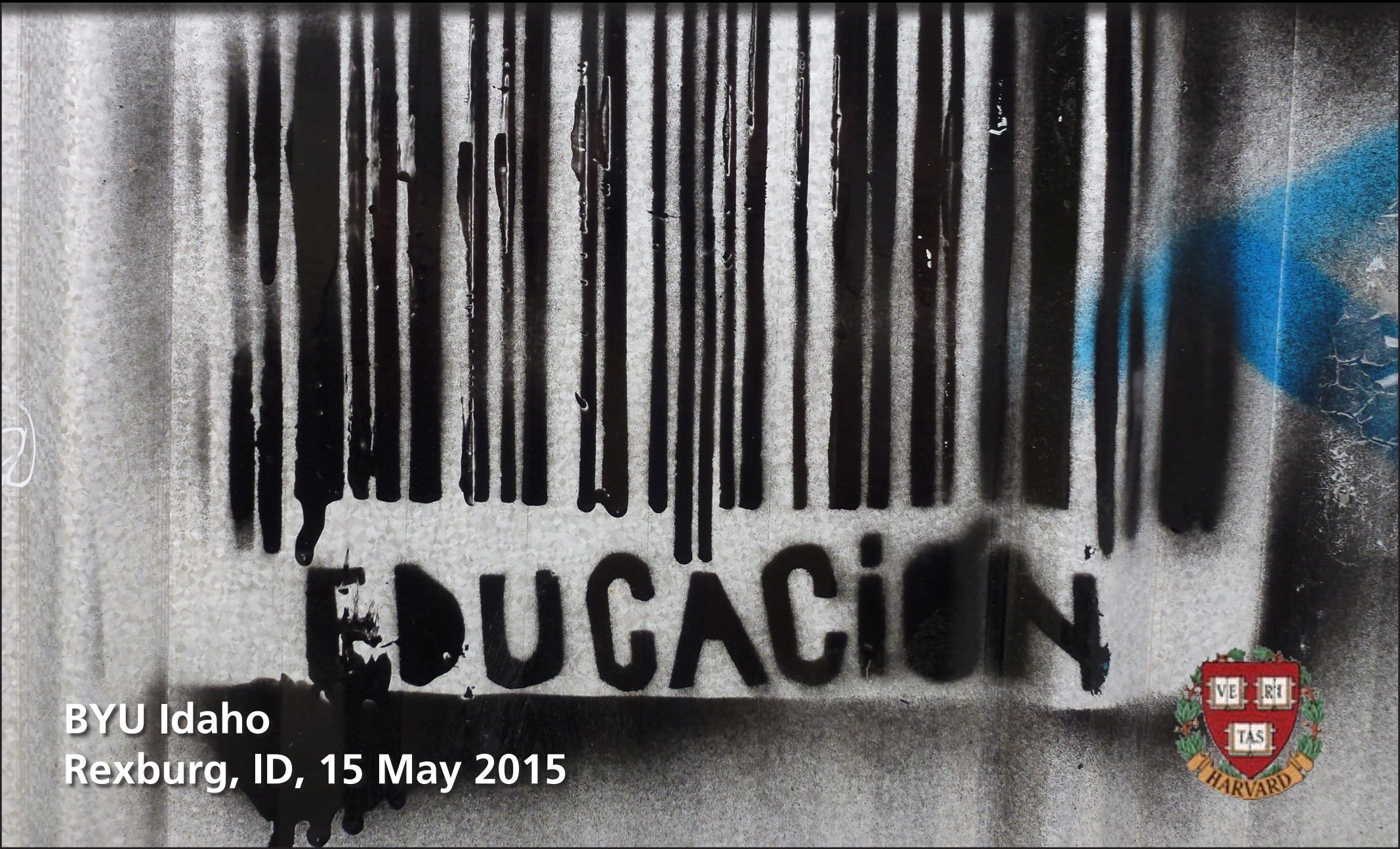


# How student learning transformed my teaching



BYU Idaho  
Rexburg, ID, 15 May 2015





# How student learning transformed my teaching

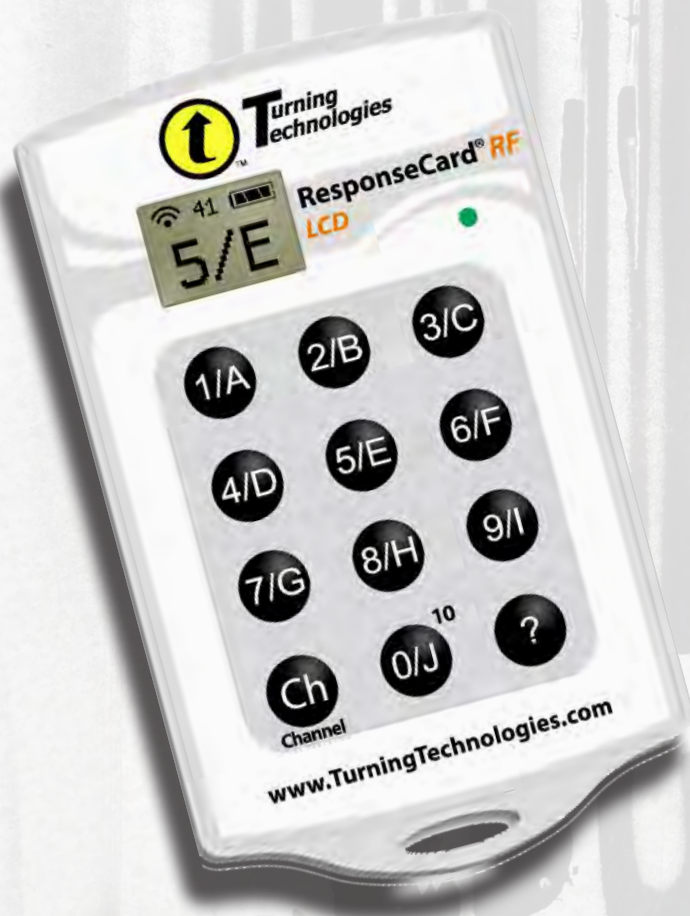


@eric\_mazur

BYU Idaho  
Rexburg, ID, 15 May 2015







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





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**unique ID on back of clicker**



**Think of something you are good at**

**EDUCACION**



**Think of something you are good at**

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



**Became good at it by:**

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







1. The first part of the lecture is devoted to the study of the properties of the function  $f(x)$  defined on the interval  $[a, b]$ . We shall assume that  $f(x)$  is continuous on  $[a, b]$  and that  $f(a) = f(b)$ . We shall also assume that  $f(x)$  is not constant on  $[a, b]$ . We shall prove that in this case the function  $f(x)$  attains its maximum and minimum values on  $[a, b]$ .

2. The second part of the lecture is devoted to the study of the properties of the function  $f(x)$  defined on the interval  $[a, b]$ . We shall assume that  $f(x)$  is continuous on  $[a, b]$  and that  $f(a) = f(b)$ . We shall also assume that  $f(x)$  is not constant on  $[a, b]$ . We shall prove that in this case the function  $f(x)$  attains its maximum and minimum values on  $[a, b]$ .

$x$	$y$
1	2
2	3
3	4
4	5
5	6
6	7
7	8
8	9
9	10

1. The first part of the lecture is devoted to the study of the properties of the function  $f(x)$  defined on the interval  $[a, b]$ . We shall assume that  $f(x)$  is continuous on  $[a, b]$  and that  $f(a) = f(b)$ . We shall also assume that  $f(x)$  is not constant on  $[a, b]$ . We shall prove that in this case the function  $f(x)$  attains its maximum and minimum values on  $[a, b]$ .

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3. The third part of the lecture is devoted to the study of the properties of the function  $f(x)$  defined on the interval  $[a, b]$ . We shall assume that  $f(x)$  is continuous on  $[a, b]$  and that  $f(a) = f(b)$ . We shall also assume that  $f(x)$  is not constant on  $[a, b]$ . We shall prove that in this case the function  $f(x)$  attains its maximum and minimum values on  $[a, b]$ .













1 education

2 PI

3 test






1 education

2 PI

3 test





**What happens  
in a lecture?**



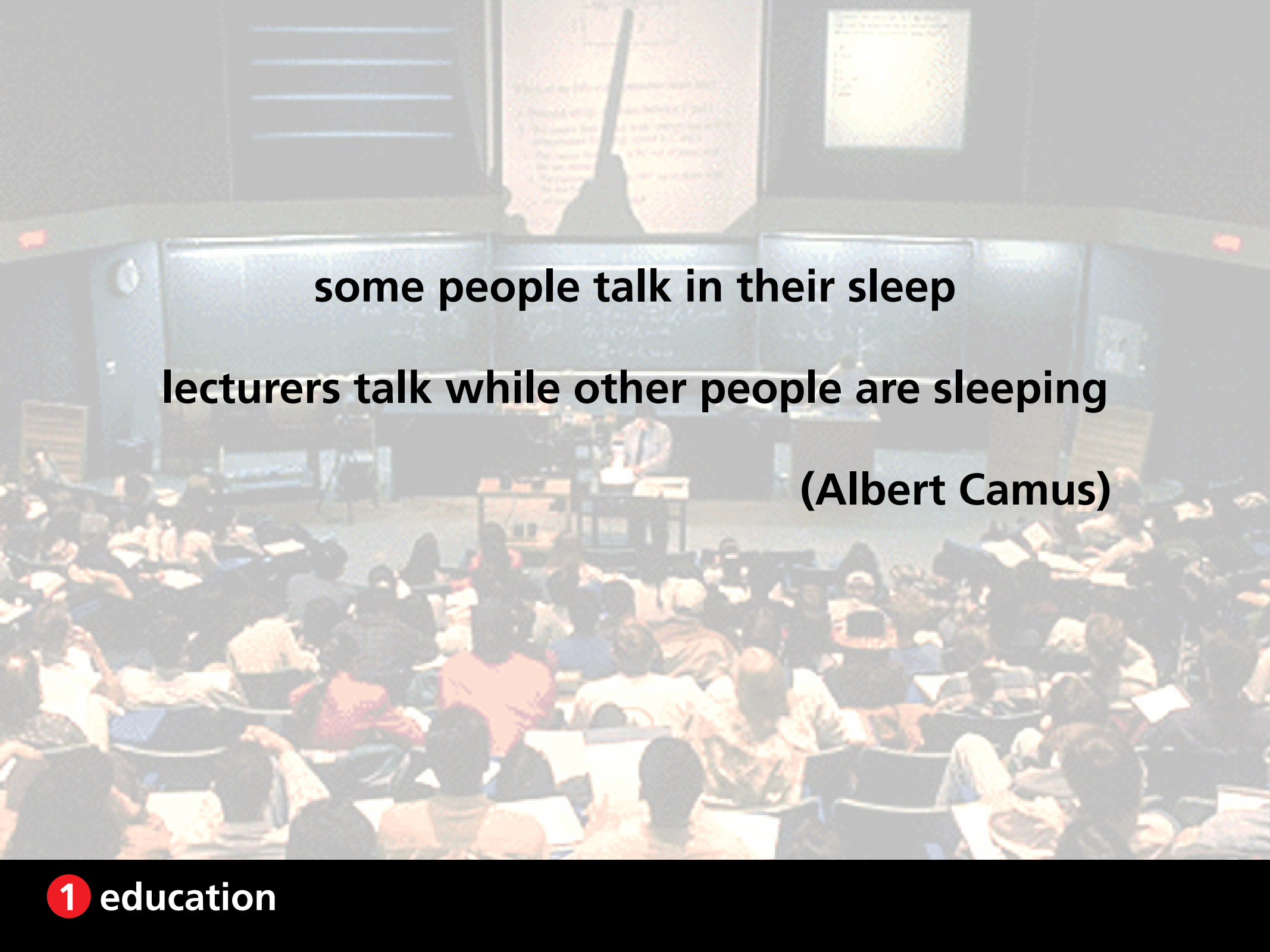




A wide-angle photograph of a large lecture hall. The room is filled with students seated in rows of chairs. Many students appear to be asleep, with their heads resting on their desks or hands. At the front of the room, a lecturer is standing near a podium, addressing the class. Behind the lecturer are several large projection screens displaying text and diagrams. The room has a high ceiling and a curved front wall.

**some people talk in their sleep**



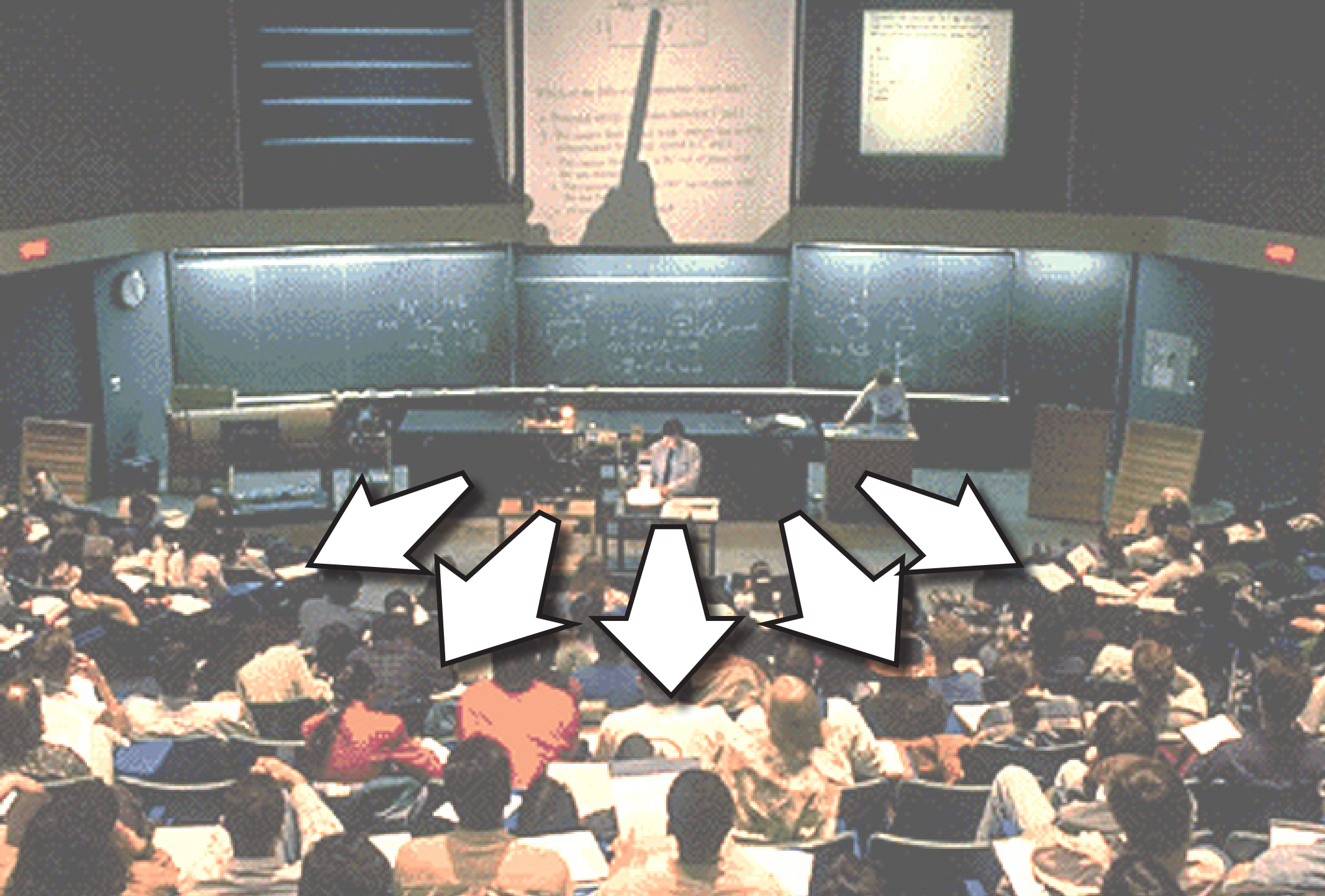
A large lecture hall filled with students. Many students are sleeping, with their heads resting on their desks or hands. The room has a curved wall with several large screens or whiteboards at the front. A lecturer is visible at the front of the hall, standing near a podium. The overall atmosphere is one of a lecture where many students are not paying attention.

**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**









## 1. transfer of information





**1. transfer of information**

**2. assimilation of that information**





**1. transfer of information (in class)**

**2. assimilation of that information**

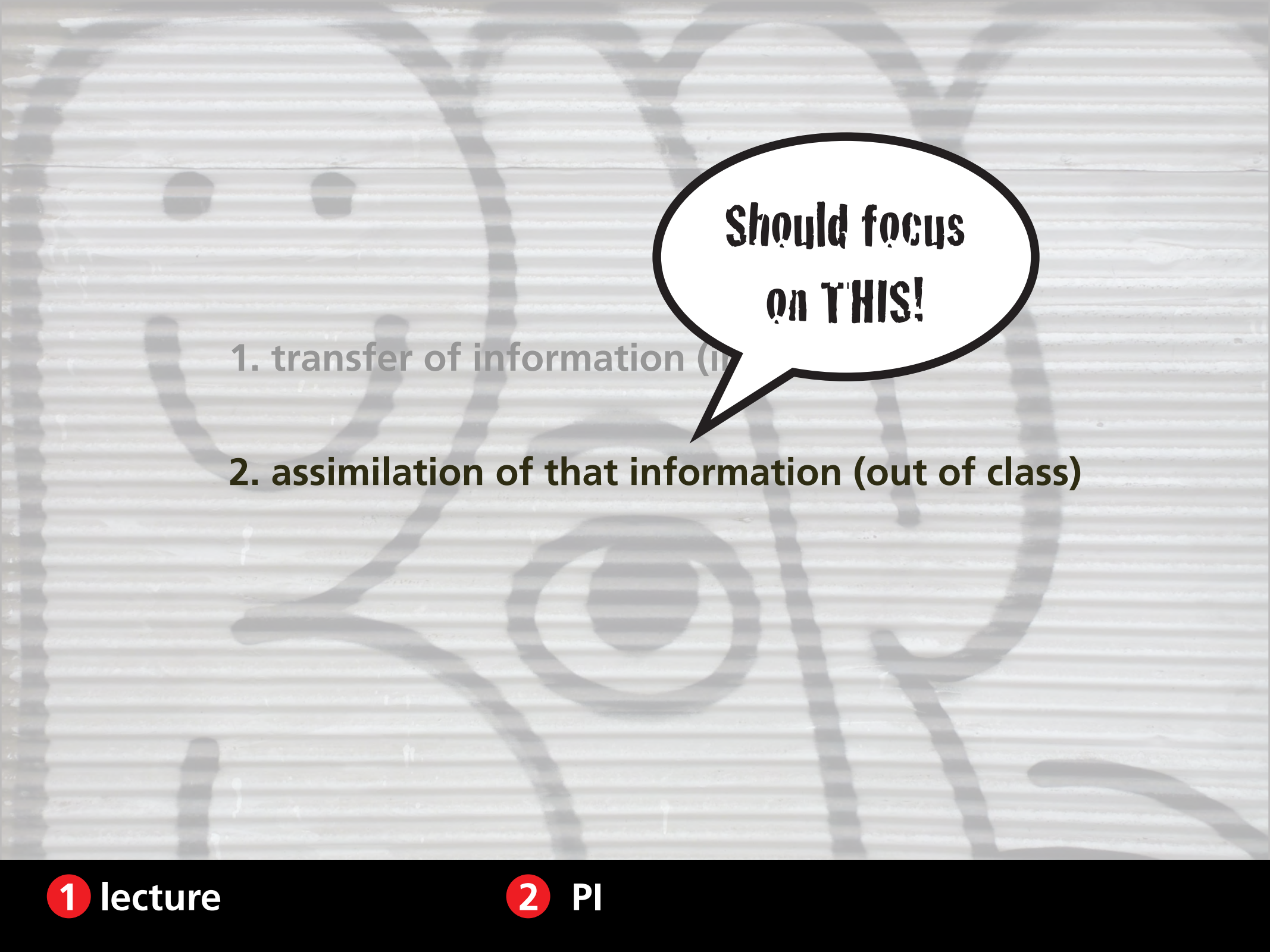




1. transfer of information (in class)

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)



question

1 education

2 PI



**question**



**think**



**question**



**think**



**poll**



**question**



**think**



**poll**



**discuss**



**question**



**think**



**poll**



**discuss**



**repoll**



**question**



**think**



**poll**



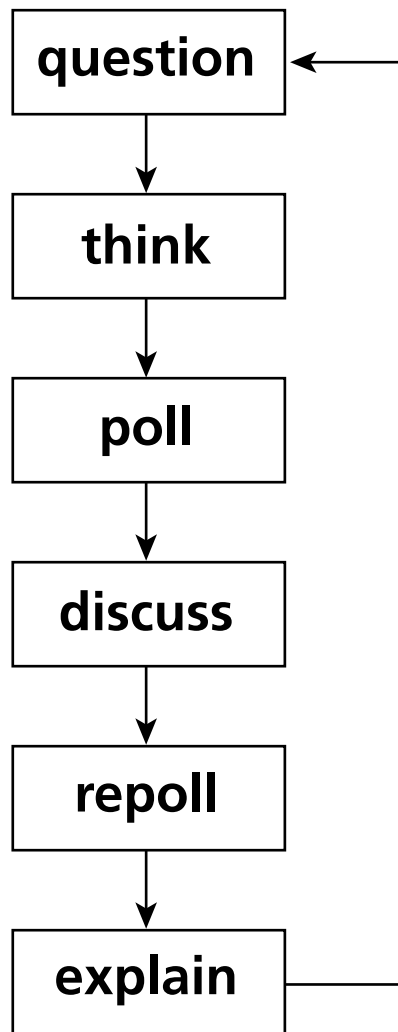
**discuss**



**repoll**



**explain**







**1** education

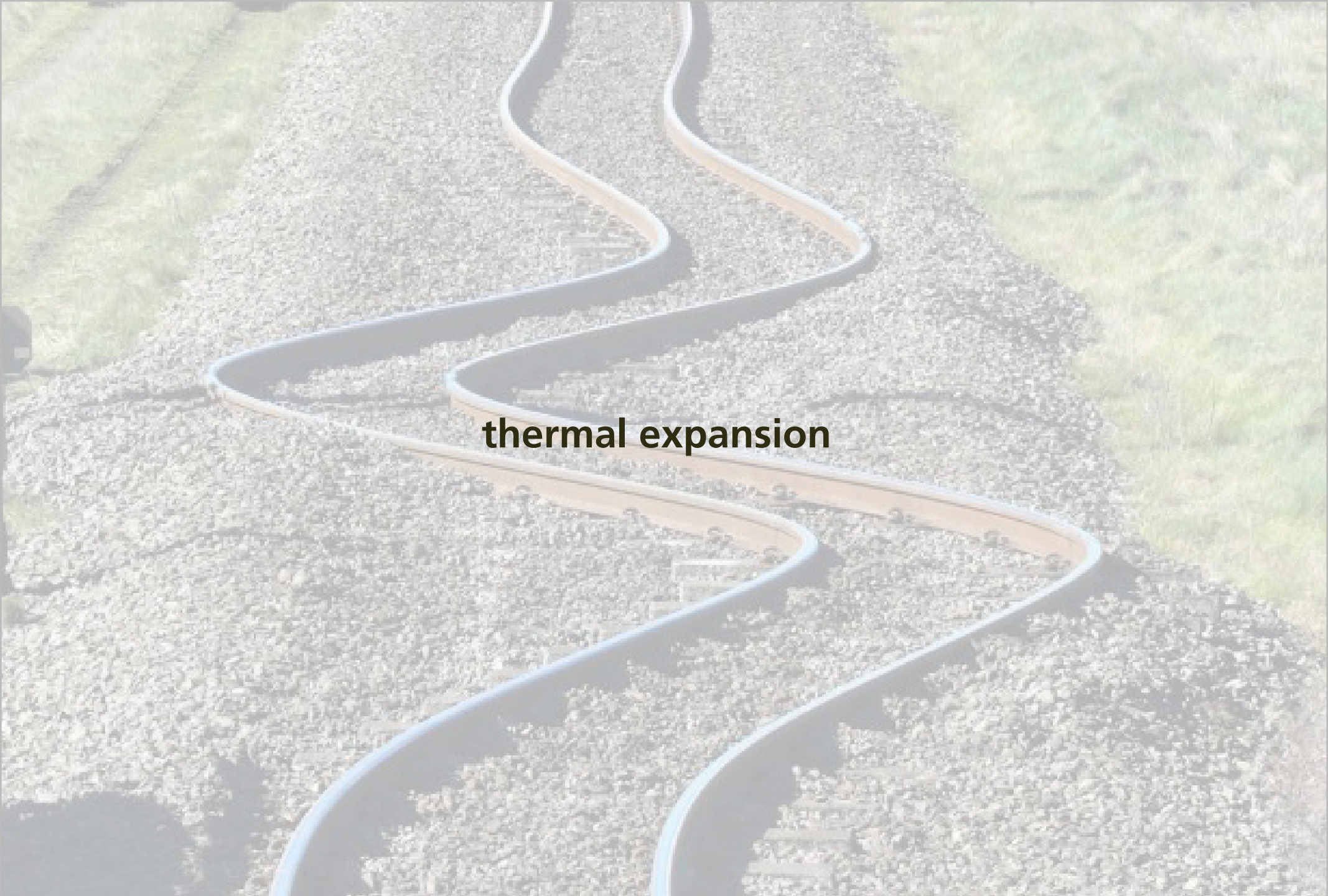
**2** PI





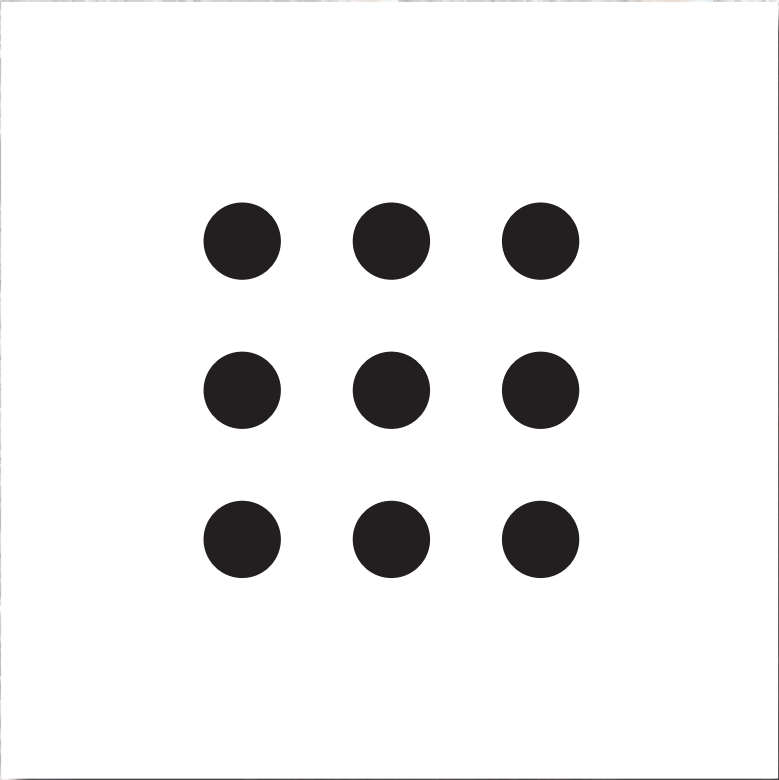
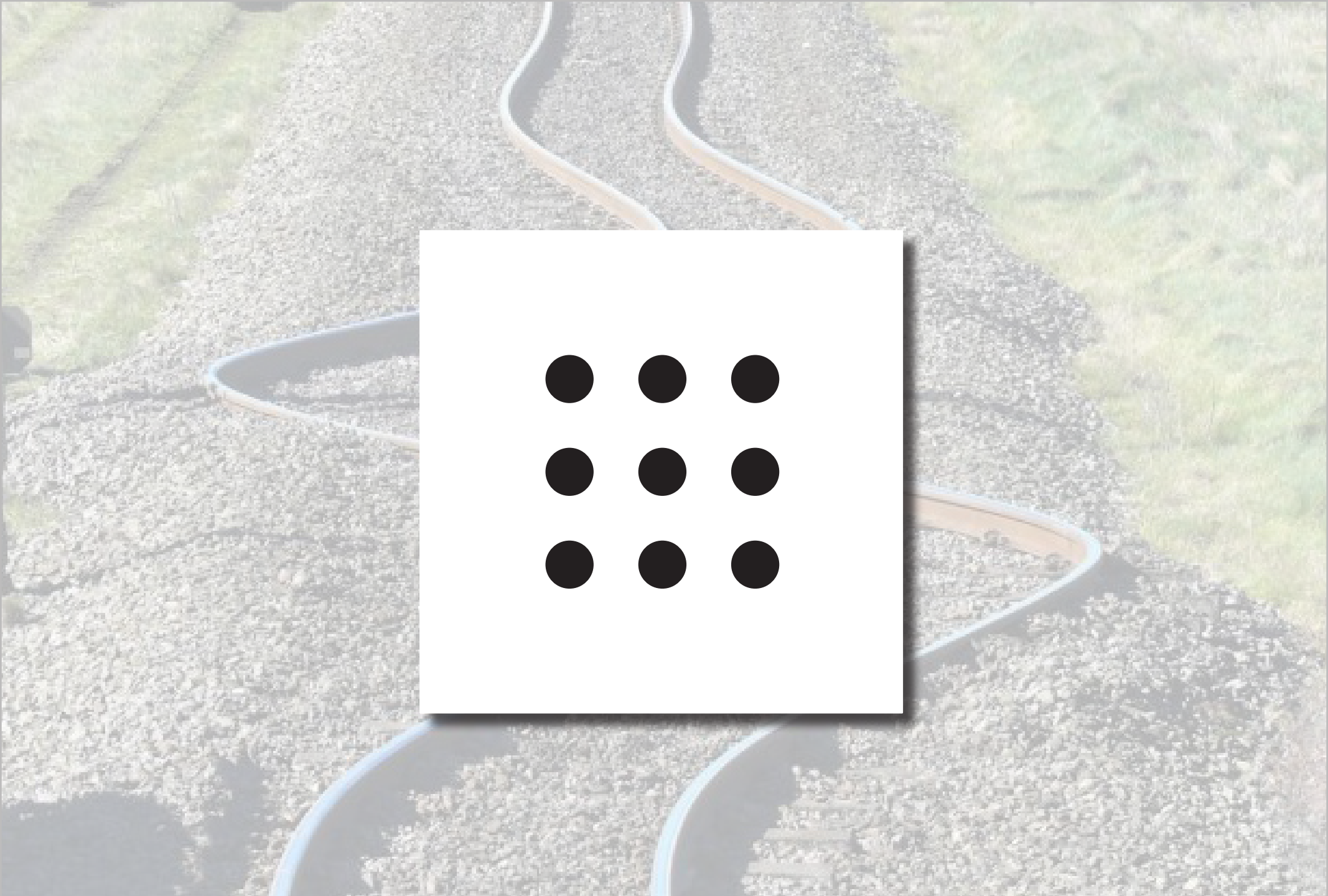
1 education

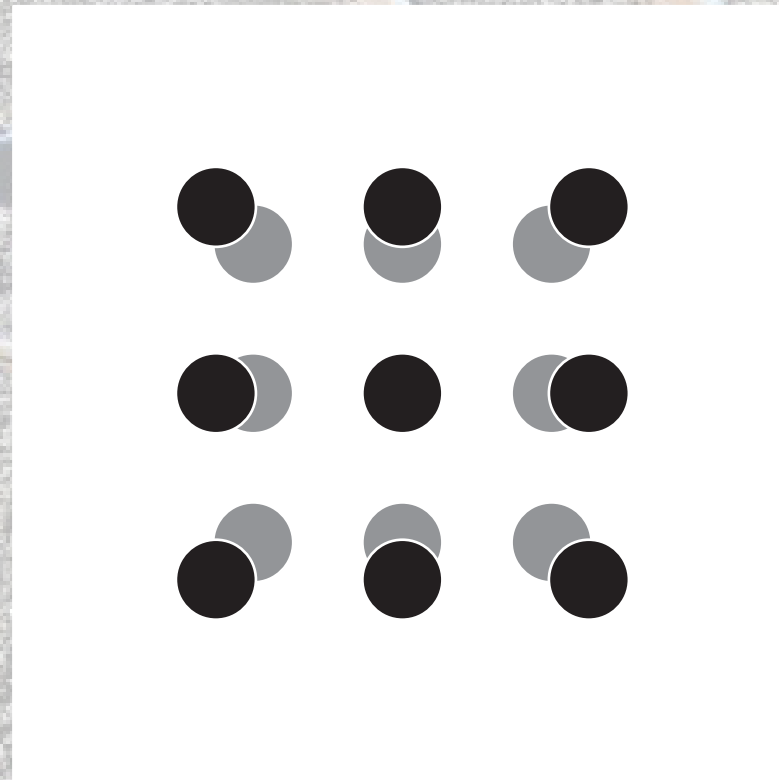
2 PI

An aerial photograph of a railway track. The track is composed of two parallel rails, which are slightly wavy, set on a bed of dark gravel. The surrounding area is green grass. The text "thermal expansion" is overlaid in the center of the image.

**thermal expansion**

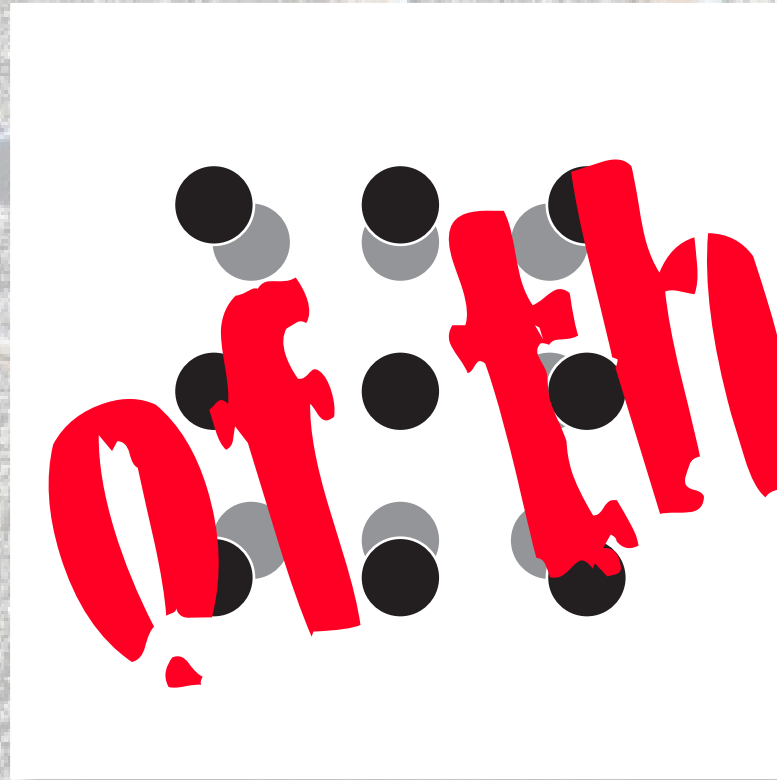








all of them



1 education

2 PI

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





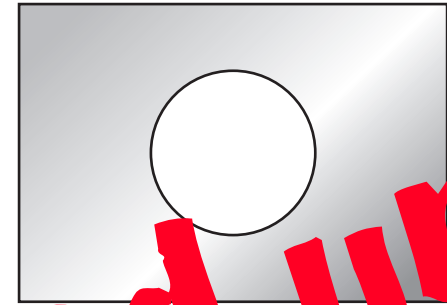
**Consider a rectangular metal plate with a circular hole in it.**



**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...**



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

**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**



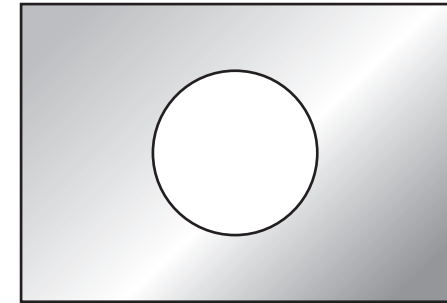
**Consider a rectangular metal plate with a circular hole in it.**



**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.**

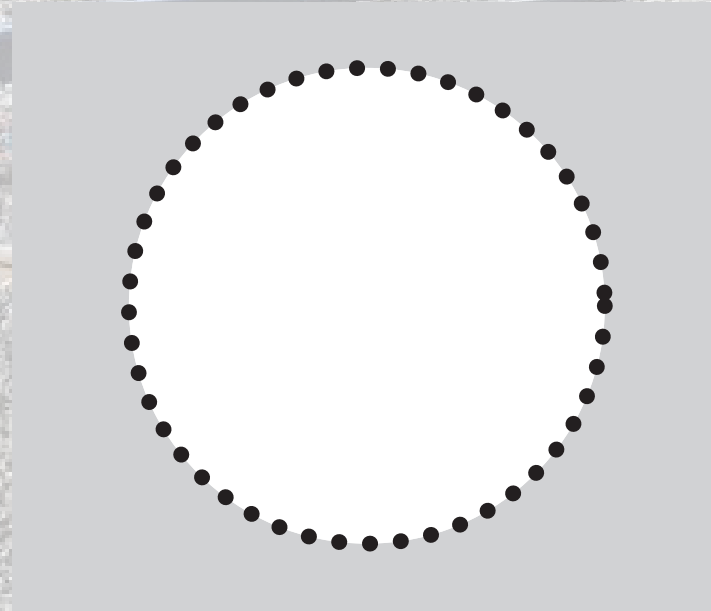


**When the plate is uniformly heated, the diameter of the hole**

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



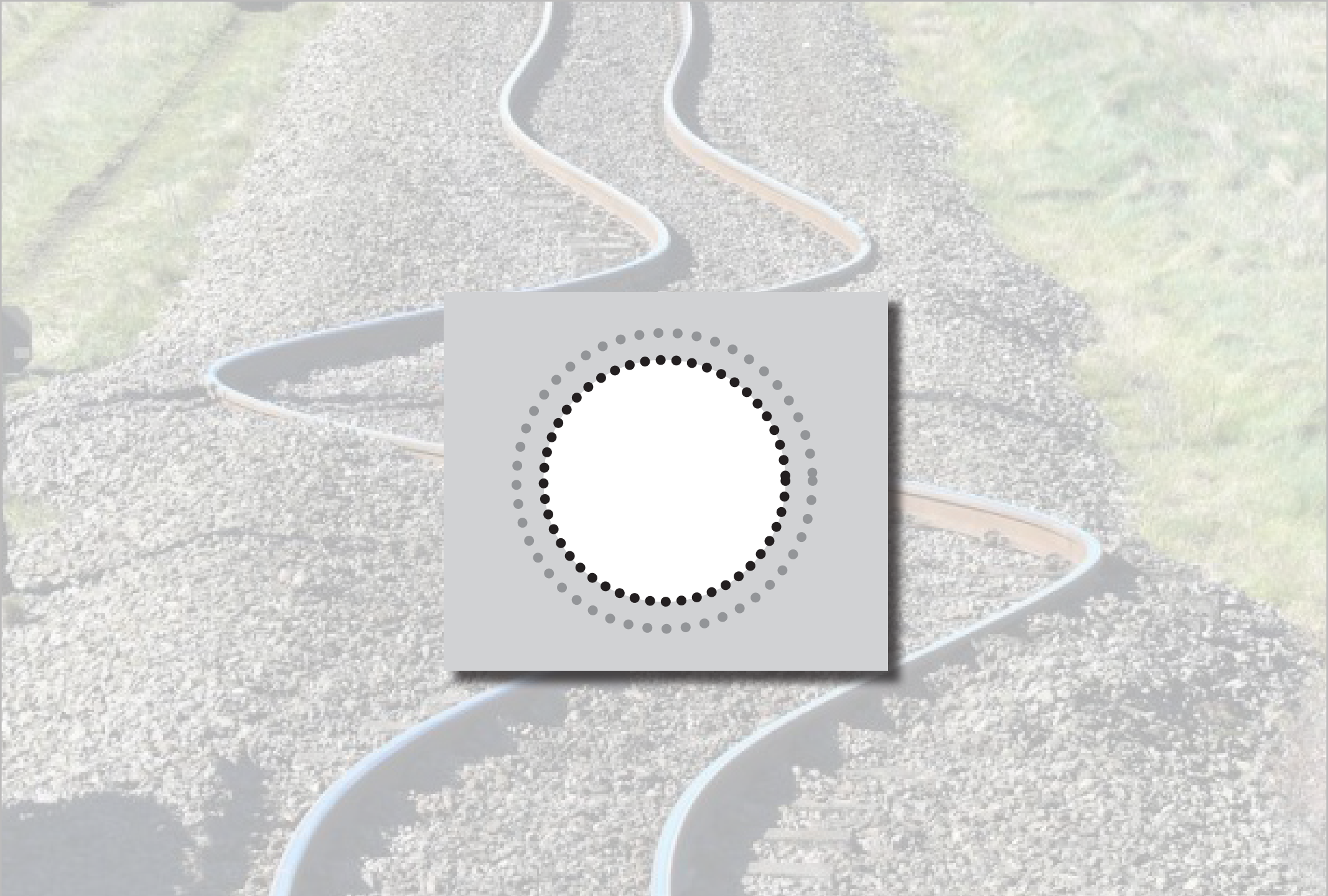
consider atoms at rim of hole



1 education

2 PI

3 test



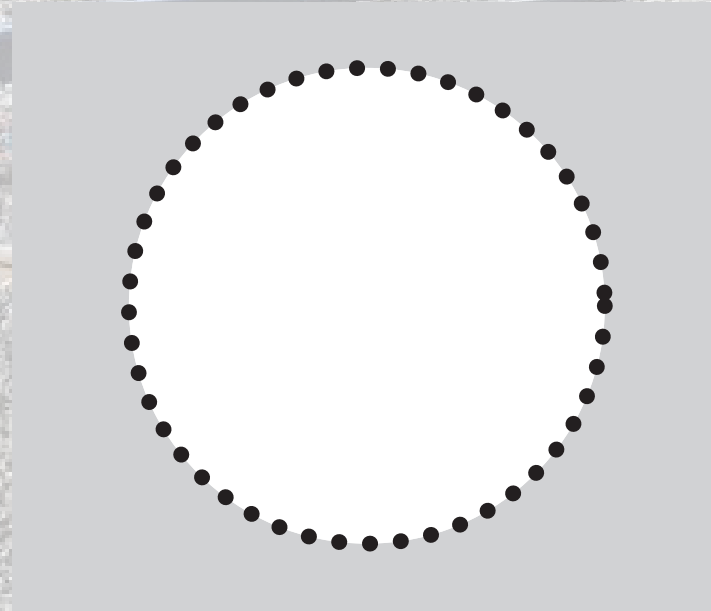
**1** education

**2** PI

**3** test



consider atoms at rim of hole

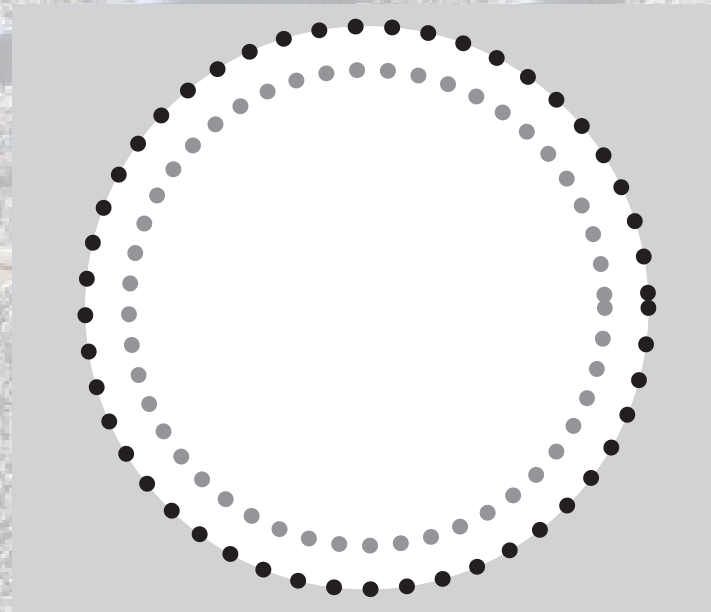


1 education

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**



**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



The background is a faded, classical-style painting. It depicts a face, possibly a classical figure, with multiple eyes visible. The face is rendered in a pale, yellowish-tan color, and the eyes are large and detailed. The overall style is reminiscent of a classical portrait, but with a surreal twist of multiple eyes. The text 'an illusion...' is overlaid in a bold, red, serif font.

**an illusion. . .**

**1** education

**2** PI

**3** test



**Education is not just about:**

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





**Education is not just about:**

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

**active participation a must!**



**Join now!**

**PeerInstruction.net**



**Funding:**

**National Science Foundation**

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