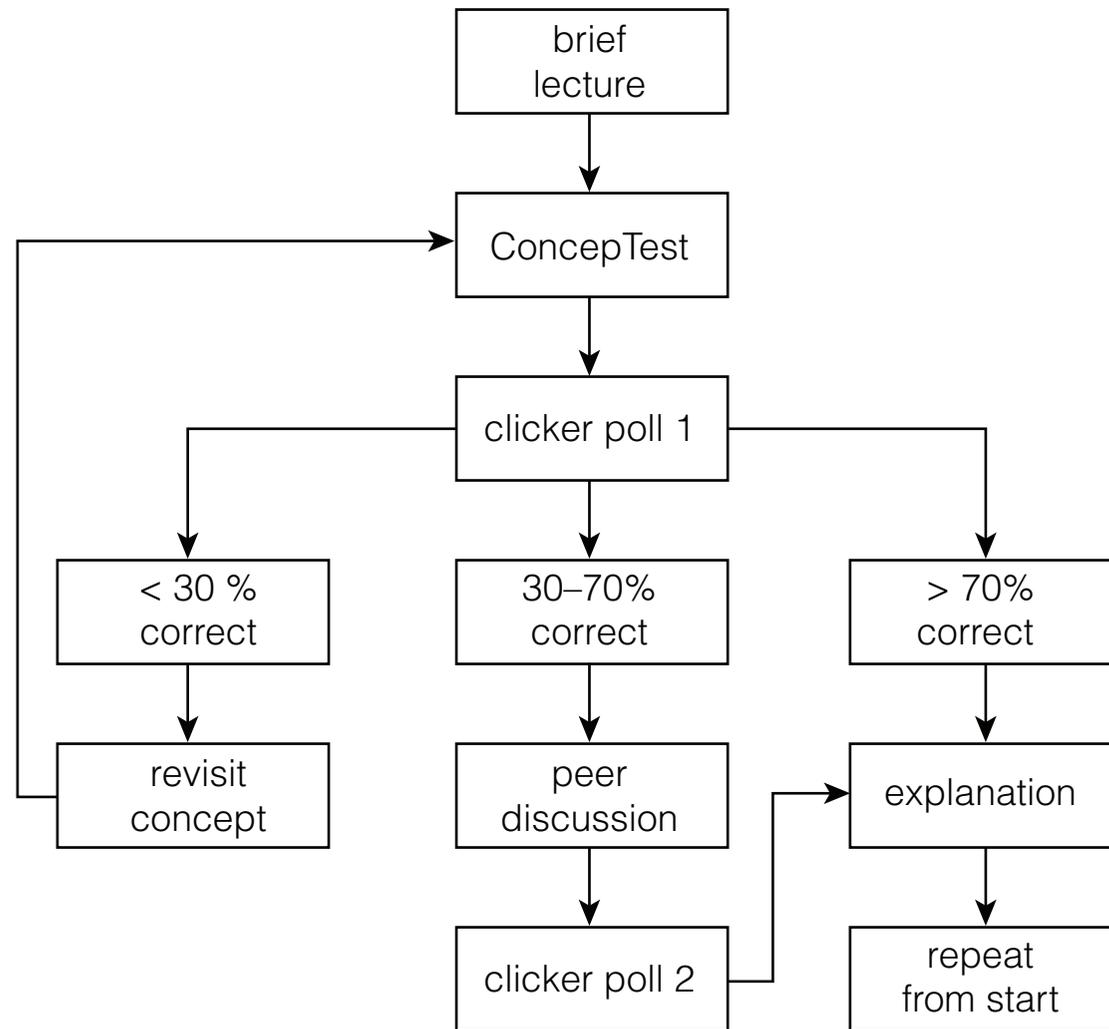
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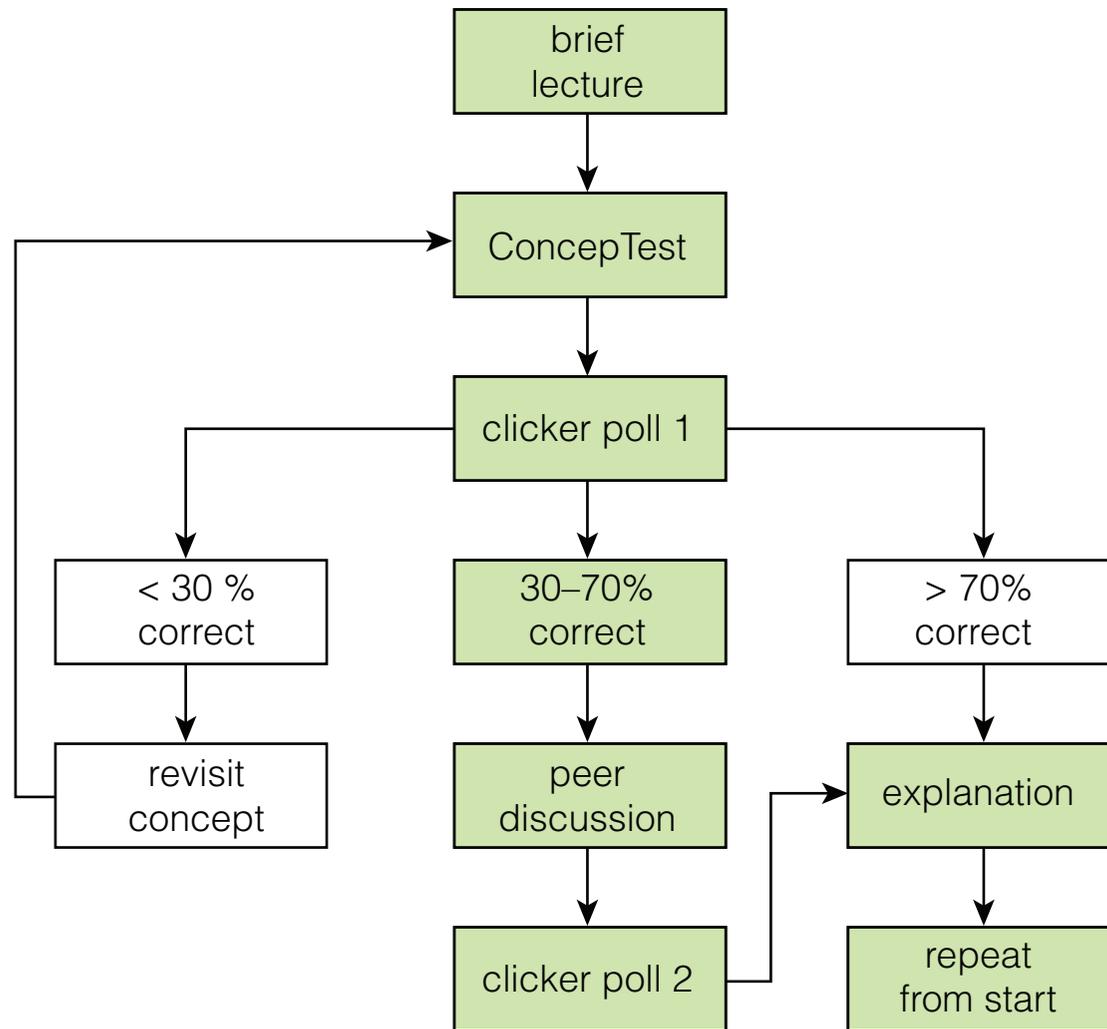
# Peer Instruction



# Peer Instruction



# Peer Instruction





# Outline

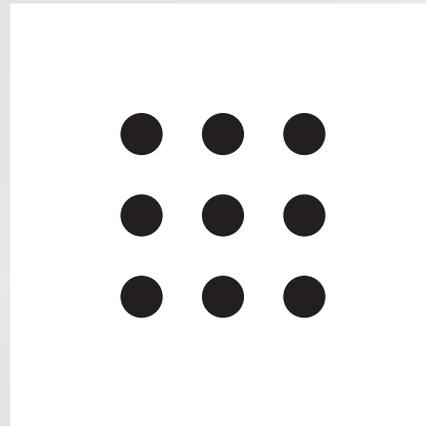
- Peer Instruction
- Let's try it!
- Results

**Let's try it!**

**thermal expansion**

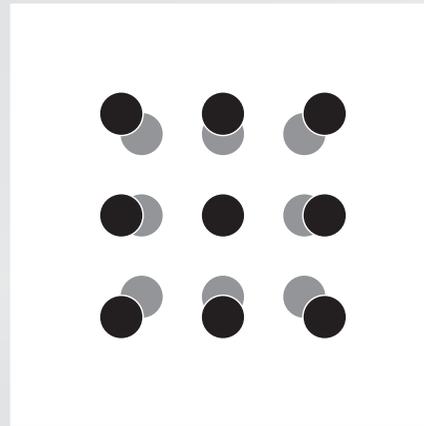
# Let's try it!

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



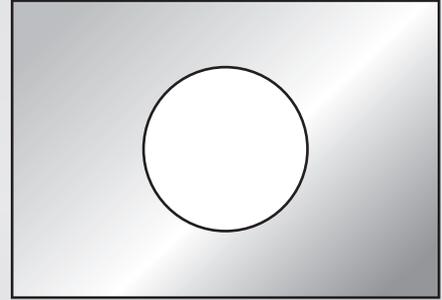
# Let's try it!

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



# Let's try it!

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

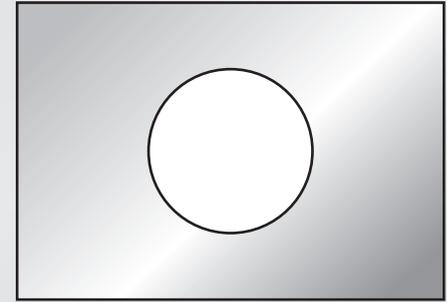


# Let's try it!

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!**

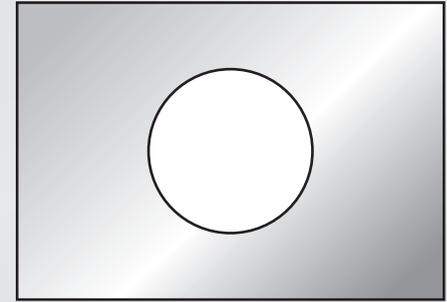
***It's easy to fire up the audience!***

# Let's try it!

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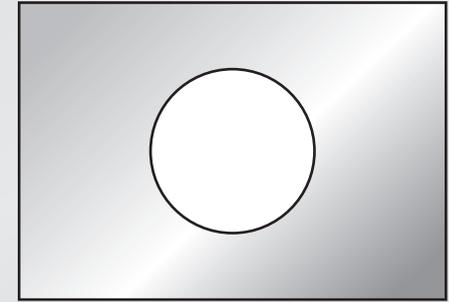
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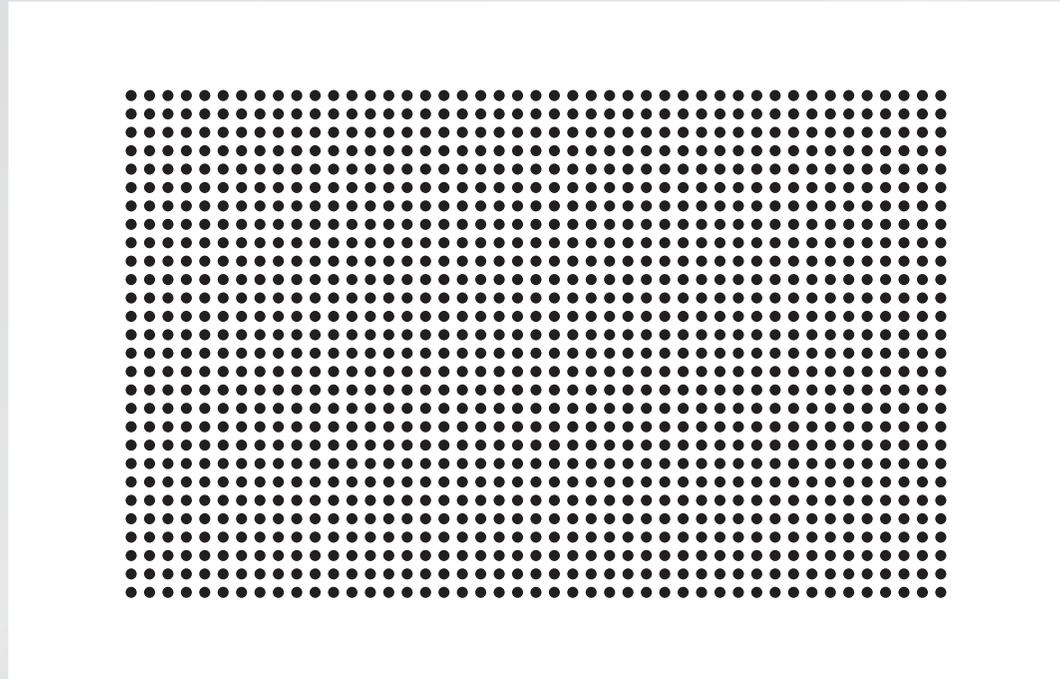
When the plate is uniformly heated, the diameter of the hole

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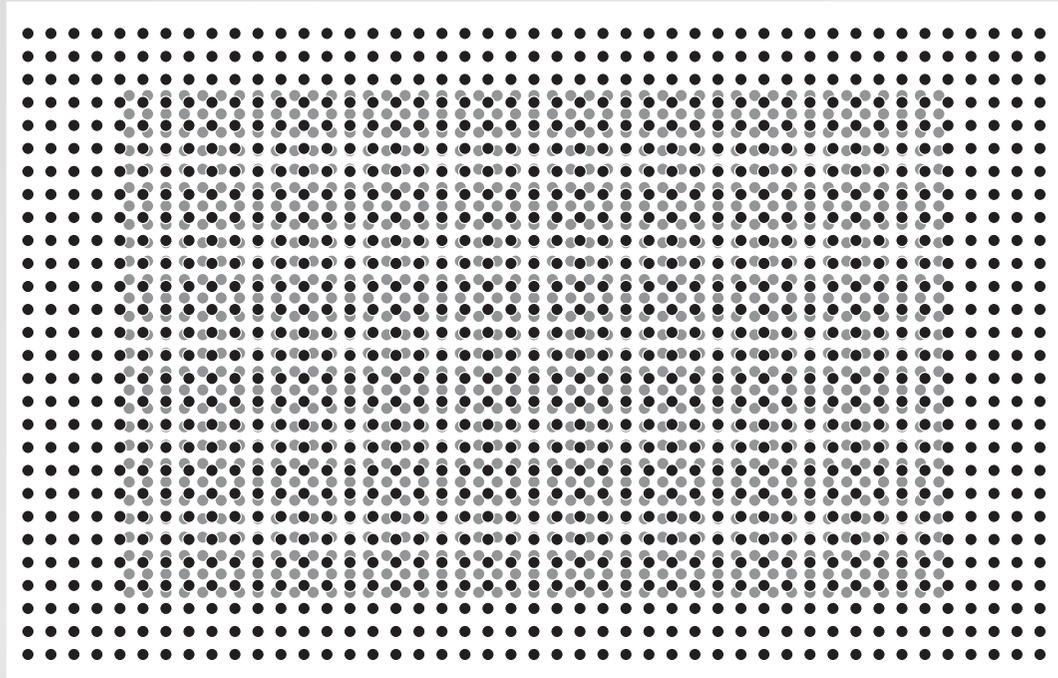
# Let's try it!

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



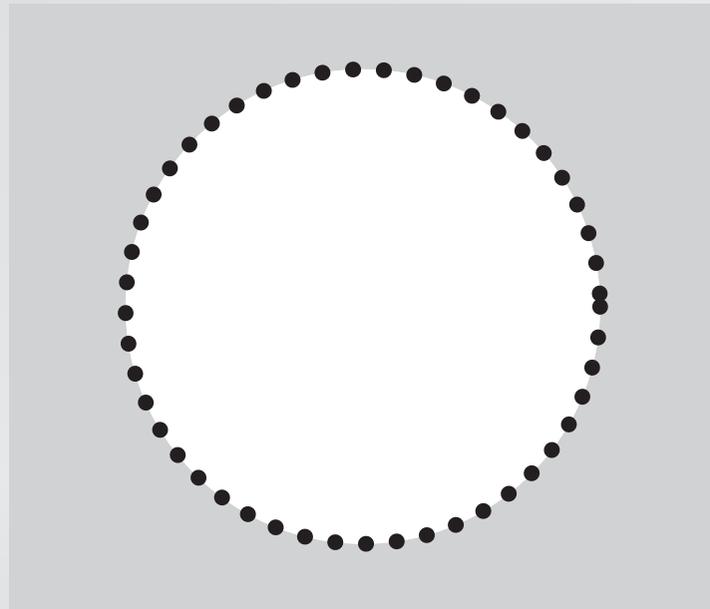
# Let's try it!

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



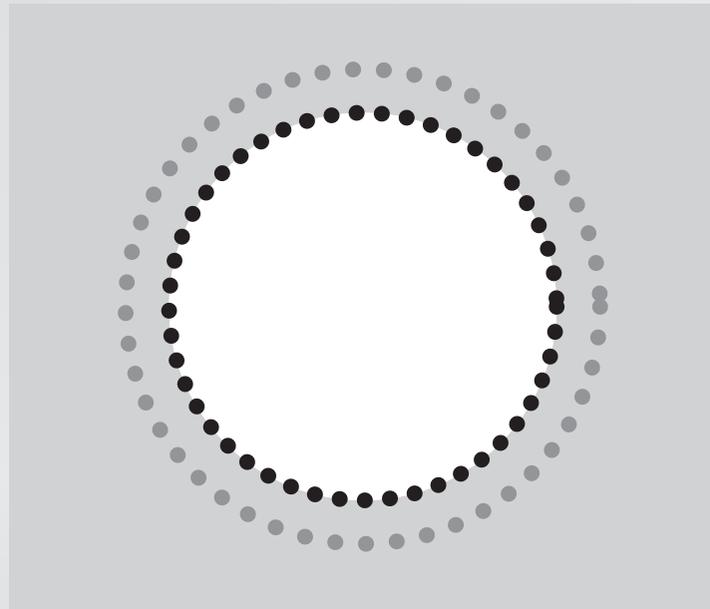
# Let's try it!

consider the atoms at the rim of the hole



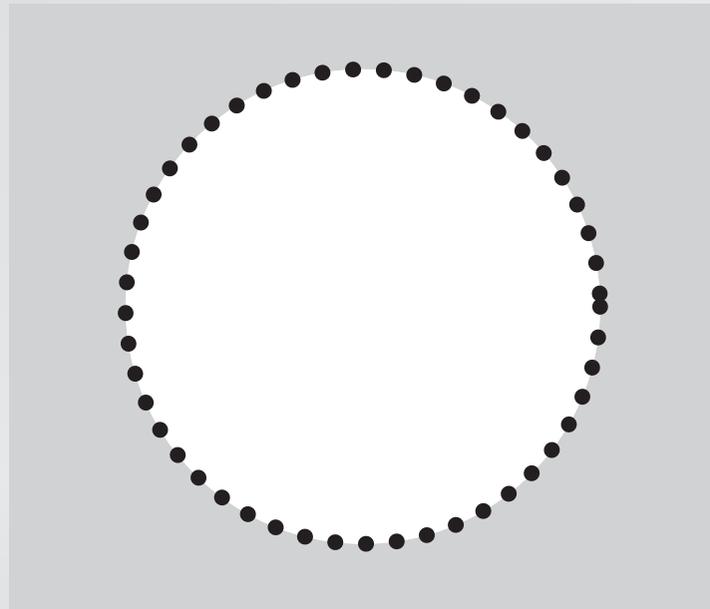
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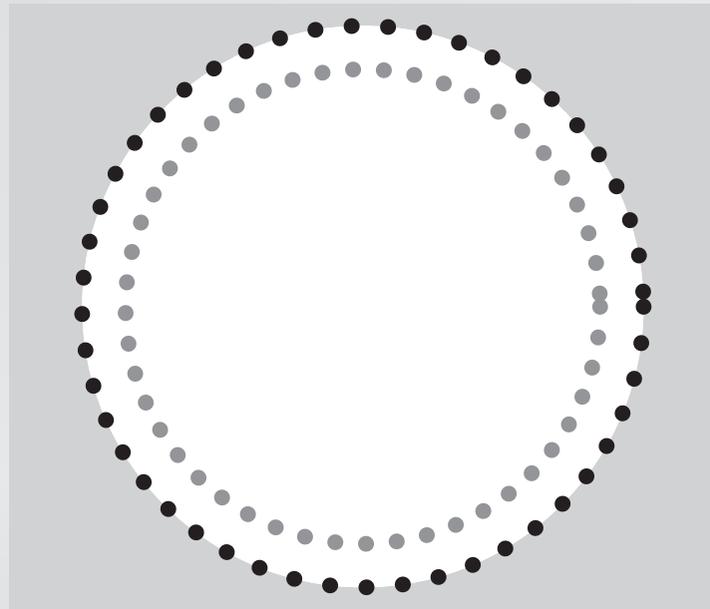
# Let's try it!

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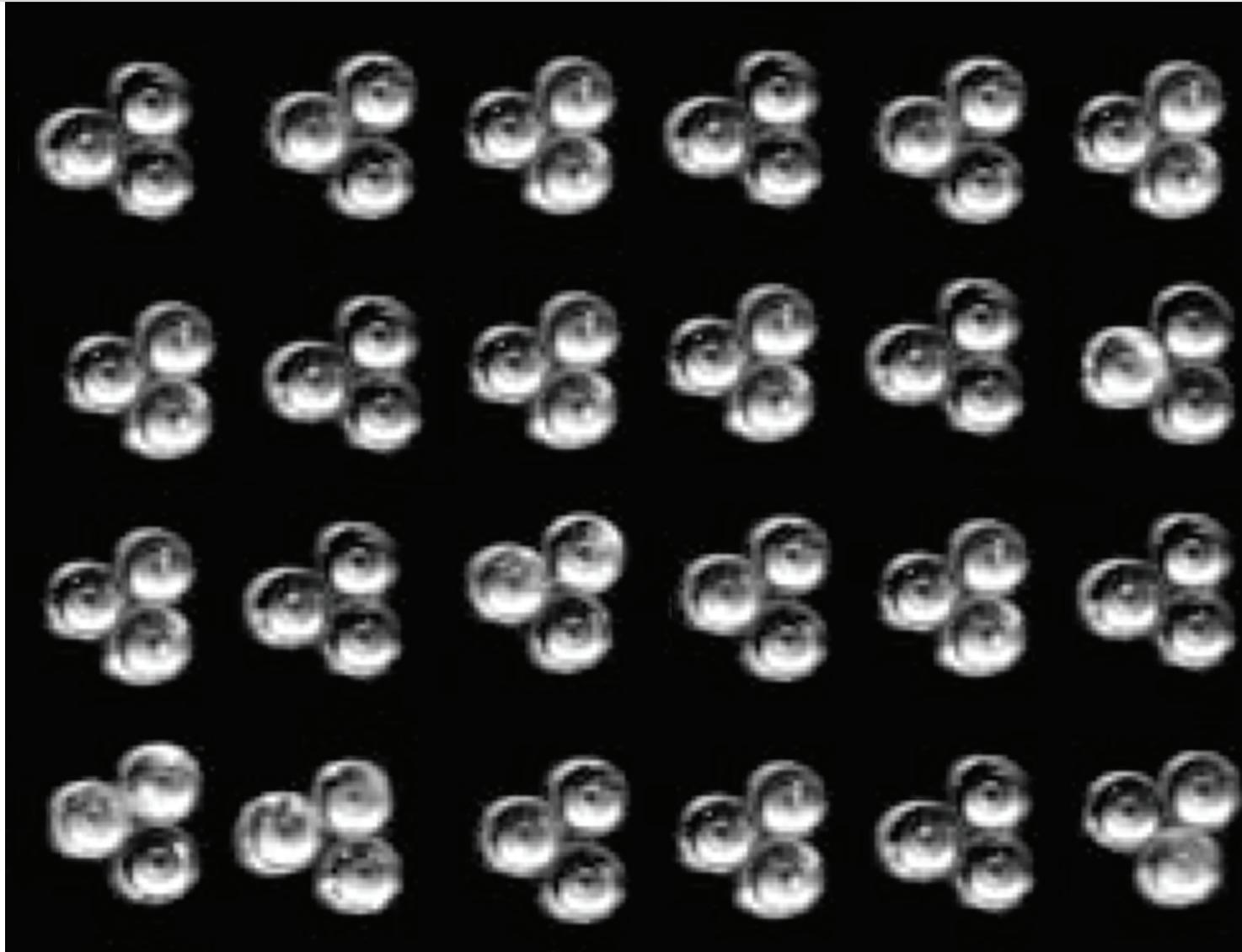
consider the atoms at the rim of the hole



# Let's try it!

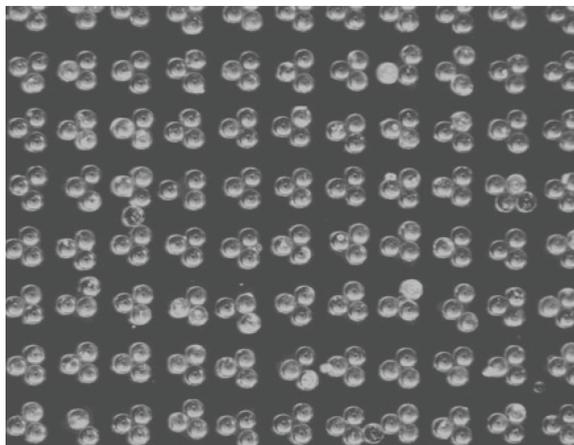
*“Does this method work only with questions  
that have a correct answer?”*

Let's try it!

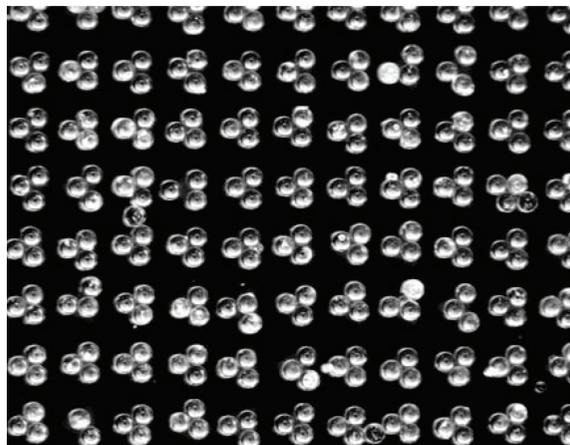


# Let's try it!

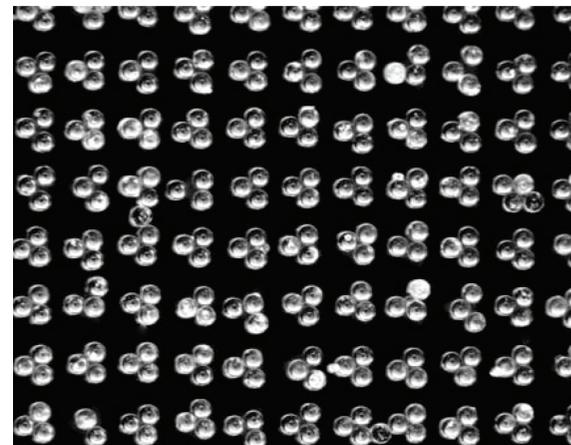
original



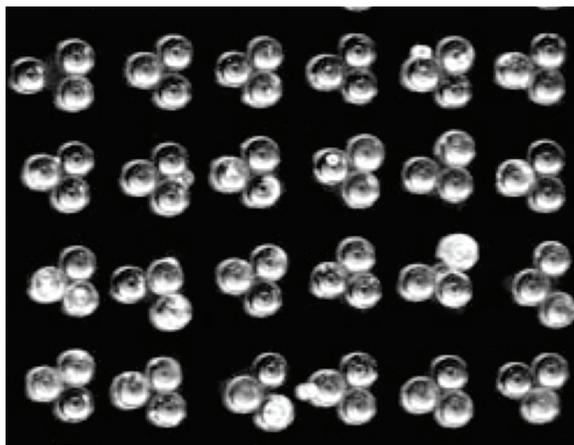
1. adjust contrast



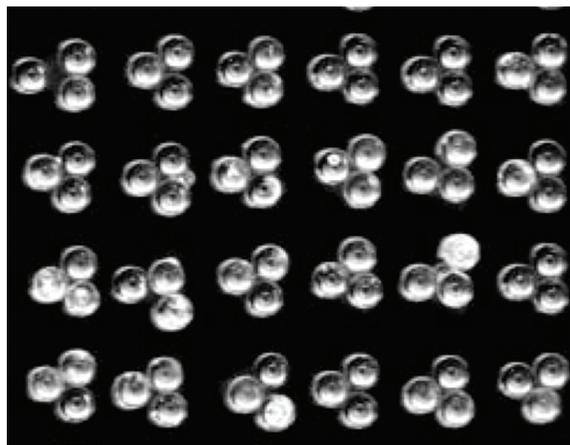
2. remove blemishes



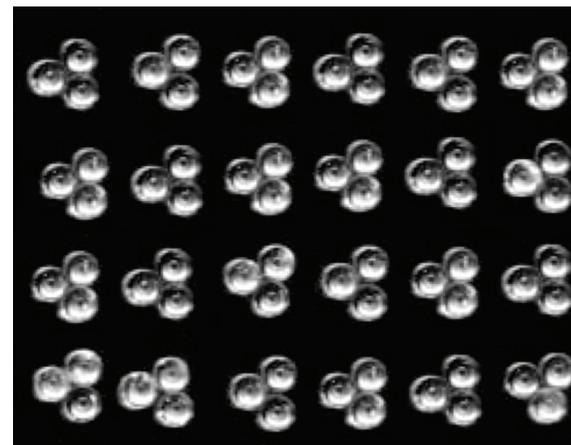
3. crop



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.

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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

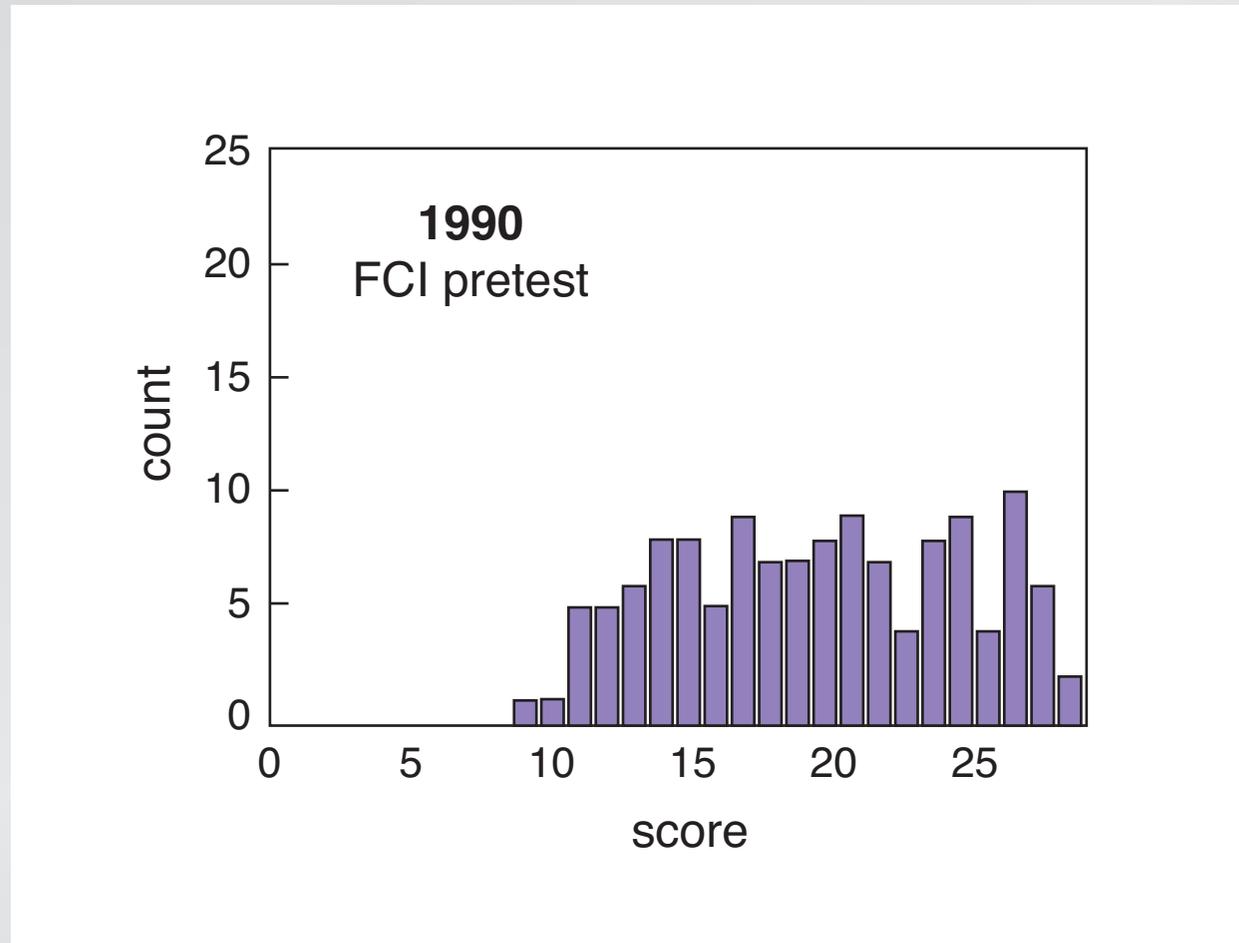
**need to test mental model!**

# Outline

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

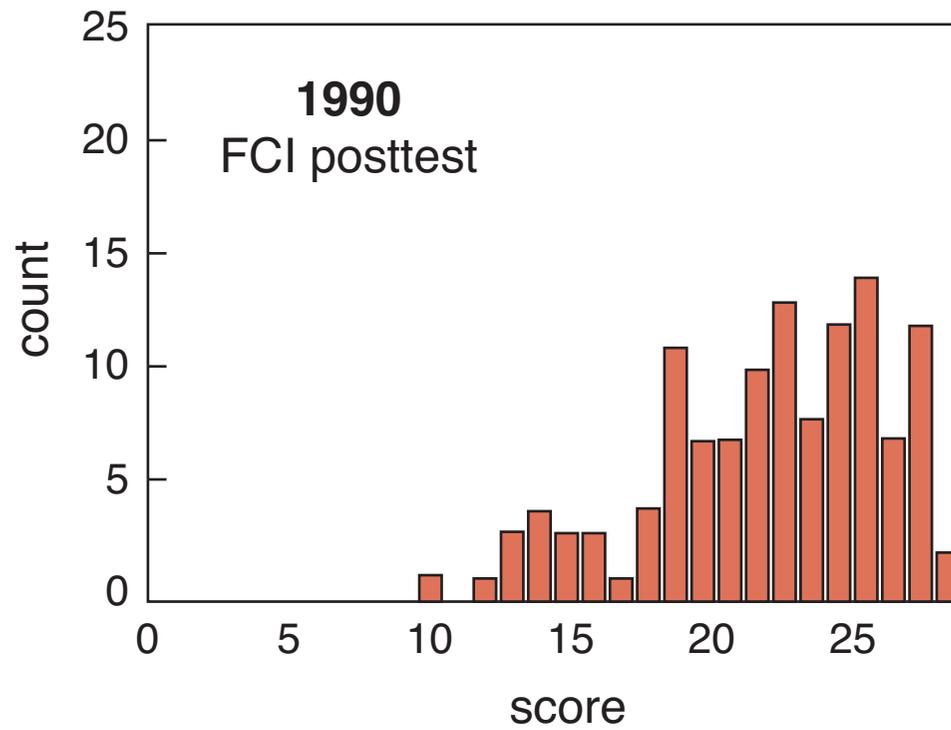
# Results

## traditional instruction



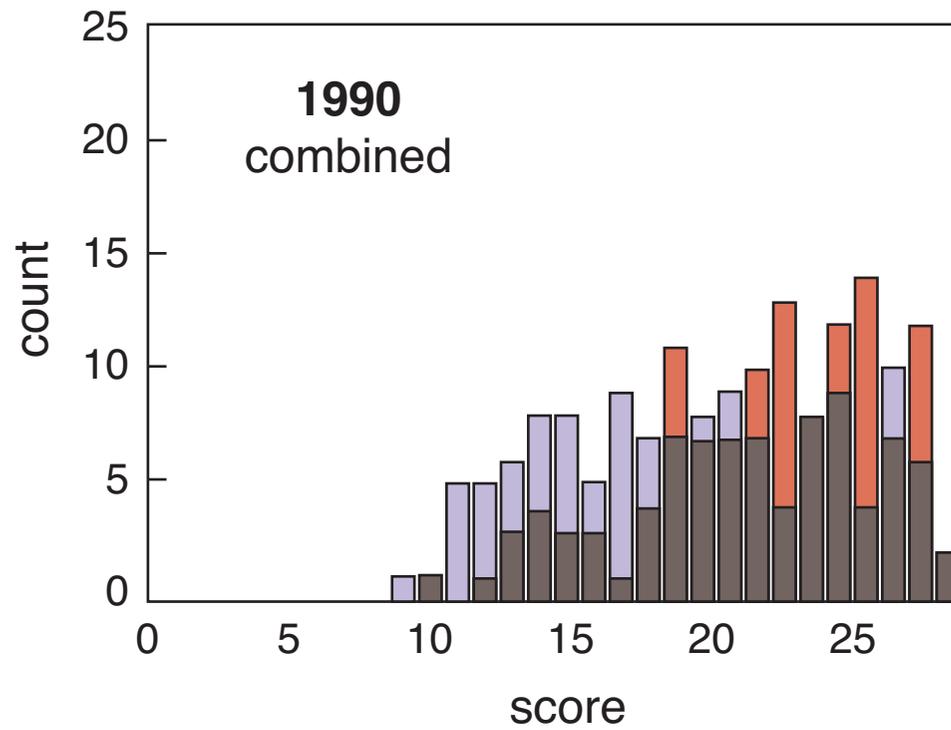
# Results

## traditional instruction



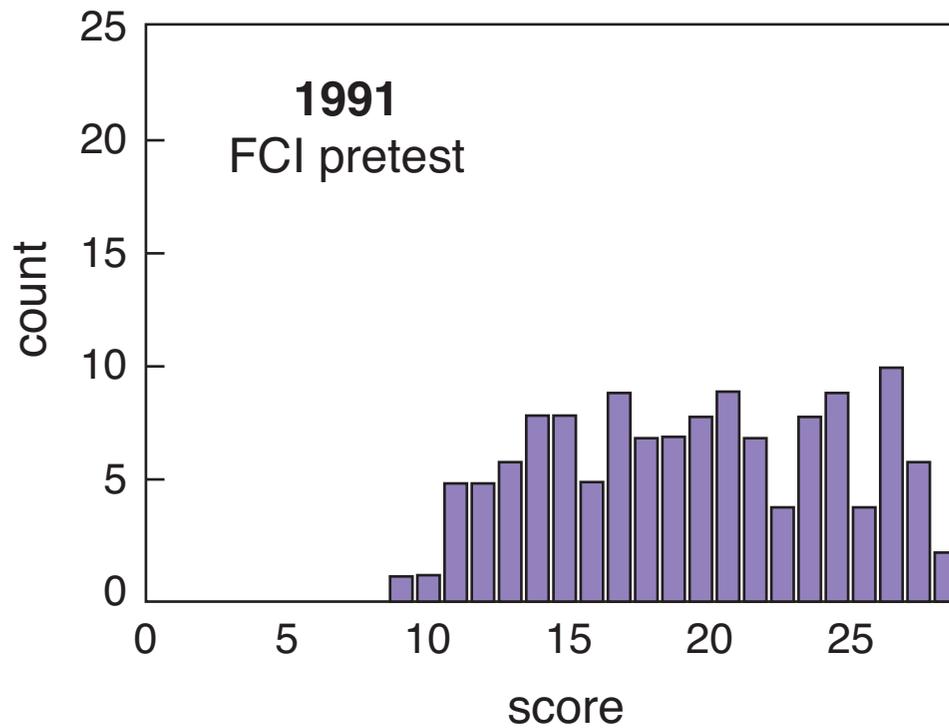
# Results

## traditional instruction



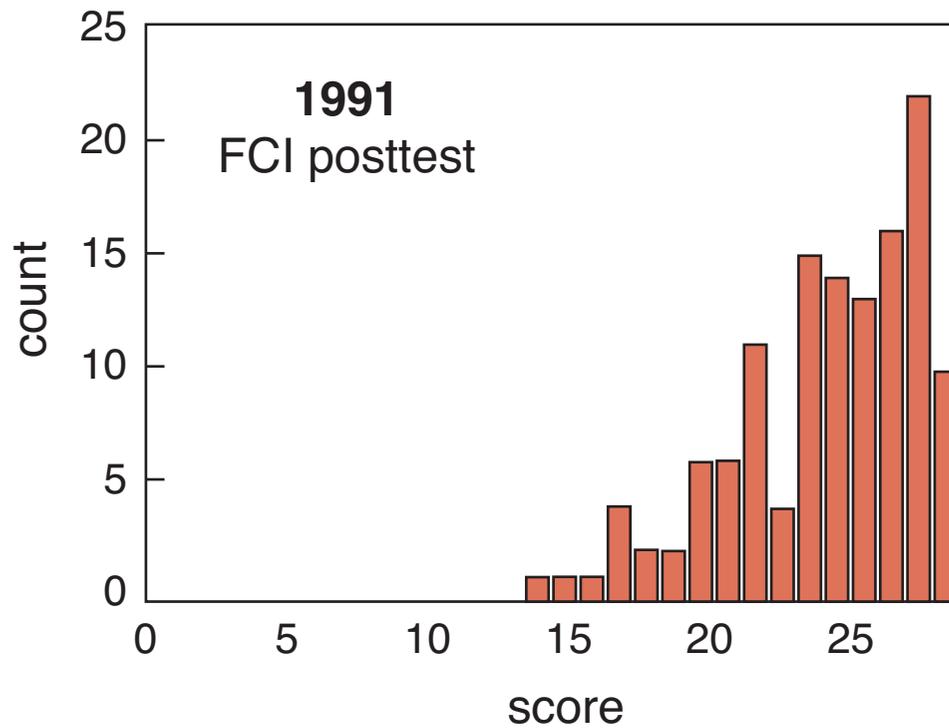
# Results

## first year of implementing PI



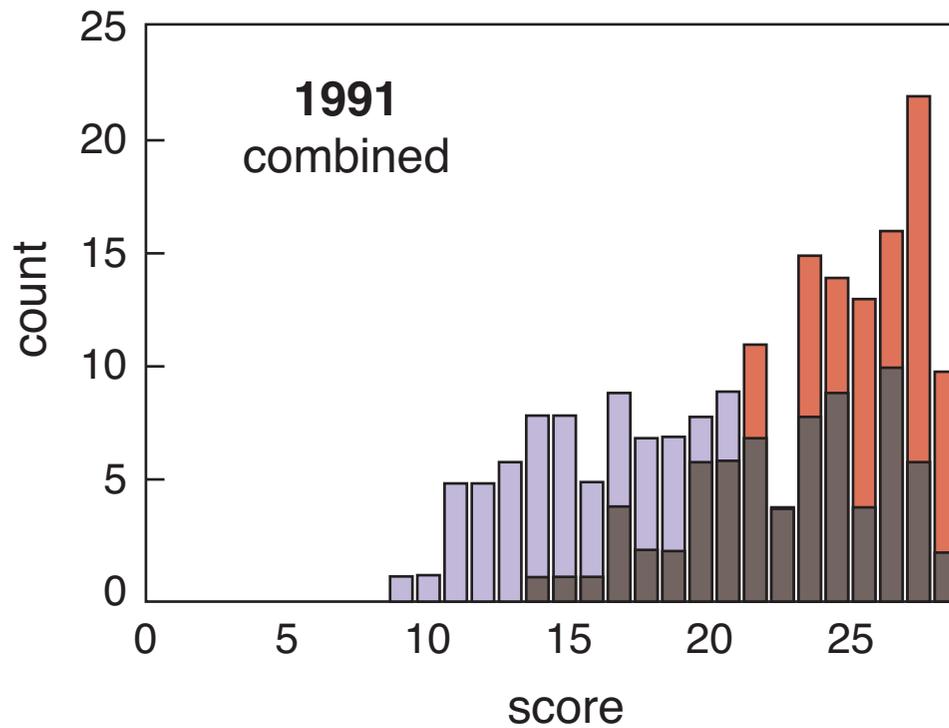
# Results

## first year of implementing PI



# Results

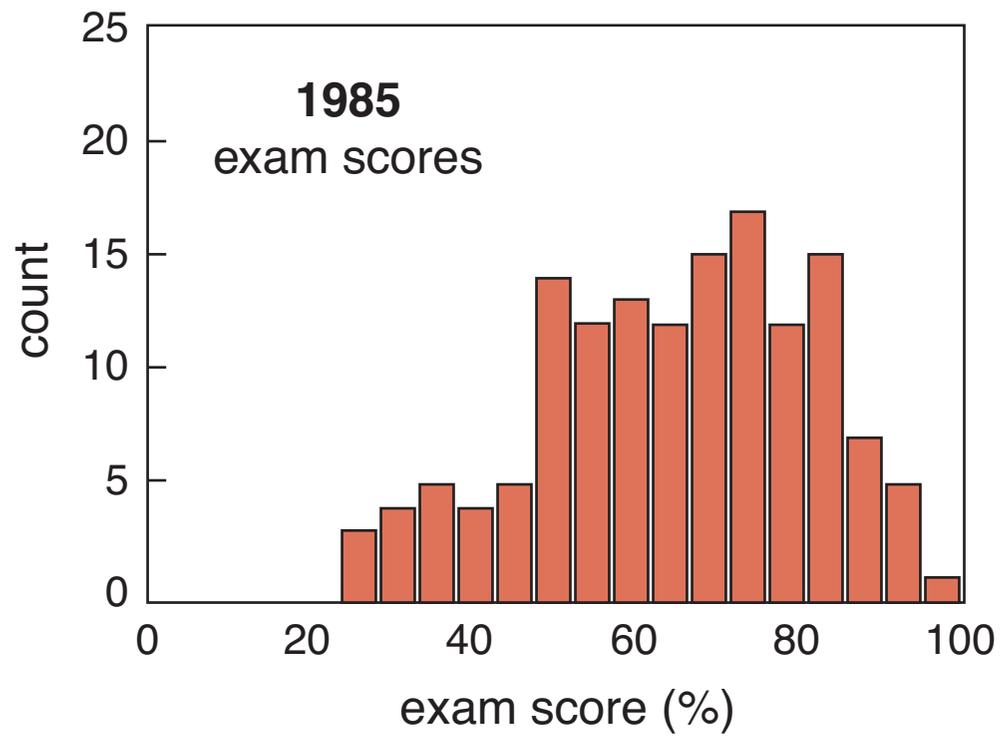
## first year of implementing PI



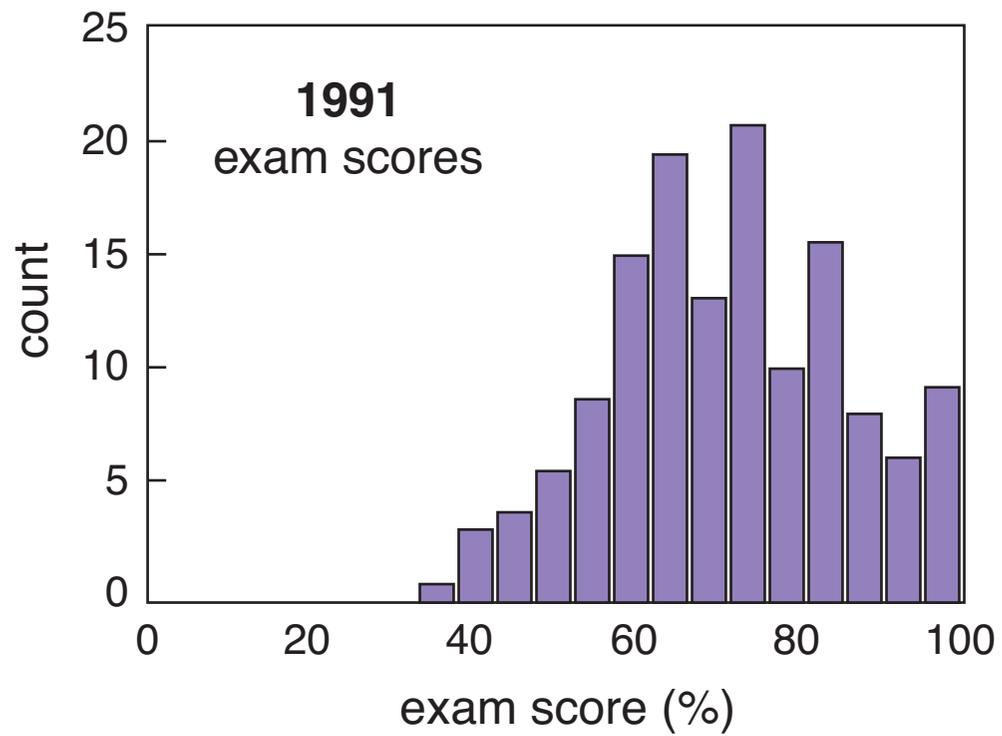
# Results

**what about problem solving?**

# Results

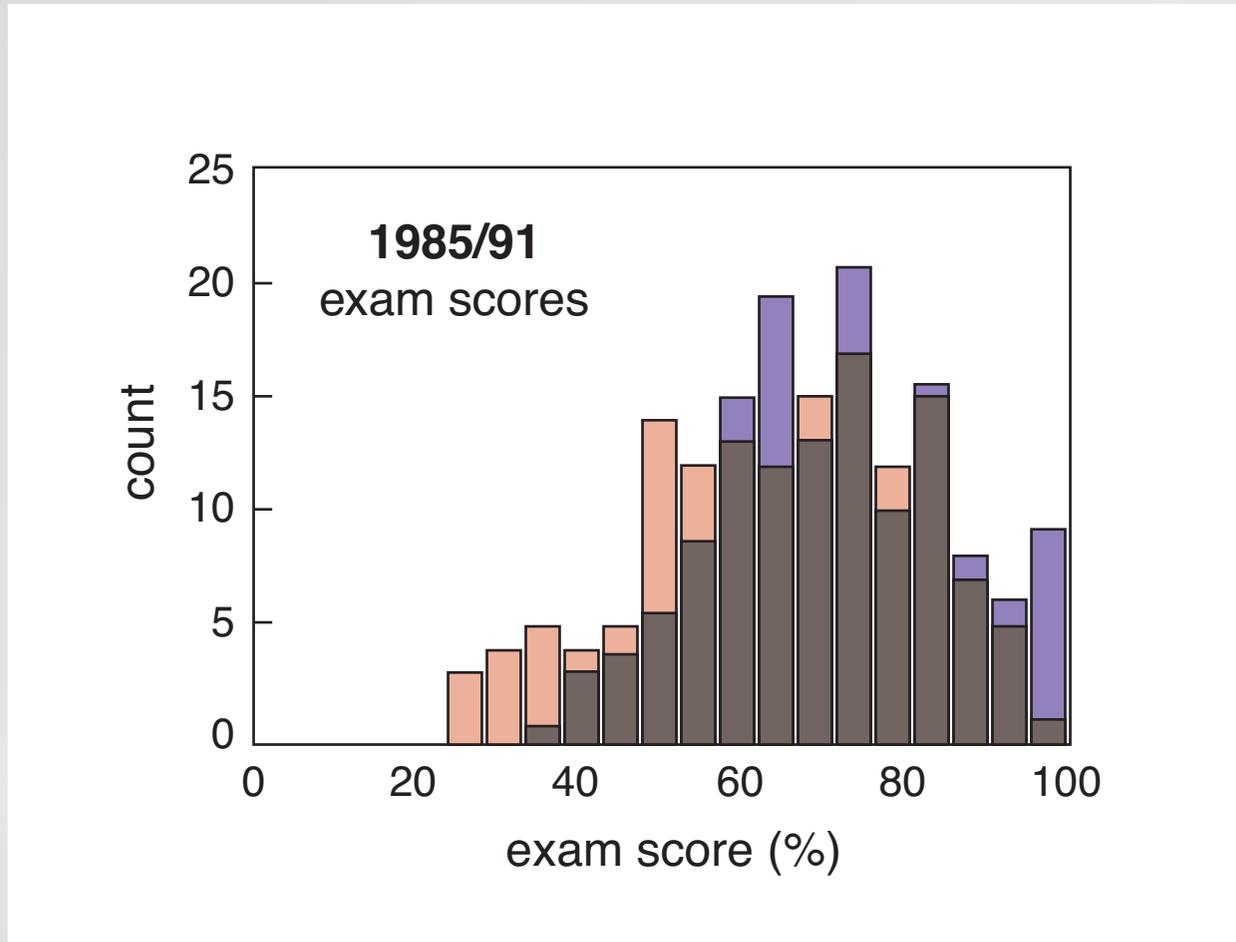


# Results



# 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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