

# Memorization or understanding: are we teaching the right thing?



ICED 2012 Conference  
Bangkok, Thailand, 23 July 2012

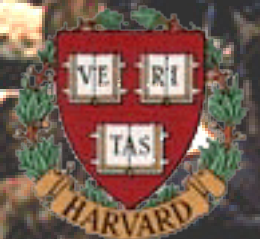


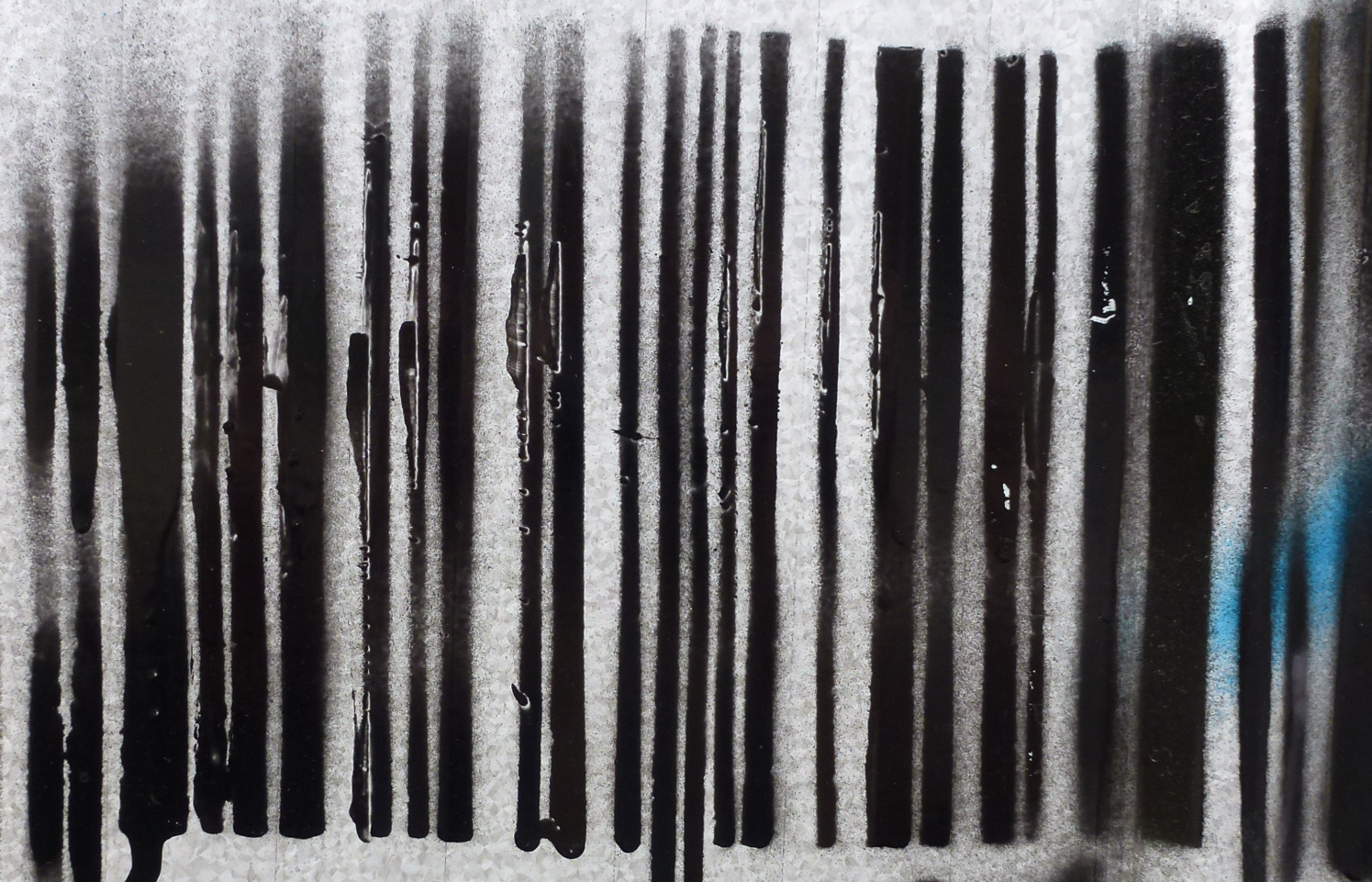
# Memorization or understanding: are we teaching the right thing?



@eric\_mazur

ICED 2012 Conference  
Bangkok, Thailand, 23 July 2012





EDUCACION

2





- no ON/OFF button
- only last "click" counts
- display shows recorded answer



Turning Technologies, LLC  
www.TurningTechnologies.com  
P/N:RCRF-03 (Programmable)  
CE FCC RoHS  
FCC ID: R4WRCRF03  
ACN: 008 694 609  
IC: 6994A-RESCARD  
Pat 7,330,716  
Other Pats Pend  
Assembled in Thailand  
05959E  
3310

[www.TurningTechnologies.com](http://www.TurningTechnologies.com)



**Think of something you are good at**

**EDUCACION**

**Think of something you are good at**

***How did you become good at this?***

**EDUCACION**



**Became good at it by:**

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

**EDUCACION**









1 education

2 PI



1 education

2 PI

3 test

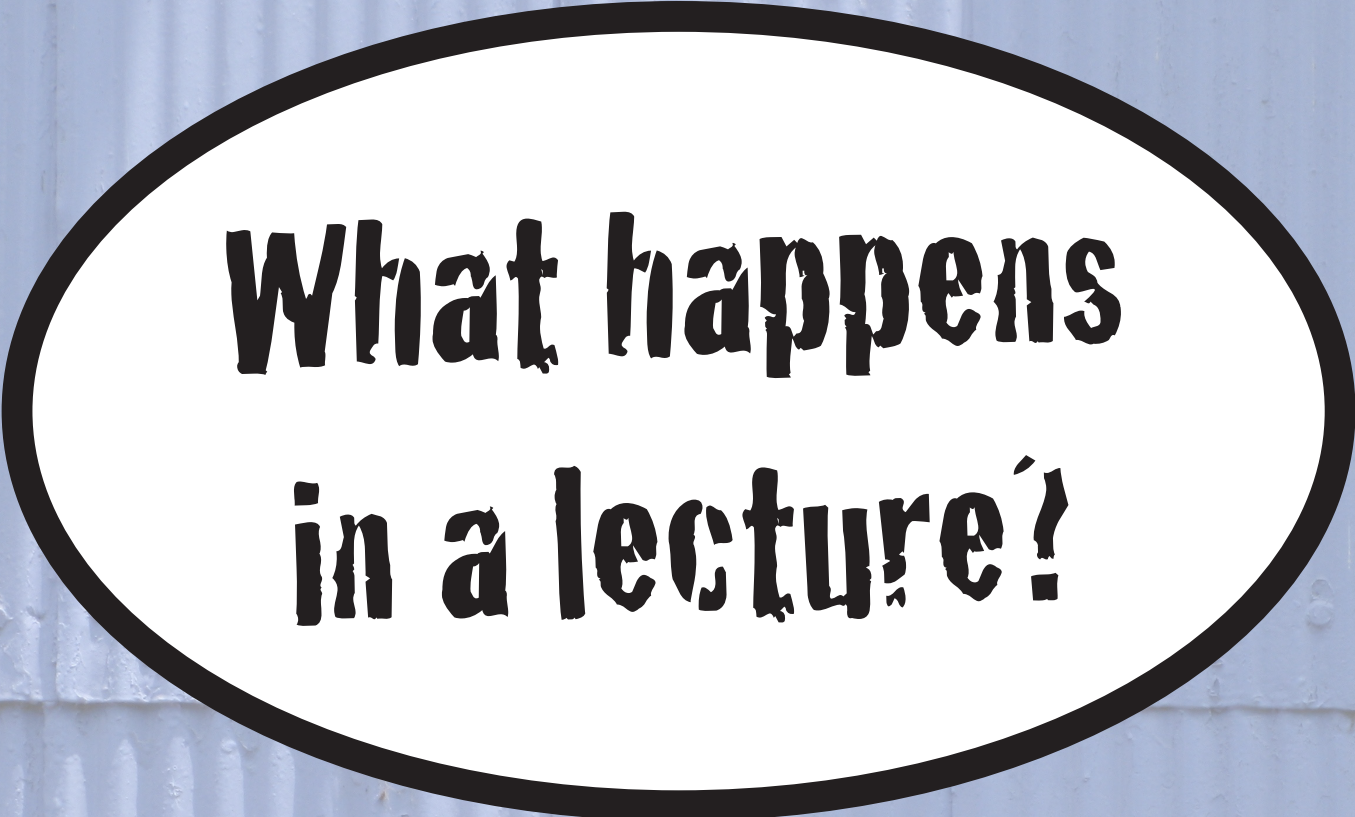


**better pay  
attention!**

**1** education

**2** PI

**3** test

A large white thought bubble with a thick black border is centered in the upper half of the image. It contains the text 'What happens in a lecture?'. Below the main bubble are three smaller, empty white circles with black borders, arranged in a descending staircase pattern from left to right, suggesting a trail of thought.

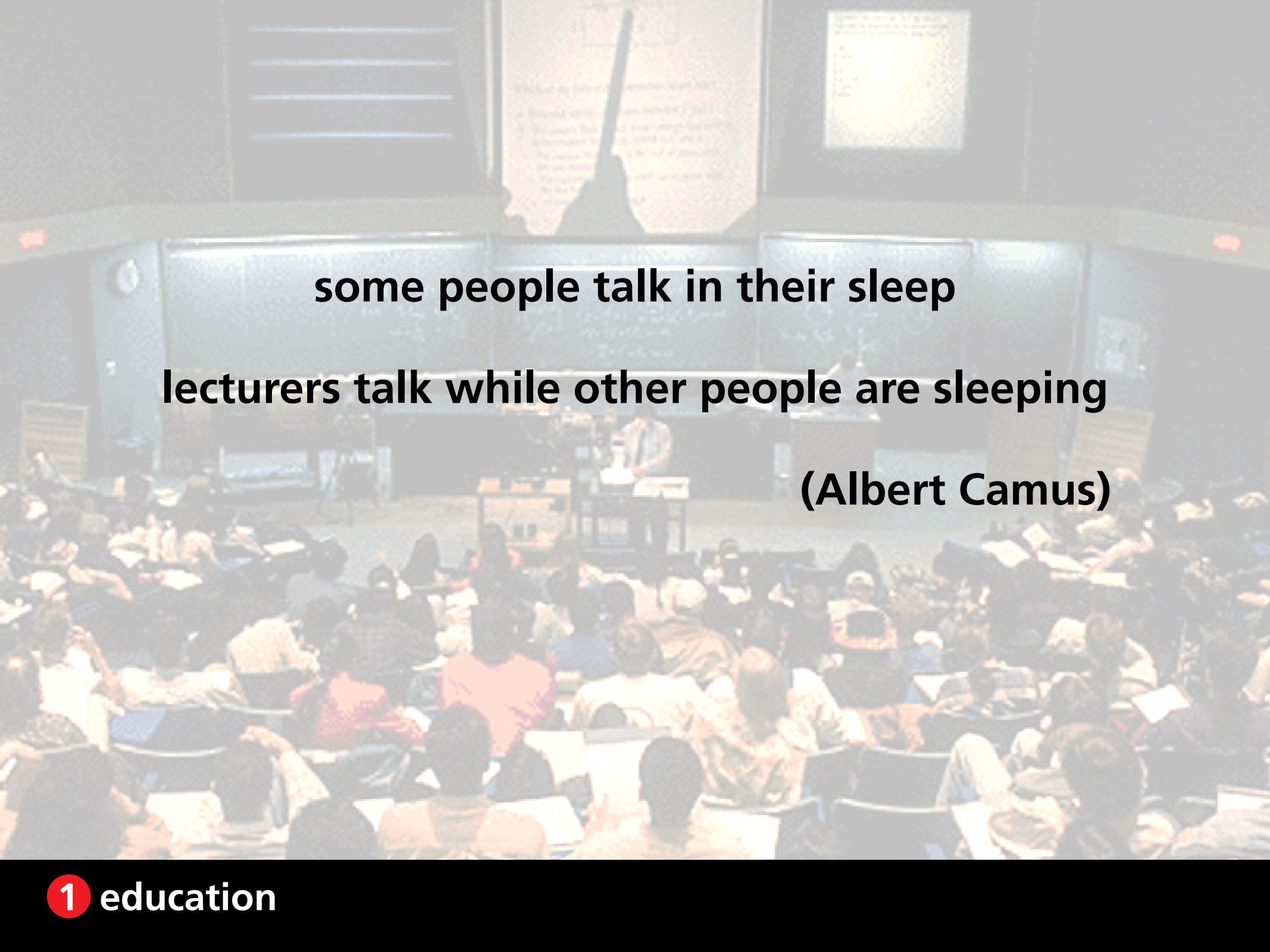
**What happens  
in a lecture?**





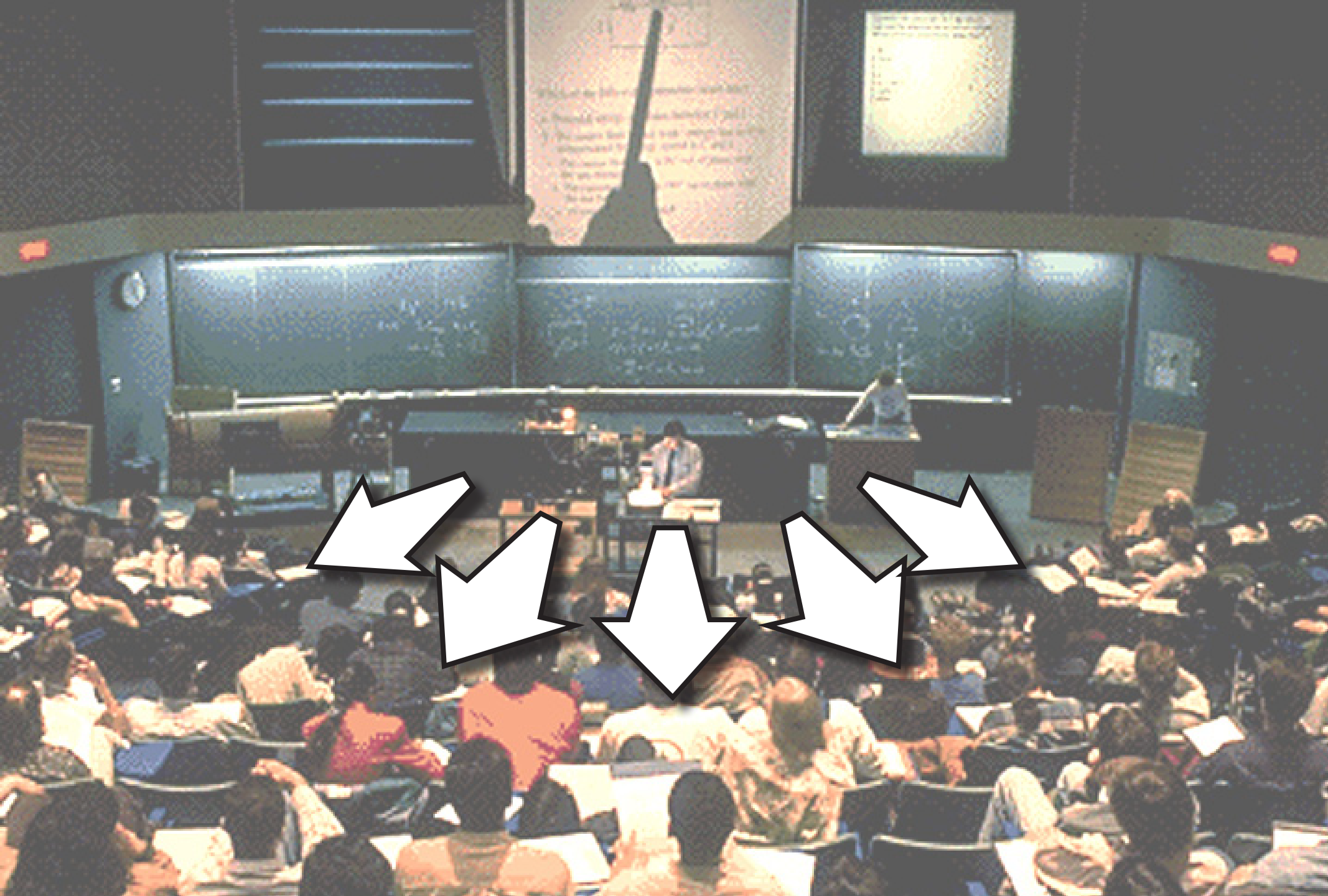
A large lecture hall with a professor at a podium and students in the audience. The professor is standing at a podium on a stage, facing the audience. The audience is seated in rows of chairs, filling the hall. The stage has a large screen behind the professor displaying text. The room is dimly lit, with the main light source being the stage lights.

**some people talk in their sleep**

A large lecture hall with a lecturer at a podium and a large audience of students. The room is filled with people sitting at desks, and a large screen is visible in the background.

**some people talk in their sleep**  
**lecturers talk while other people are sleeping**  
**(Albert Camus)**





The result?

EDUCACION

Lack of learning

EDUCACION

**Lack of learning**

**Lack of retention**







**1** education

**2** PI



# 1. transfer of information



**1. transfer of information**


**2. assimilation of that information**

- 
- 1. transfer of information (in class)**
  2. assimilation of that information



1. transfer of information (in class)

2. assimilation of that information (out of class)

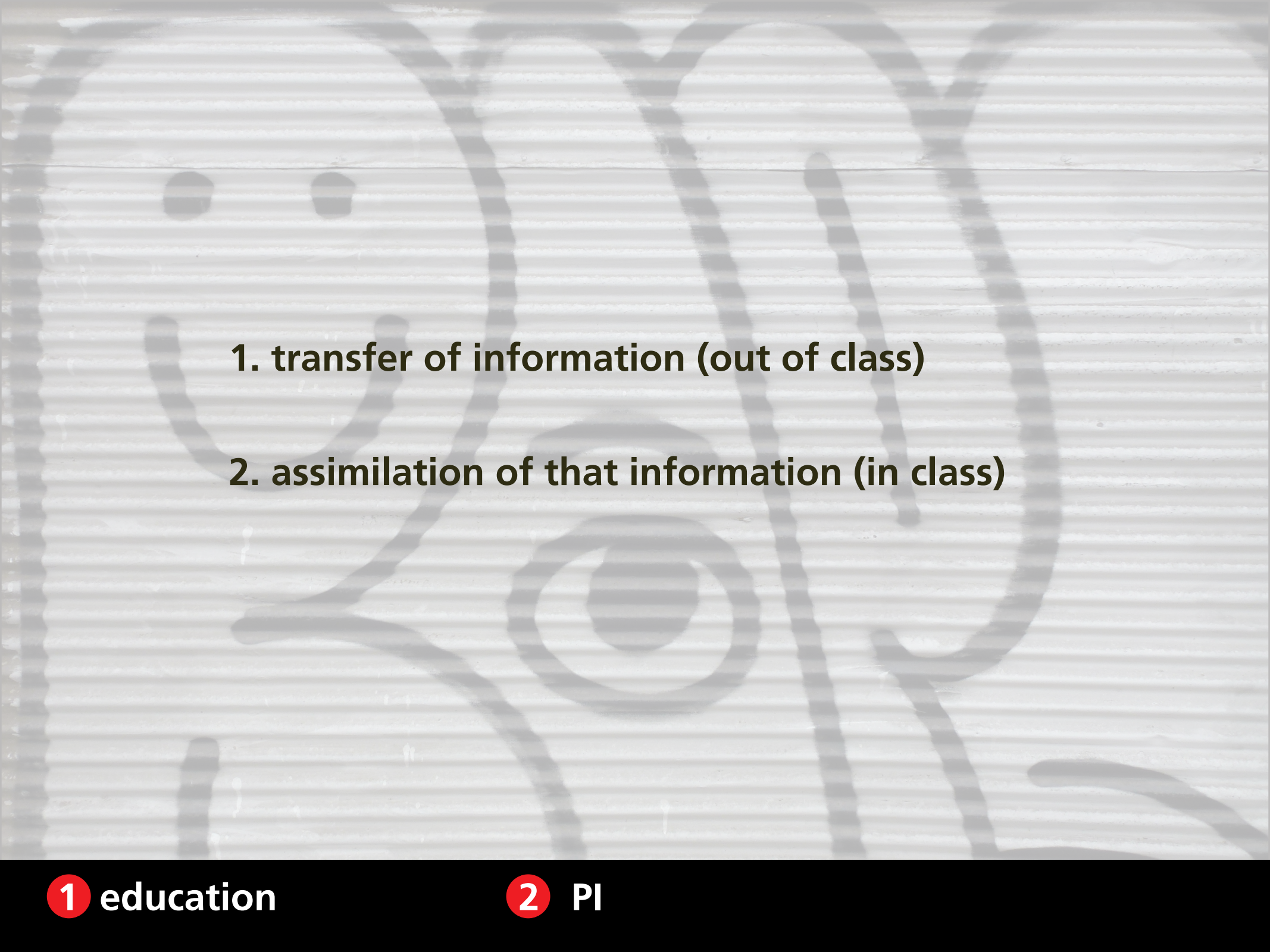


**Should focus  
on THIS!**

1. transfer of information (in class)

**2. assimilation of that information (out of class)**

- 
- 1. transfer of information (in class)**
  - 2. assimilation of that information (out of class)**

- 
- 1. transfer of information (out of class)**
  - 2. assimilation of that information (in class)**



# Peer



1. transfer of information (out of class)

2. assimilation of that information (in class)

INSTRUCTION

question

1 education

2 PI

question



think

**question**



**think**



**poll**

**question**



**think**



**poll**



**discuss**

**question**



**think**



**poll**



**discuss**



**repoll**

**question**



**think**



**poll**



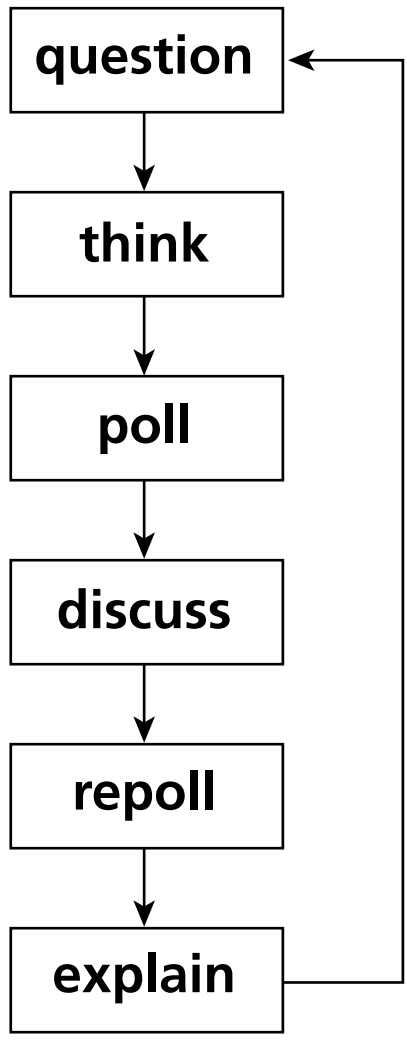
**discuss**



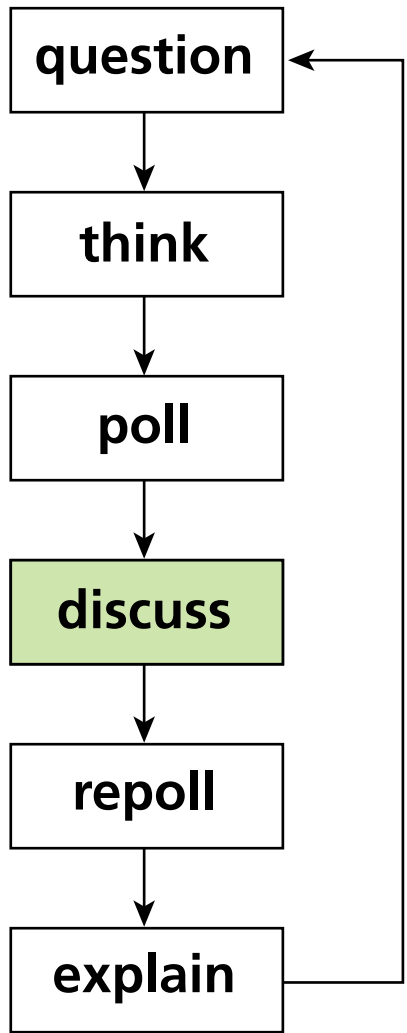
**repoll**



**explain**







**1** lecture

**2** PI

Let's try it!

QUESTION

think

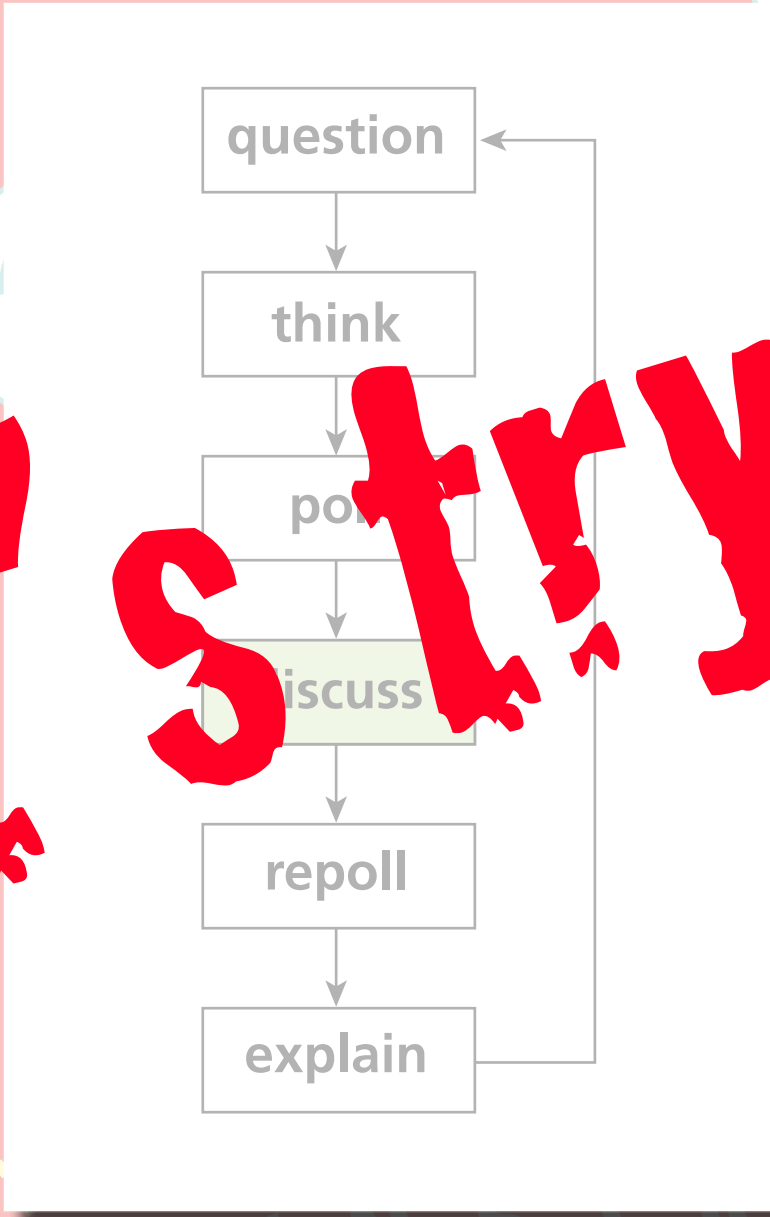
poll

discuss

repoll

explain

ACTION

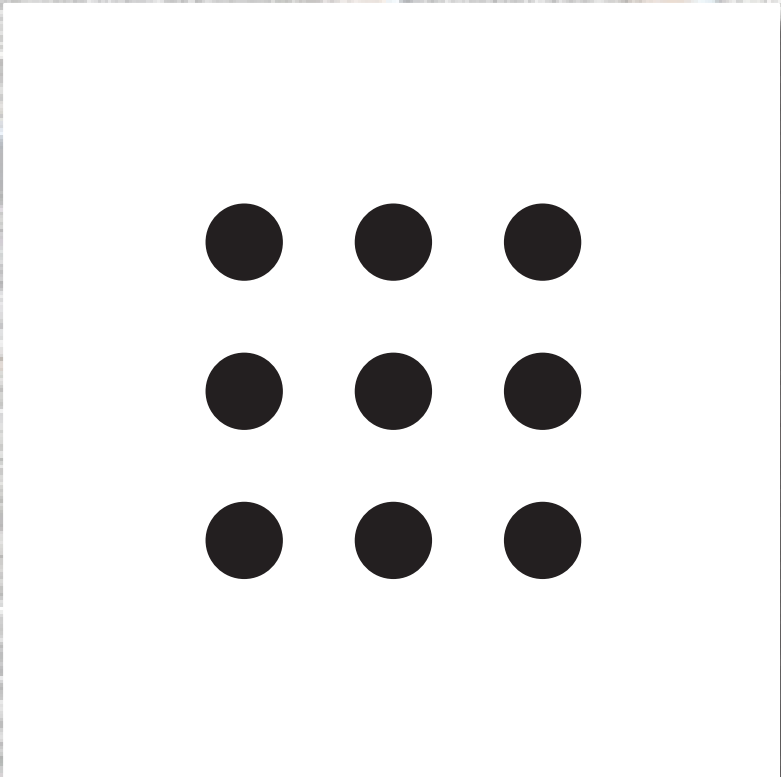


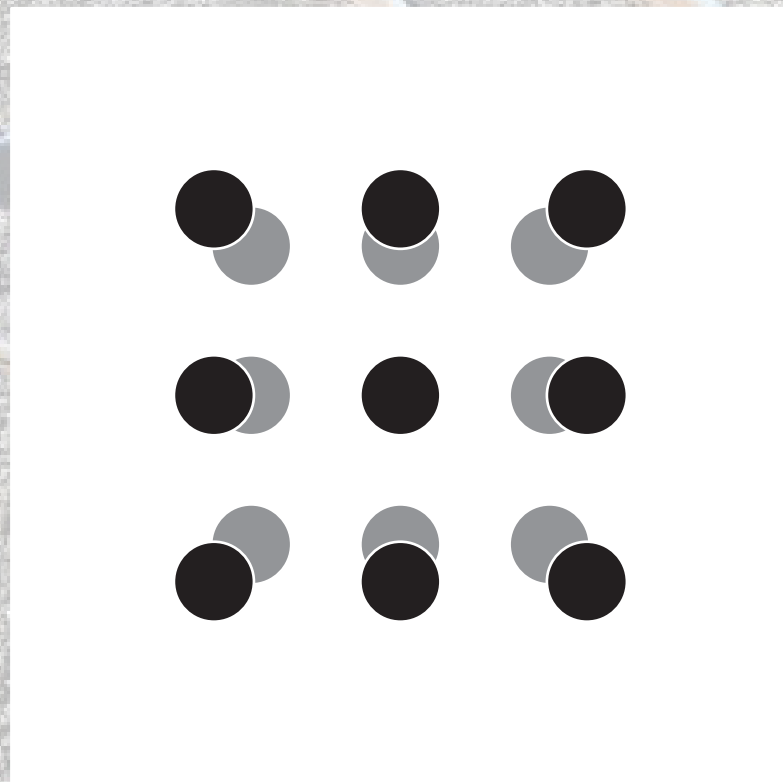
1 education

2 PI

A photograph of a gravel path with a blue wavy line drawn on it, illustrating thermal expansion. The path is made of grey gravel and is flanked by green grass. The blue line is a thick, wavy line that follows the path's edge, showing how it would expand and contract with temperature changes. The text "thermal expansion" is overlaid on the path.

**thermal expansion**





**all of them**

**1** education

**2** PI

**all of them!**



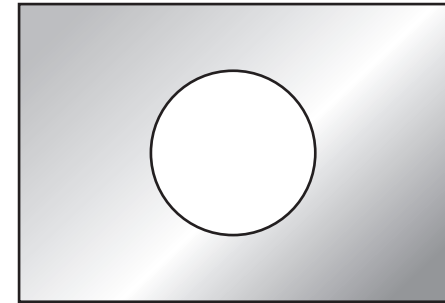
**1** education

**2** PI

**3** test?

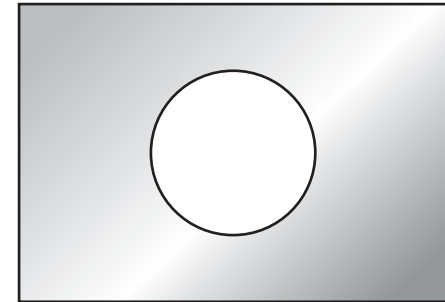


**Consider a rectangular metal plate  
with a circular hole in it.**



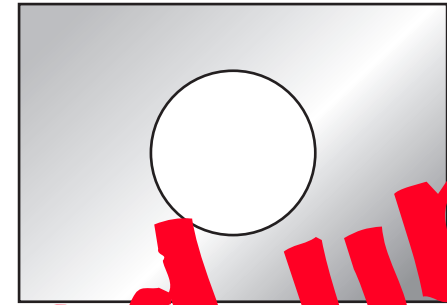
**Consider a rectangular metal plate with a circular hole in it.**

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



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

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



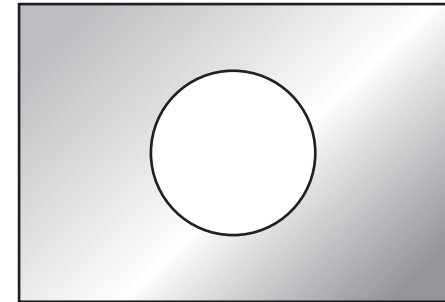
When the plate is uniformly heated, the diameter of the hole

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

**you got all fired up!**

**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.**

**Before I tell you the answer...**

**1** education

**2** PI

**3** test

**Before I tell you the answer, let's analyze what happened.**

**1** education

**2** PI

**3** test

**Before I tell you the answer, let's analyze what happened.**

**You...**

**Before I tell you the answer, let's analyze what happened.**

**You...**

**1. made a commitment**



**Before I tell you the answer, let's analyze what happened.**

**You...**

- 1. made a commitment**
- 2. externalized your answer**

**Before I tell you the answer, let's analyze what happened.**

**You...**

- 1. made a commitment**
- 2. externalized your answer**
- 3. moved from the answer/fact to reasoning**

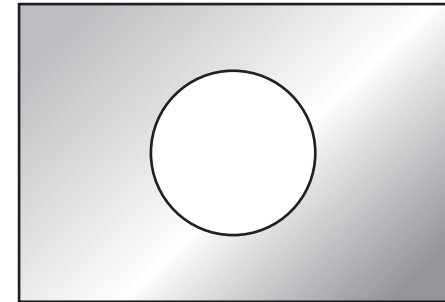
**Before I tell you the answer, let's analyze what happened.**

**You...**

- 1. made a commitment**
- 2. externalized your answer**
- 3. moved from the answer/fact to reasoning**
- 4. became emotionally invested in the learning process**

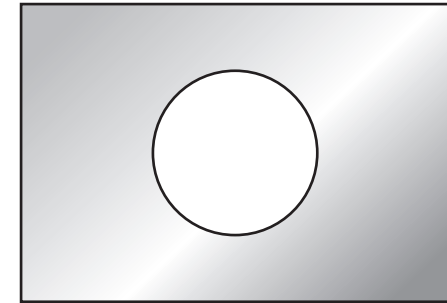
**Consider a rectangular metal plate with a circular hole in it.**

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



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

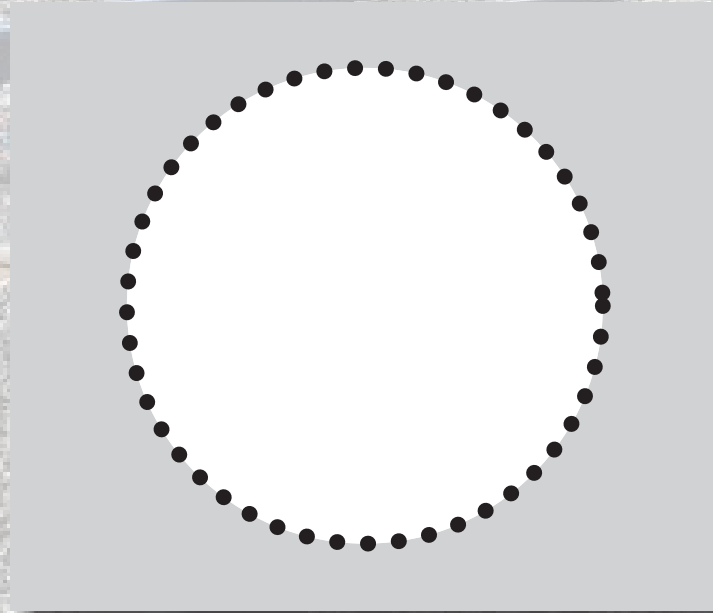
Consider a rectangular metal plate with a circular hole in it.



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

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

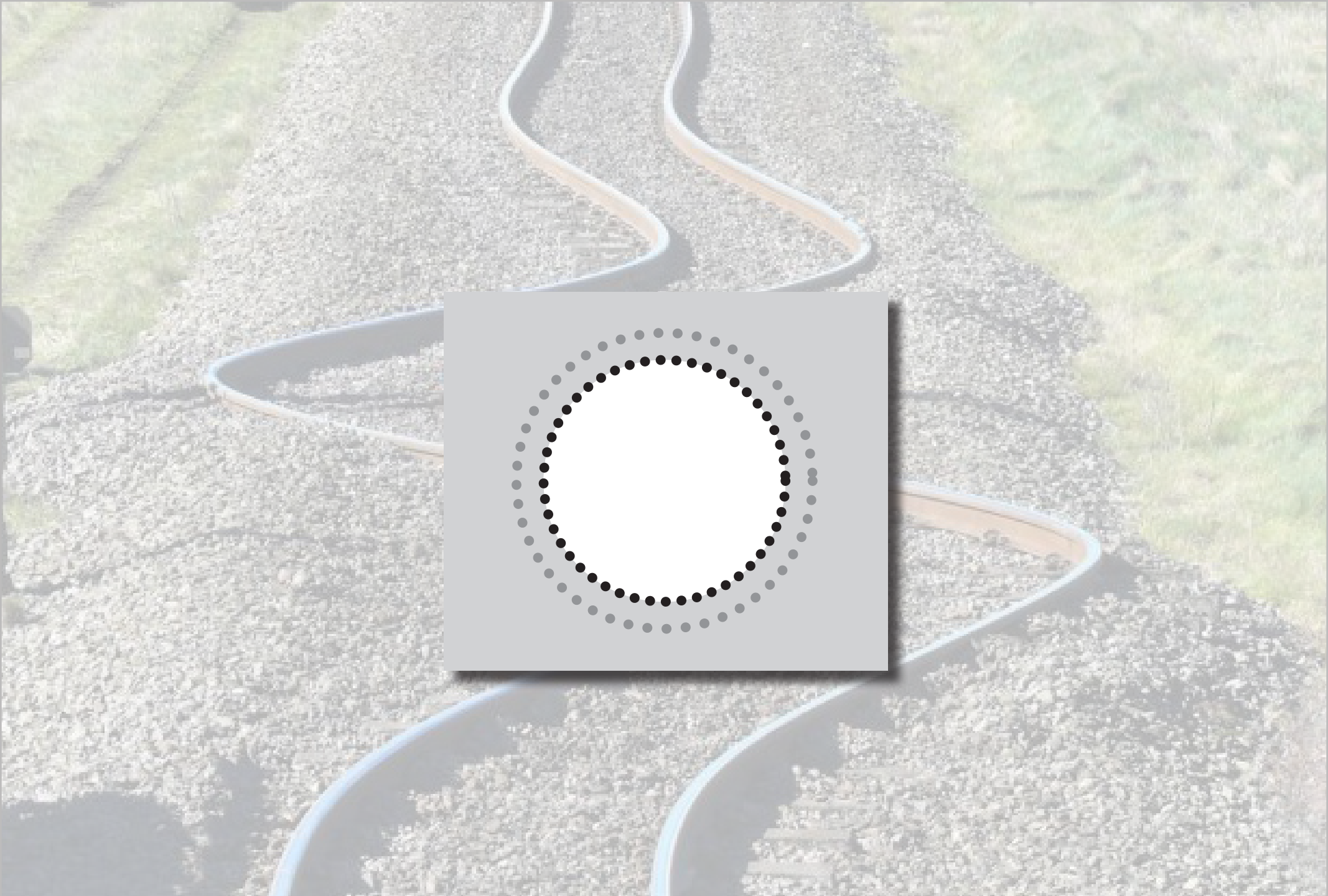
consider atoms at rim of hole



1 education

2 PI

3 test

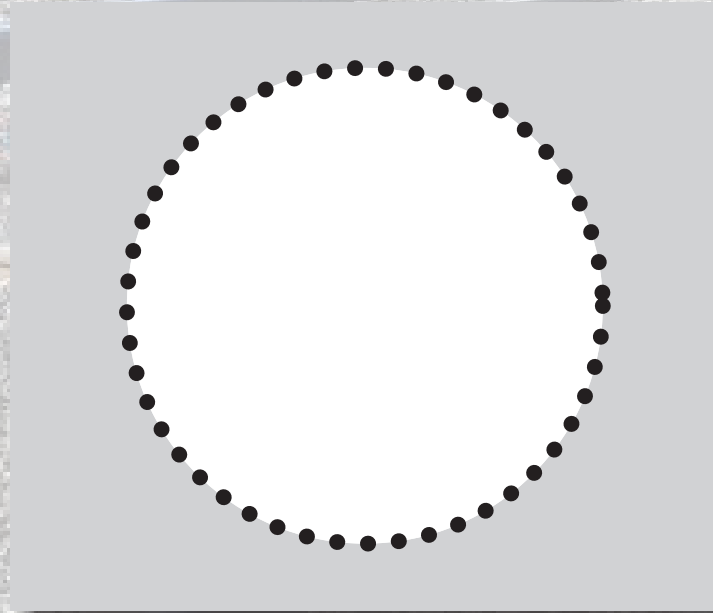


**1** education

**2** PI

**3** test

consider atoms at rim of hole



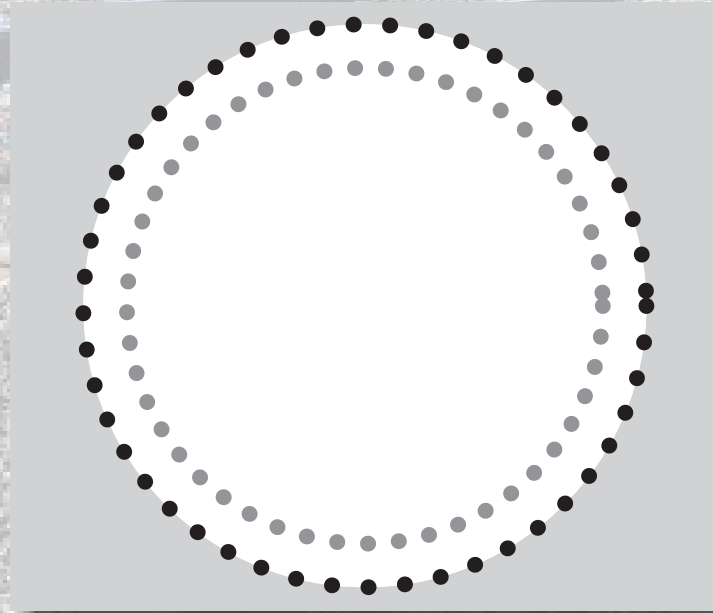
1 education

2 PI

3 test



consider atoms at rim of hole



1 education

2 PI

3 test

consider atoms at rim of hole

**you won't forget this**



**1** education

**2** PI

**3** test

# Peer

## back to PI

### INSTRUCTION

1 education

2 PI

3 test

Peer  
INSTRUCTION

1 education

2 PI

3 test

Peer  
Higher learning & gains

INSTRUCTION

1 education

2 PI

3 test

**Higher learning gains**

**Better retention**

**INSTRUCTION**

1 education

2 PI

3 test

# First International Asia-Pacific Conference on Peer Instruction



Beijing, China

mazur@harvard.edu

14-16 December 2012



**Join now!**

**PeerInstruction.net**





**1** education

**2** PI

**3** test

in a lecture, students...

**1** education

**2** PI

**3** test

**in a lecture, students...**

**1. don't pay utmost attention**

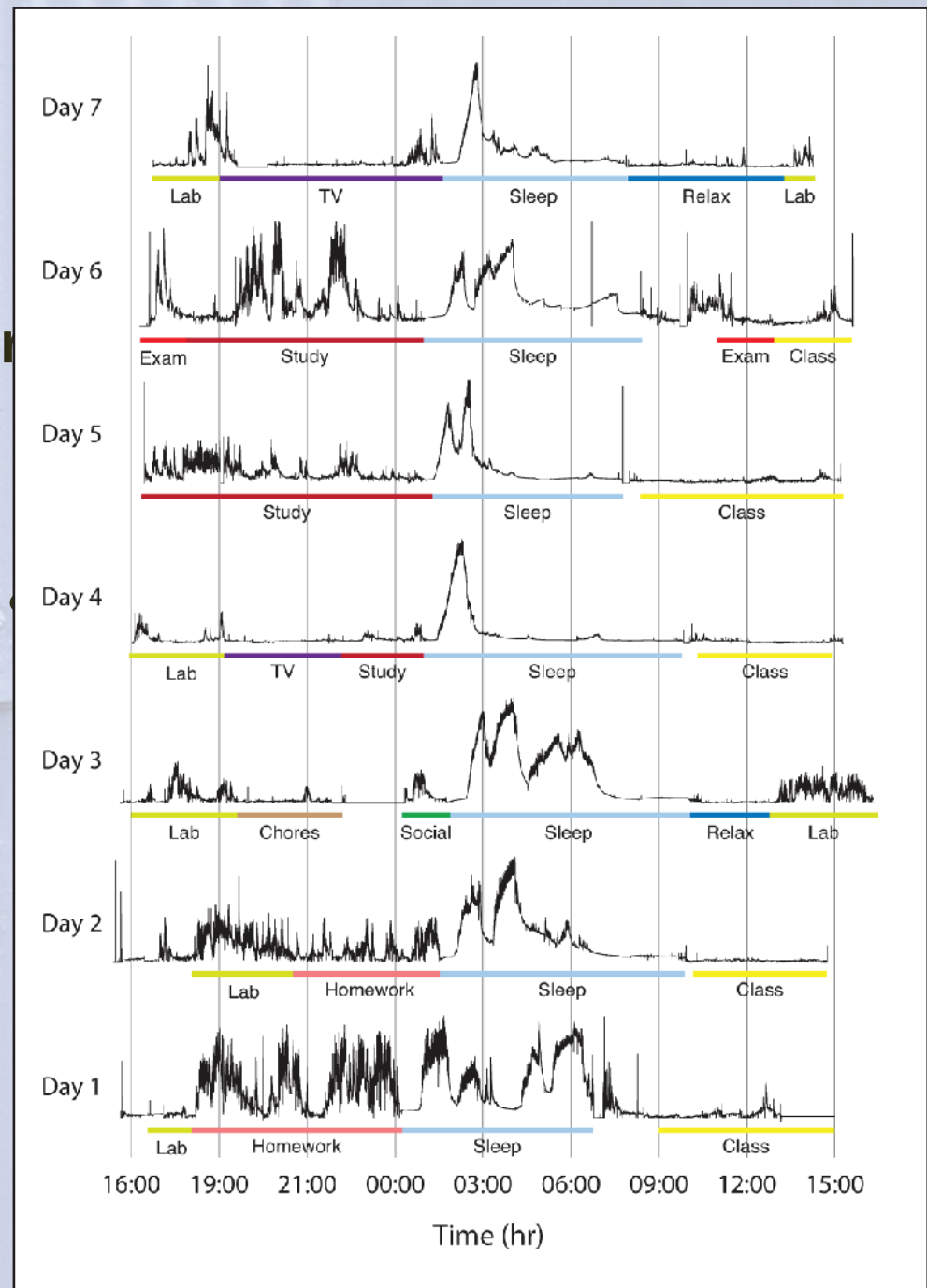
**1** education

**2** PI

**3** test

in a lecture

1. don't pay utmost



doi: 10.1109/TBME.2009.2038487

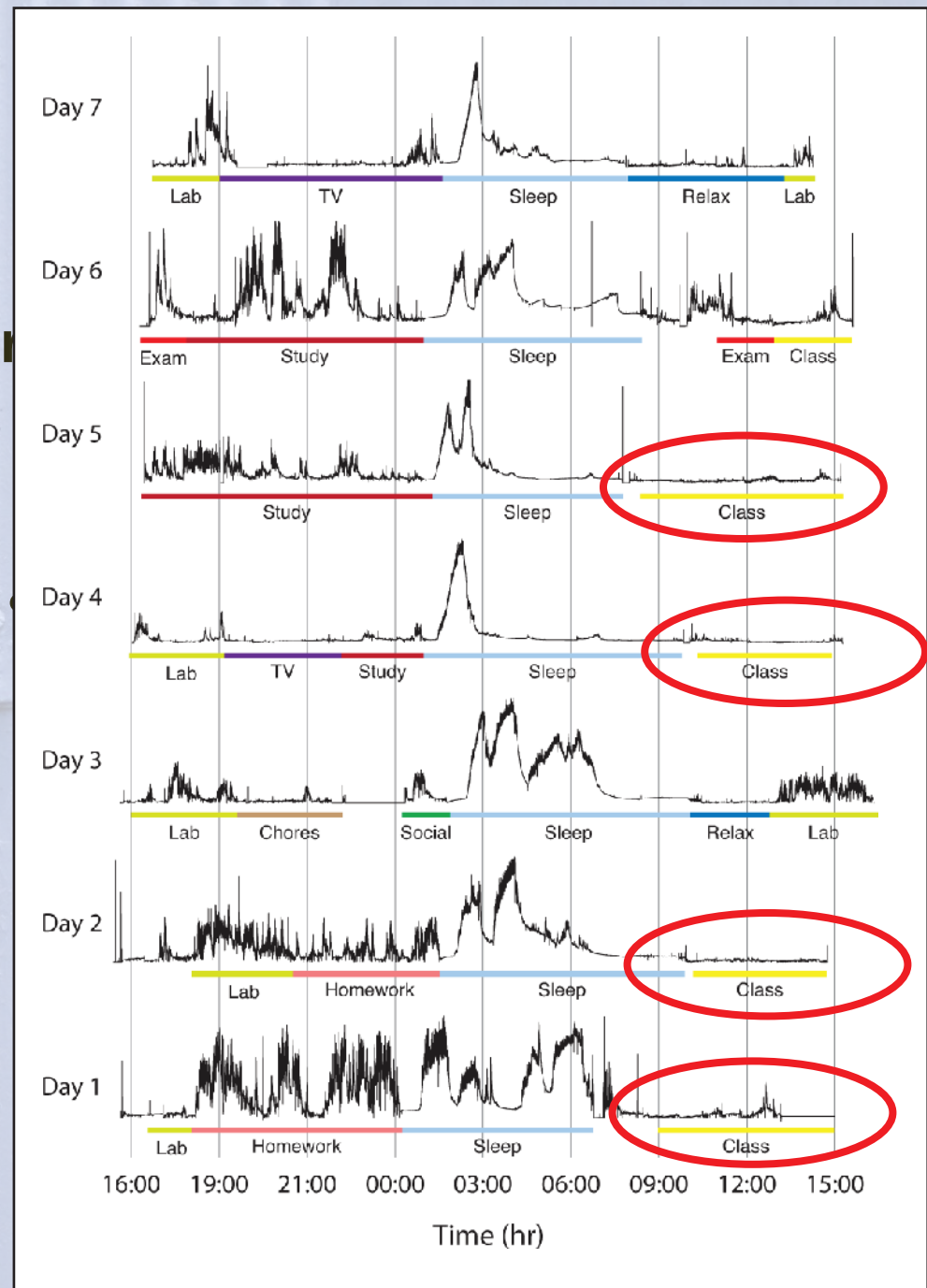
1 education

2 PI

3 test

in a lecture

1. don't pay utmost



doi: 10.1109/TBME.2009.2038487

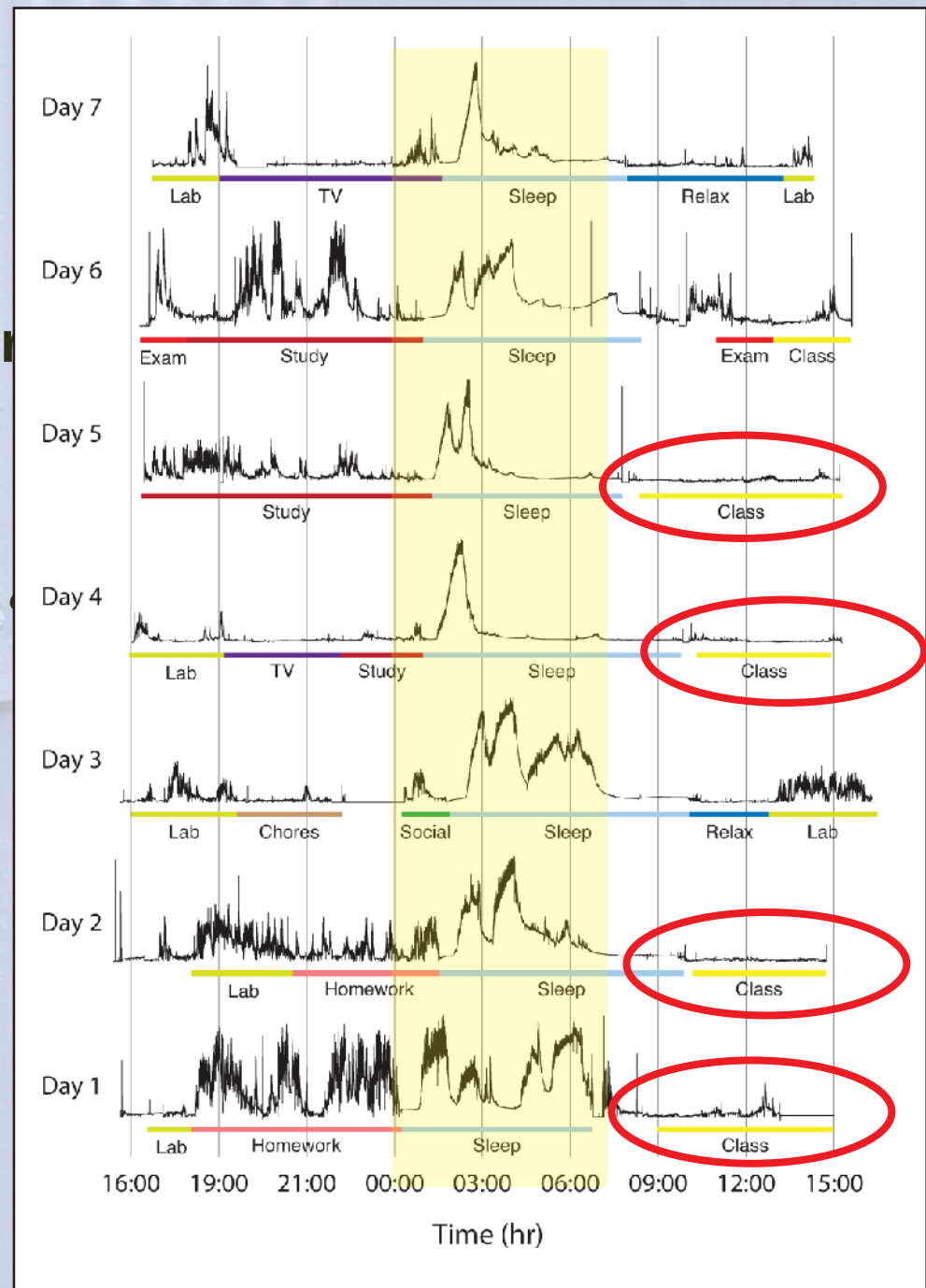
1 education

2 PI

3 test

in a lecture

1. don't pay utmost



doi: 10.1109/TBME.2009.2038487

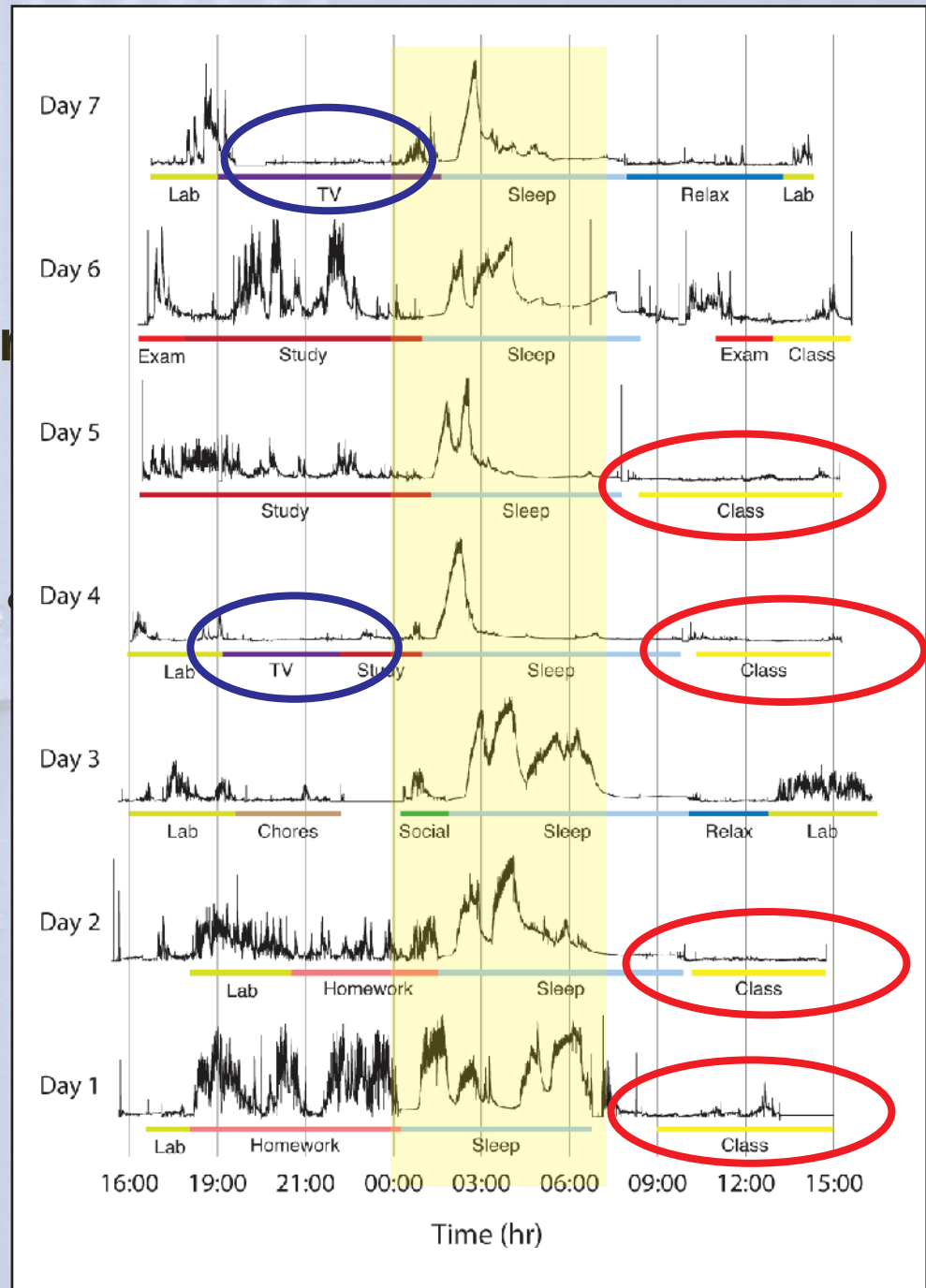
1 education

2 PI

3 test

in a lecture

1. don't pay utmost



doi: 10.1109/TBME.2009.2038487

1 education

2 PI

3 test

**in a lecture, students...**

- 1. don't pay utmost attention**
- 2. think they know it**



**in a lecture, students...**

- 1. don't pay utmost attention**
- 2. think they know it**
- 3. are not confronted with misconceptions**

in a lecture, students...

1. don't pay utmost attention

2. think they know it

3. are not confronted with misconceptions

**false**  
**sense of security**



**1** education

**2** PI

**3** test



an illusion. . .

1 education

2 PI

3 test



**Education is not just about:**

- **transferring information**
- **getting students to do what we do**

**1** education

**2** PI

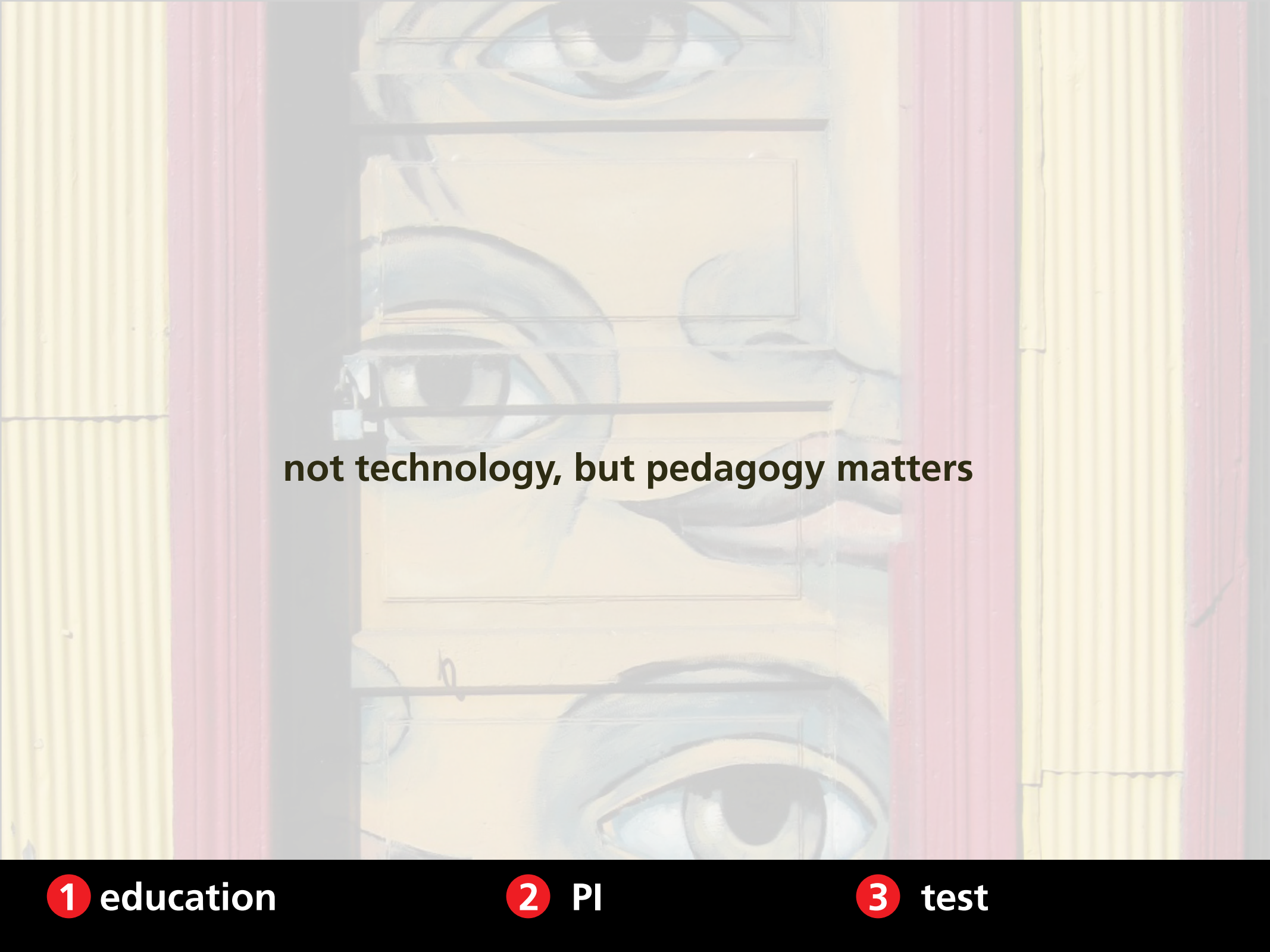
**3** test



**Education is not just about:**

- **transferring information**
- **getting students to do what we do**

**active participation a must!**



**not technology, but pedagogy matters**

**1** education

**2** PI

**3** test

**Funding:**

**National Science Foundation**

**for a copy of this presentation:**

**[mazor.harvard.edu](http://mazor.harvard.edu)**

**Follow me!**



**[eric\\_mazor](https://twitter.com/eric_mazor)**



Google™

Google Search

I'm Feeling Lucky

Google™

mazur

Google Search

I'm Feeling Lucky

# Google™

Google Search

I'm Feeling Lucky

# Google™

Google Search

I'm Feeling Lucky

**Funding:**

**National Science Foundation**

**for a copy of this presentation:**

**[mazor.harvard.edu](http://mazor.harvard.edu)**

**Follow me!**



**[eric\\_mazor](https://twitter.com/eric_mazor)**