

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



EDULEARN14

Barcelona, Spain 7 July 2014



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

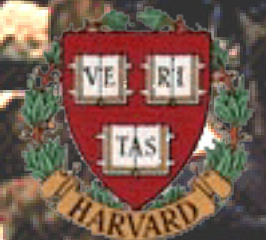


**@eric\_mazur**



EDULEARN14

Barcelona, Spain 7 July 2014











simplemente el que le cal, amb els m...  
ter, o te dignitat, que és el mateix"  
ANTONI  
tione simplemente lo que necesita con  
tione carácter o tiene dignidad, que es lo  
ANTONI  
y simply has what it needs with the r...  
haracter, or dignity, which is the same th...  
ANTONI C















1 education

2 PI





1 education

2 PI

3 test



**better pay  
attention!**

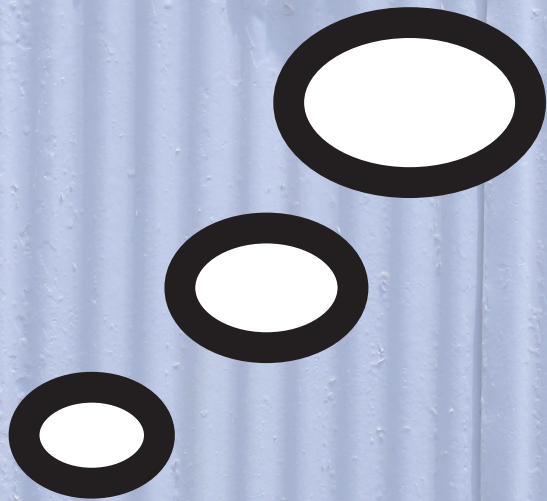
**1** education

**2** PI

**3** test



**What happens  
in a lecture?**

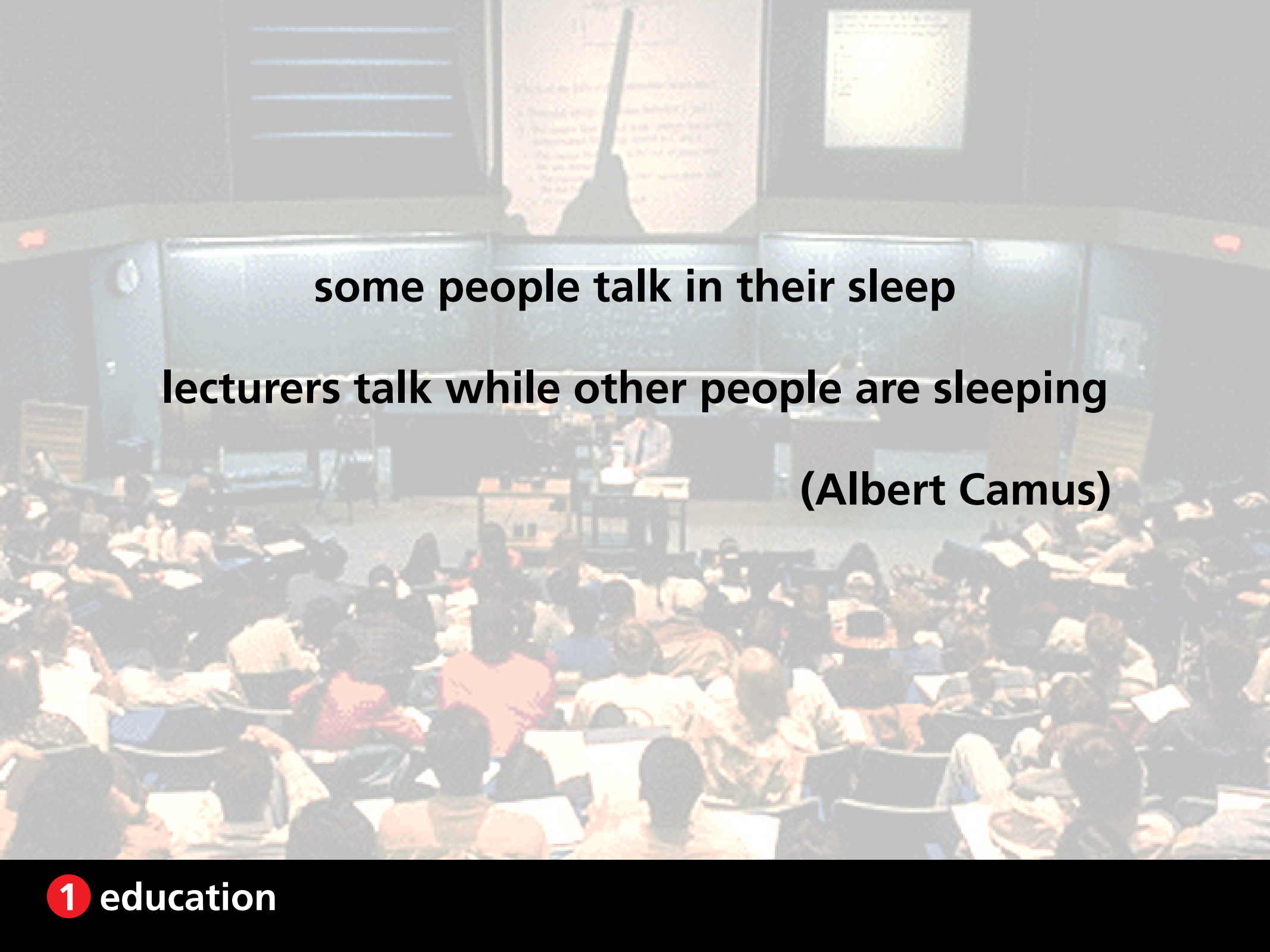






A large lecture hall with a professor at a podium and students in the audience. The professor is standing at a podium on the stage, facing the audience. The audience is seated in rows of chairs, facing the stage. The room has a curved wall and a large screen at the front. The text "some people talk in their sleep" is overlaid on the image.

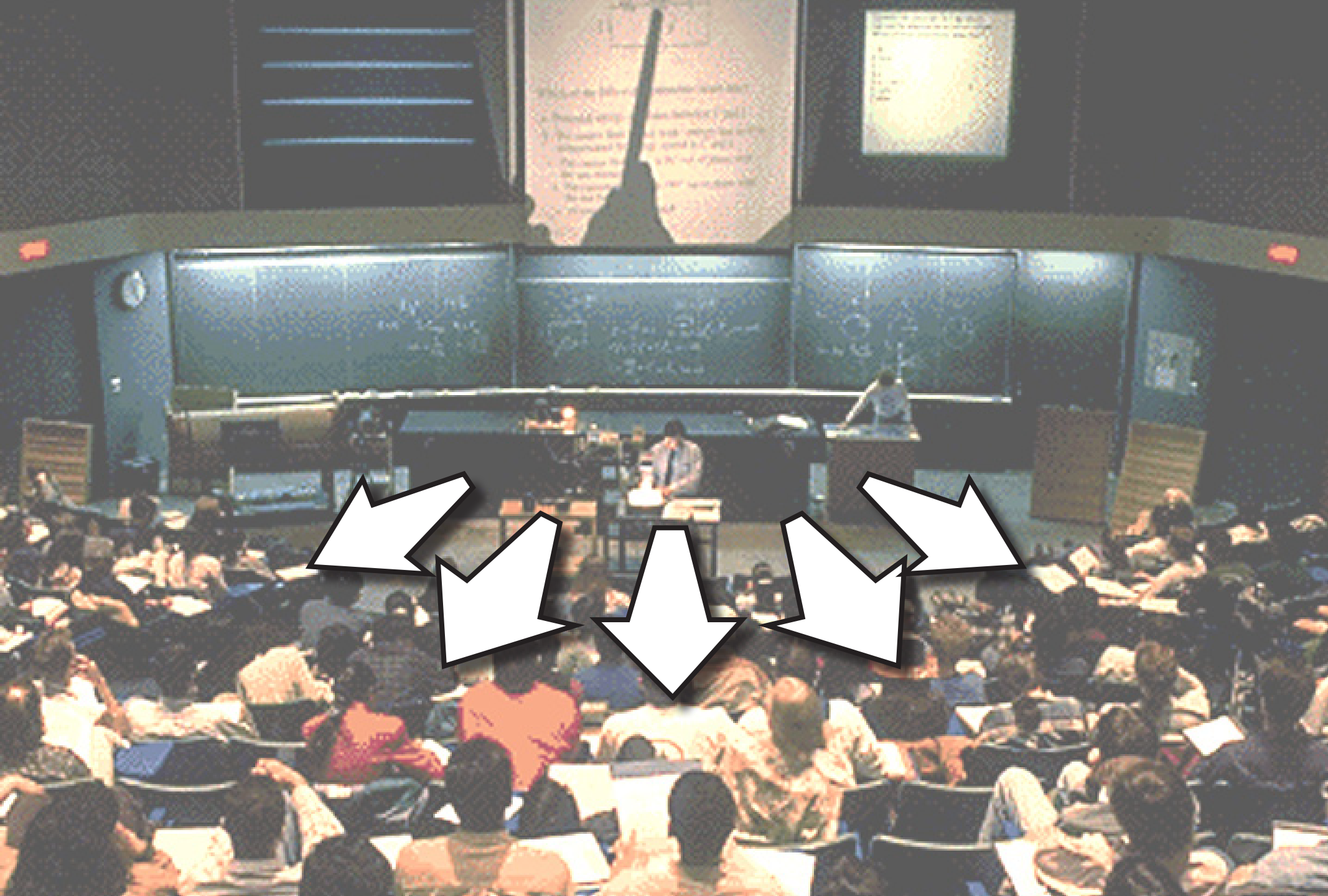
**some people talk in their sleep**

A large lecture hall with a lecturer at a podium and an audience of students. The room is filled with people sitting at desks, facing the front where a lecturer is standing at a podium. There are several large screens or whiteboards in the background displaying text and diagrams. The overall atmosphere is that of a formal educational setting.

**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**



**not transfer but assimilation of information is key**

**EDUCACION**





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**



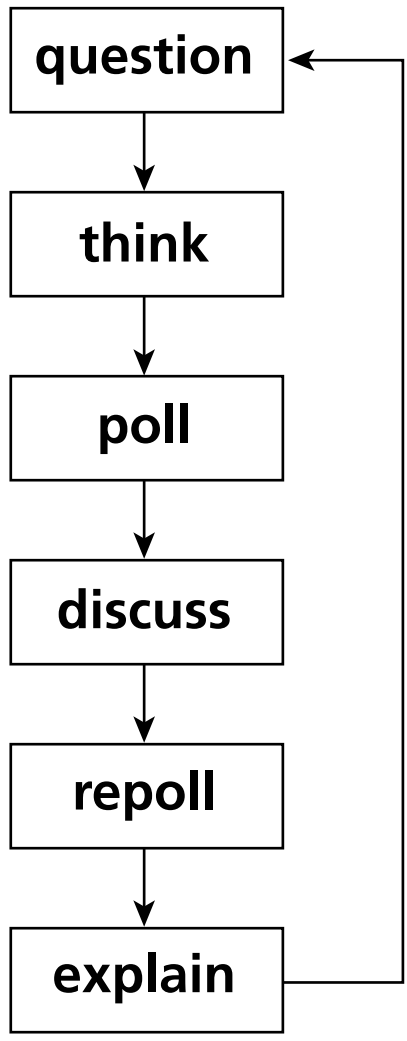
**discuss**



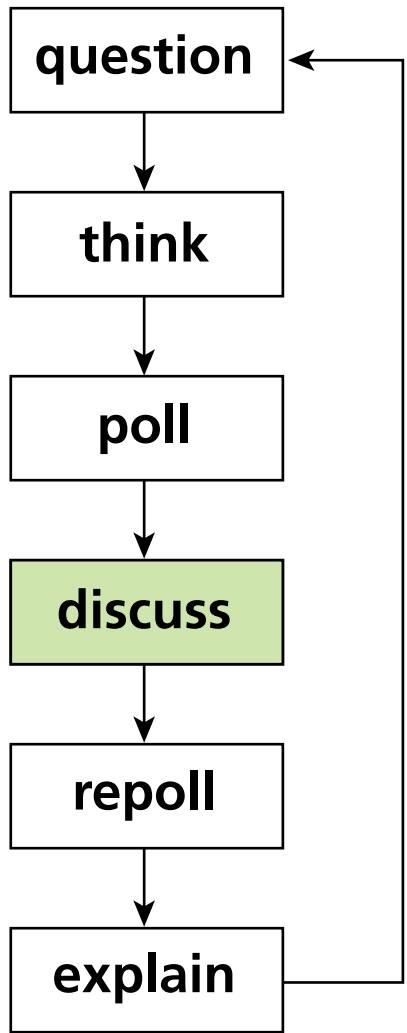
**repoll**



**explain**







**1** education

**2** PI



Let's try it!

QUESTION

think

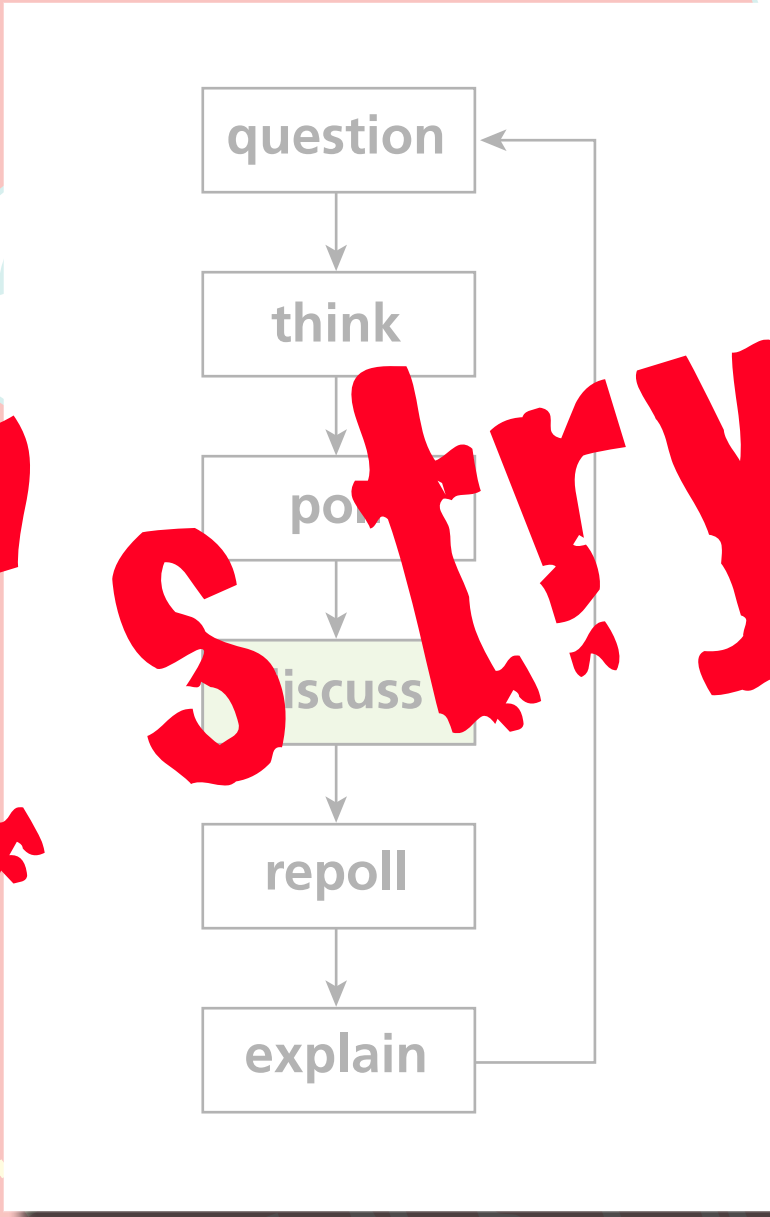
poll

discuss

repoll

explain

ACTION



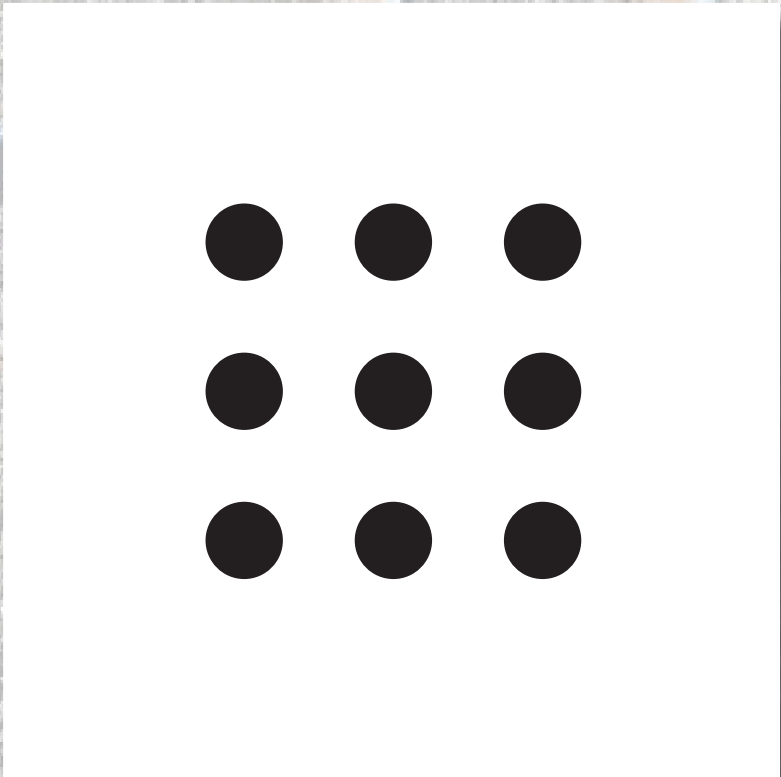
1 education

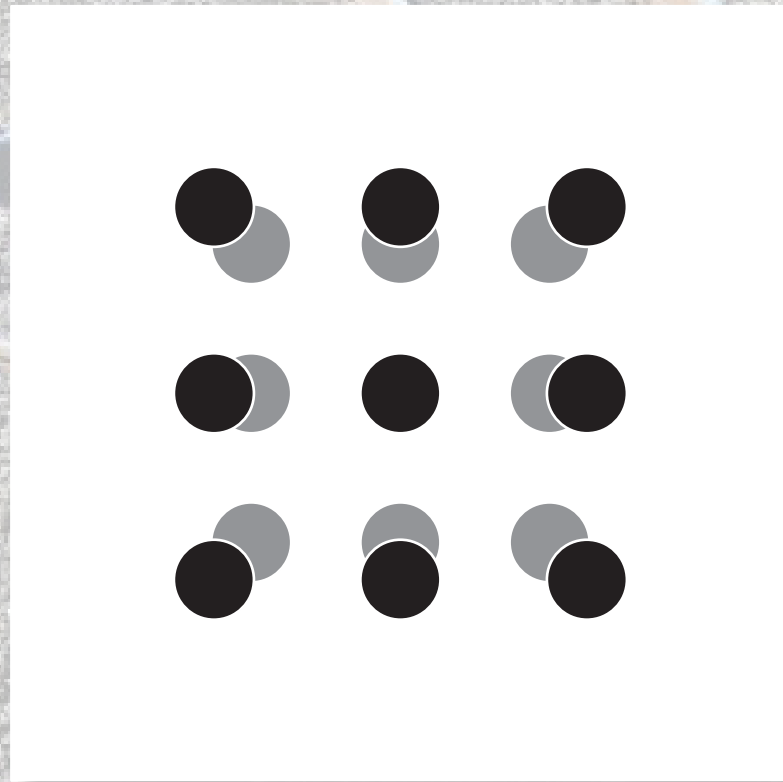
2 PI

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 bordered by green grass on both sides. The blue line is drawn in a series of connected, rounded curves, resembling a sine wave. The text "thermal expansion" is overlaid in the center of the path.

**thermal expansion**

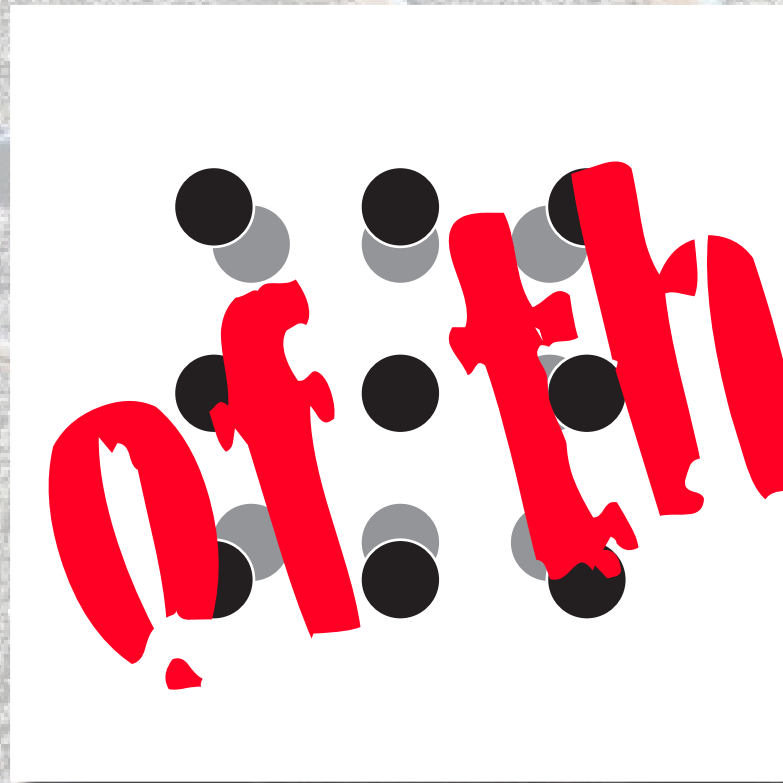








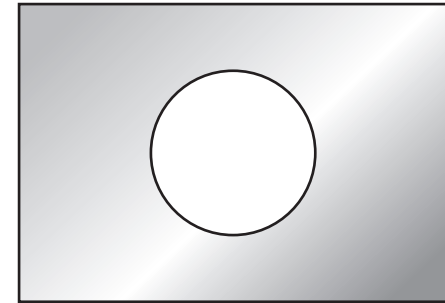
**all of them!**



**1** education

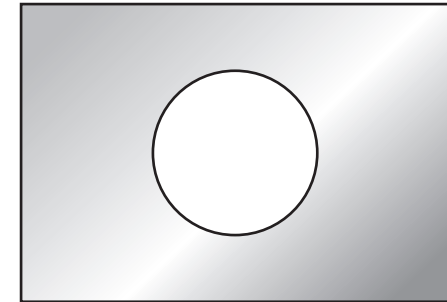
**2** PI

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





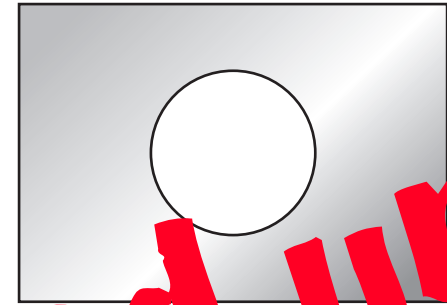
**Consider a rectangular metal plate with a circular hole in it.**



**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

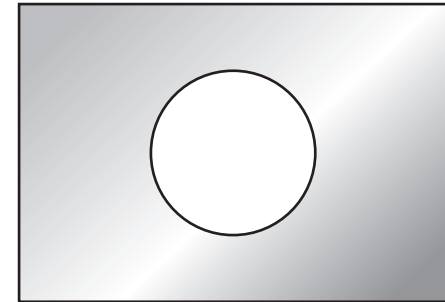
1. increases.
2. stays the same.
3. decreases.

**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**



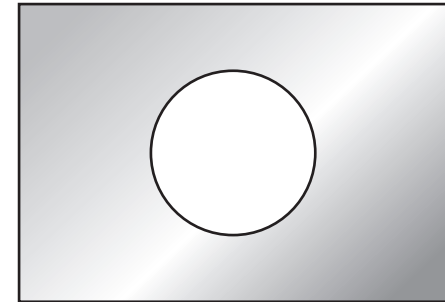
**Before I tell you the answer, let's analyze what happened.**

**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**

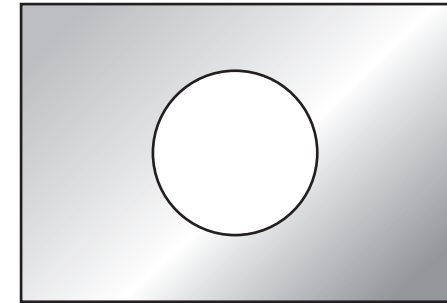
**Consider a rectangular metal plate with a circular hole in it.**

**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.

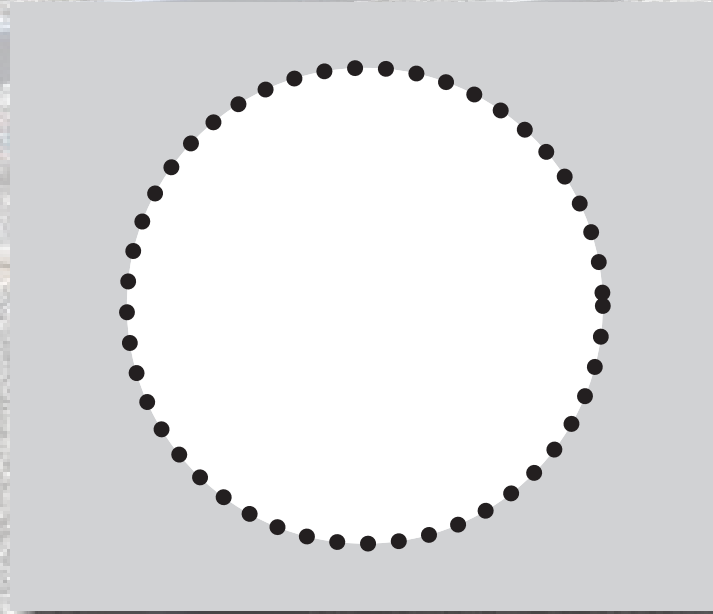


When the plate is uniformly heated, the diameter of the hole

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



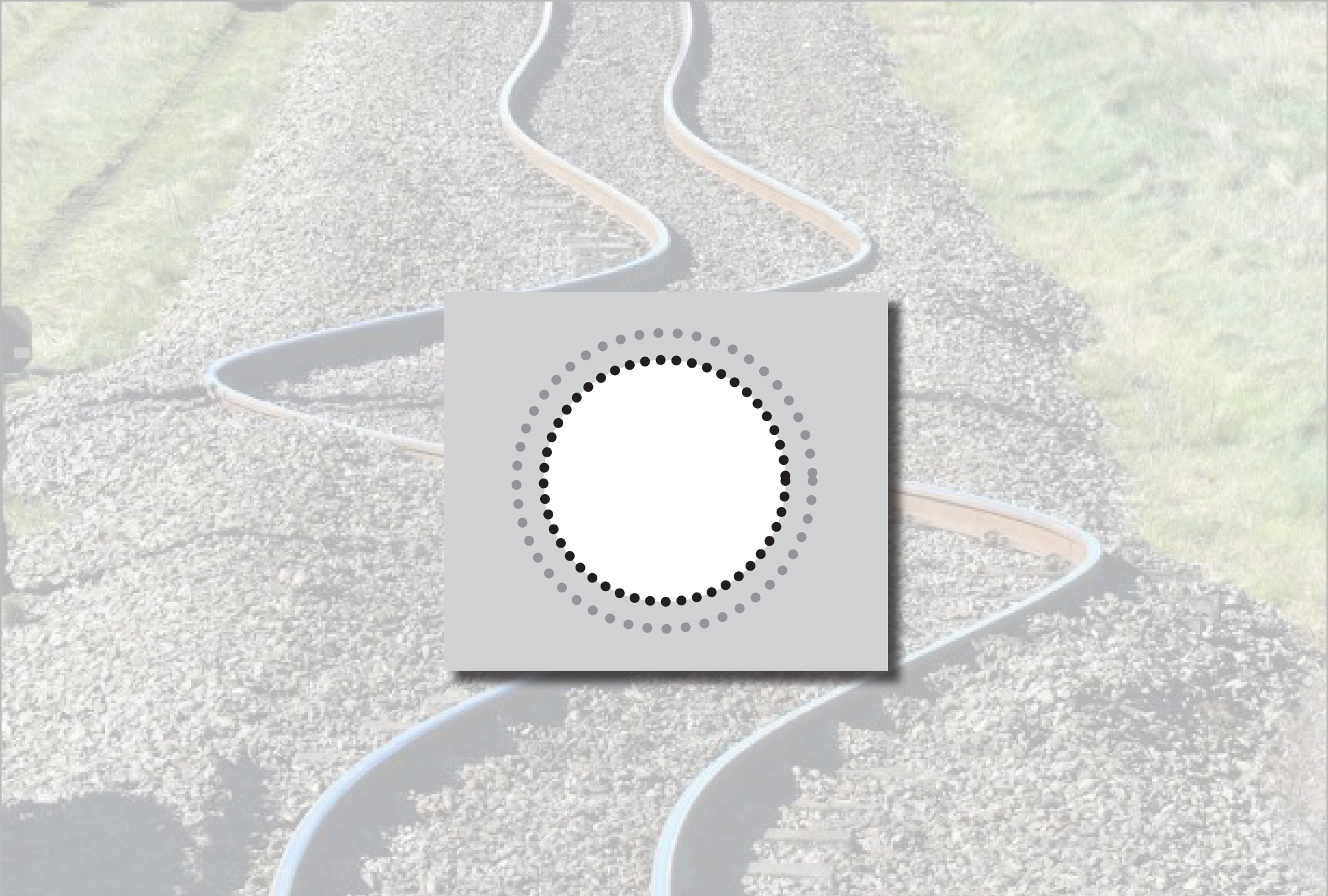
consider atoms at rim of hole



1 education

2 PI

3 test

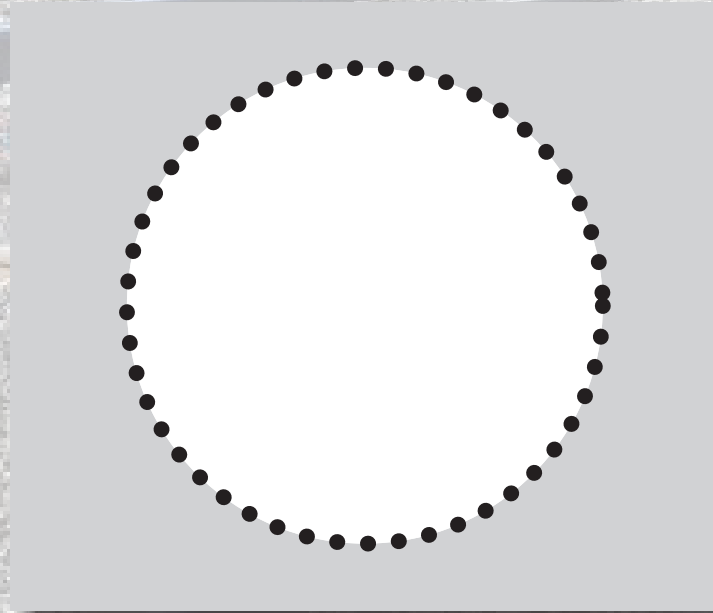


**1** education

**2** PI

**3** test

consider atoms at rim of hole



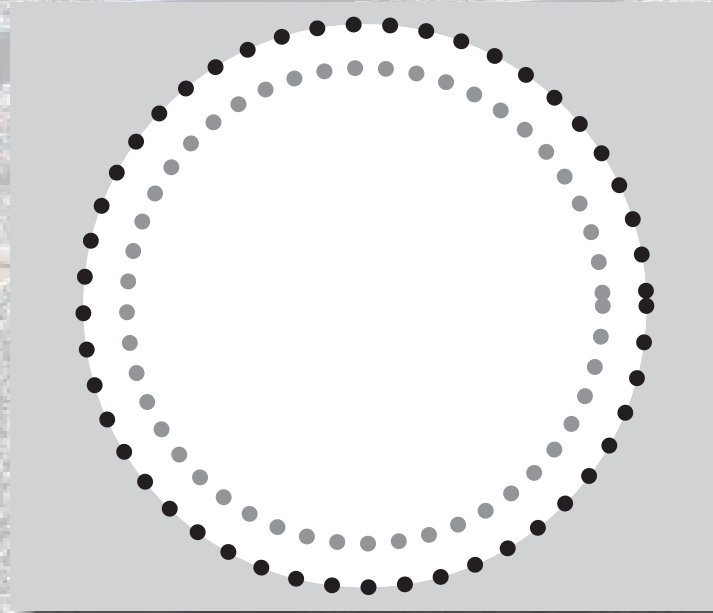
1 education

2 PI

3 test



consider atoms at rim of hole



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  
Greater learning gains

INSTRUCTION

1 education

2 PI

3 test

**Peer**  
**Greater learning gains**

**Better retention**

**INSTRUCTION**

**1** education

**2** PI

**3** test





**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

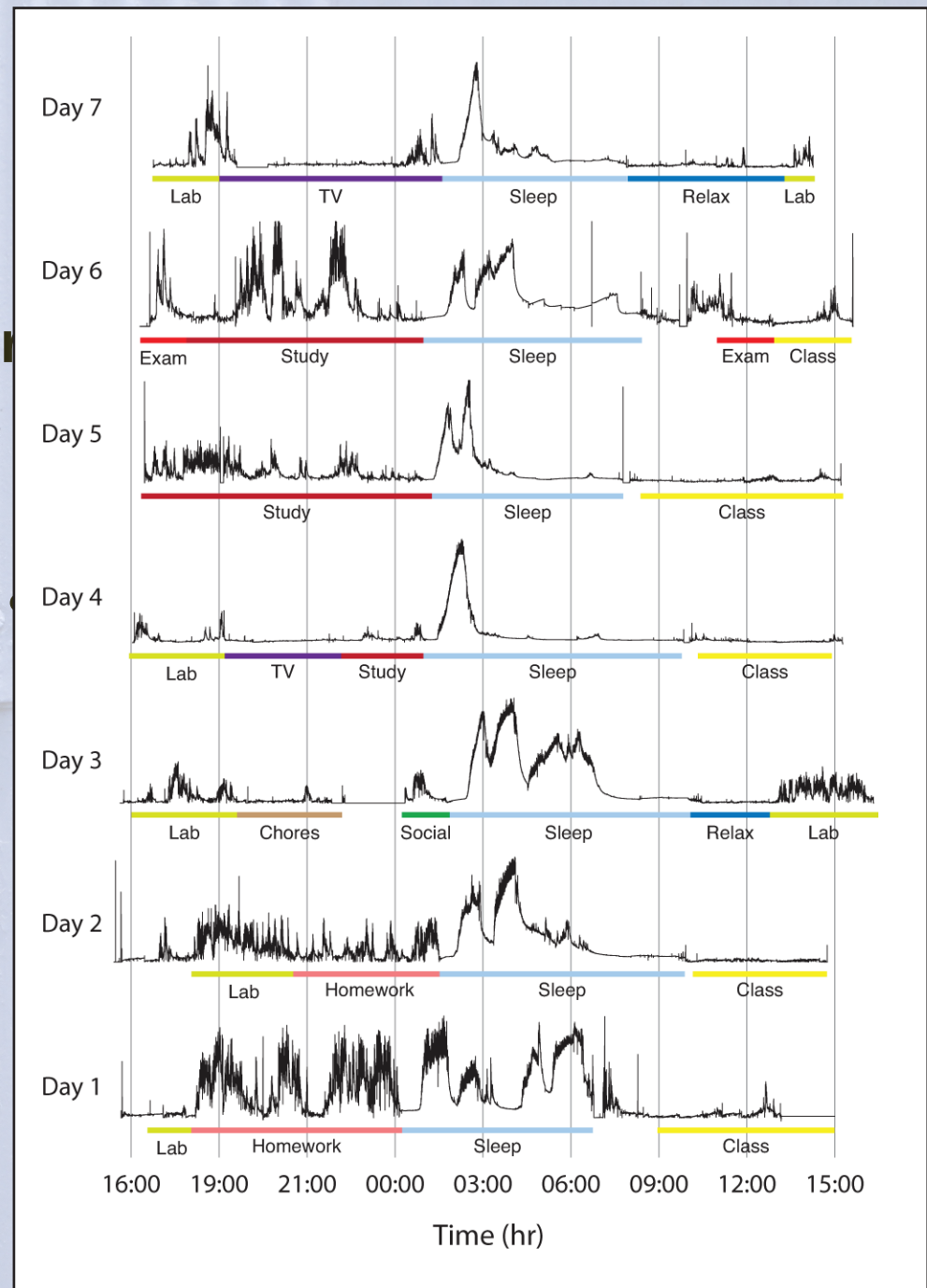
**2** PI

**3** test



in a lecture

1. don't pay utmost



doi: 10.1109/TBME.2009.2038487

1 education

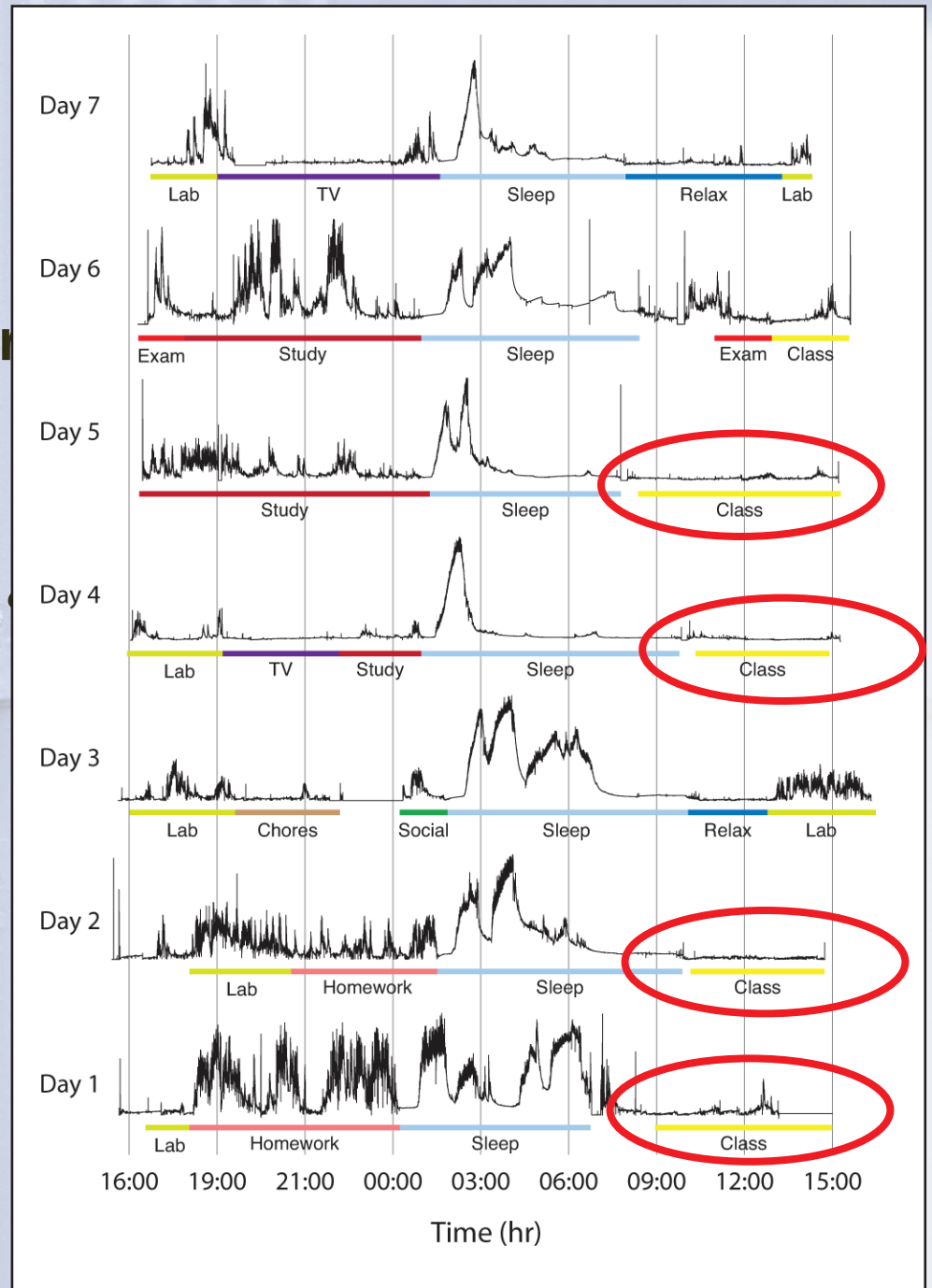
2 PI

3 test



in a lecture

1. don't pay utmost



doi: 10.1109/TBME.2009.2038487

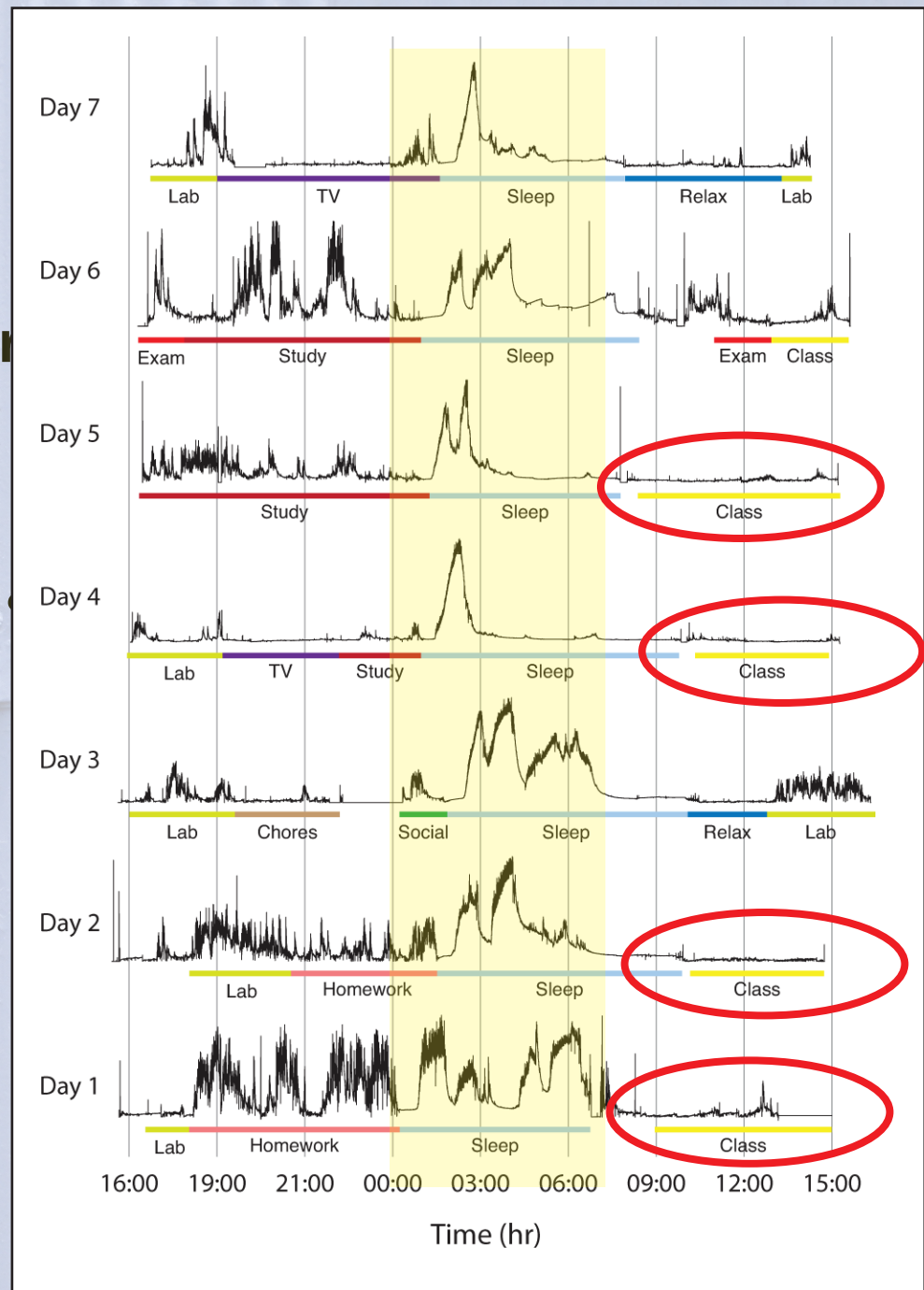
1 education

2 PI

3 test

in a lecture

1. don't pay utmost



doi: 10.1109/TBME.2009.2038487

1 education

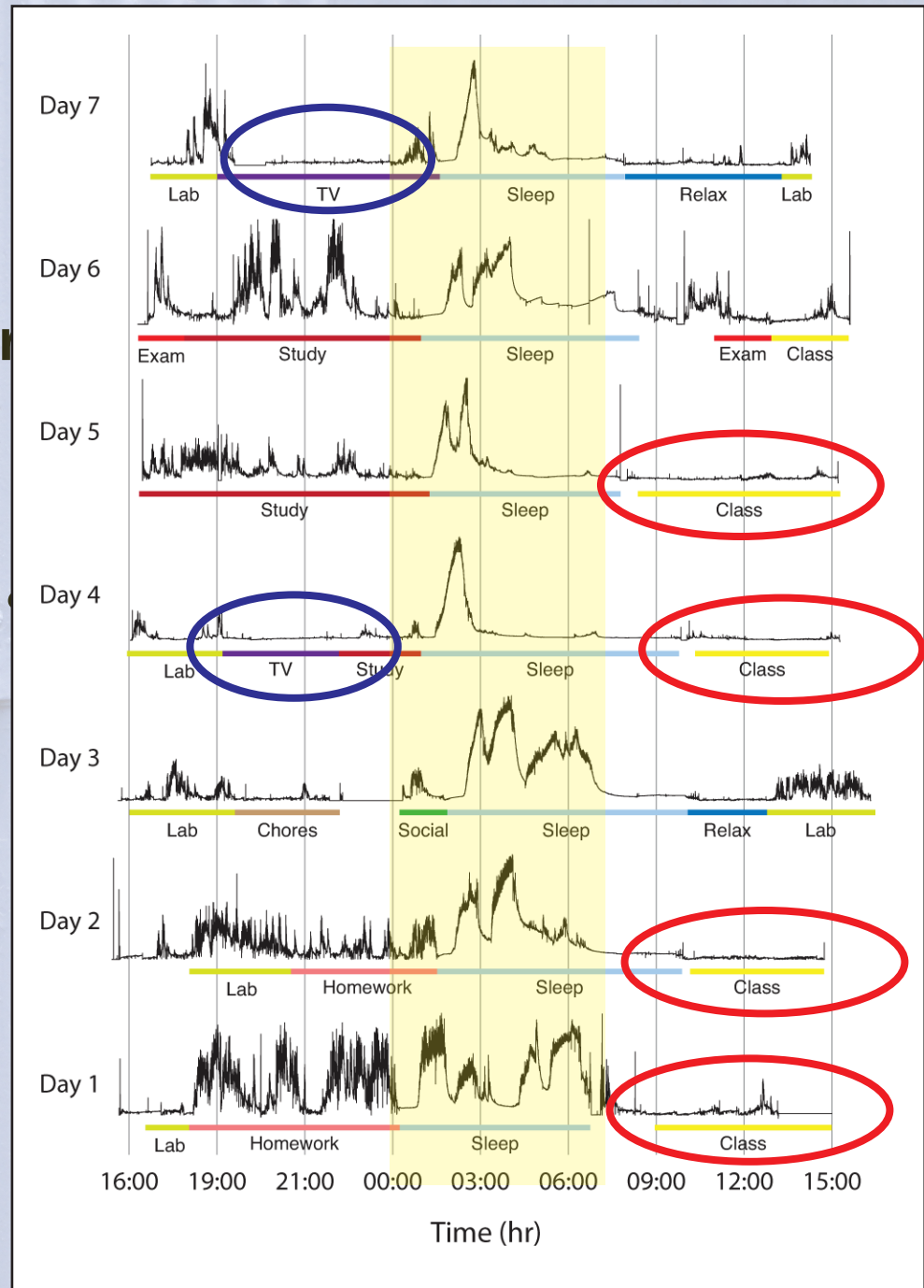
2 PI

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**

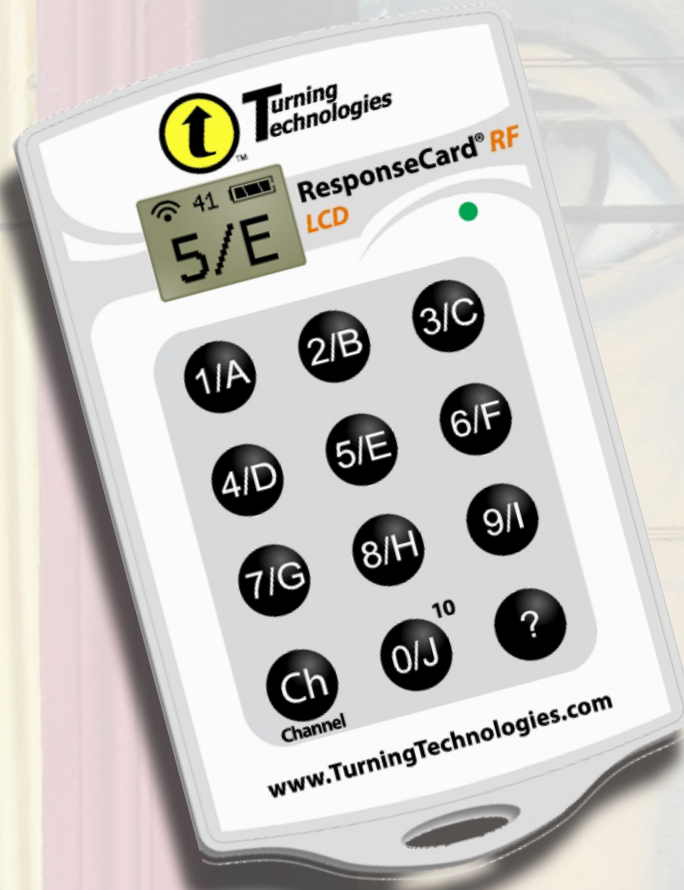
**active participation a must!**



**Join now!**

**PeerInstruction.net**

# PLEASE LEAVE CLICKER ON SEAT



1 education

2 PI

3 test



**Funding:**

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