

# Confessions of a converted lecturer



EDUCACION

Humboldt State University  
Arcata, CA, 20 August 2013



# Confessions of a converted lecturer



@eric\_mazur

EDUCATION

Humboldt State University  
Arcata, CA, 20 August 2013





- no ON/OFF button
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**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**





What are the following...  
1. Personal...  
2. The...  
3. The...  
4. The...  
5. The...

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1 education

2 PI



1 education

2 PI

3 test




**better pay  
attention!**

**1** education

**2** PI

**3** test



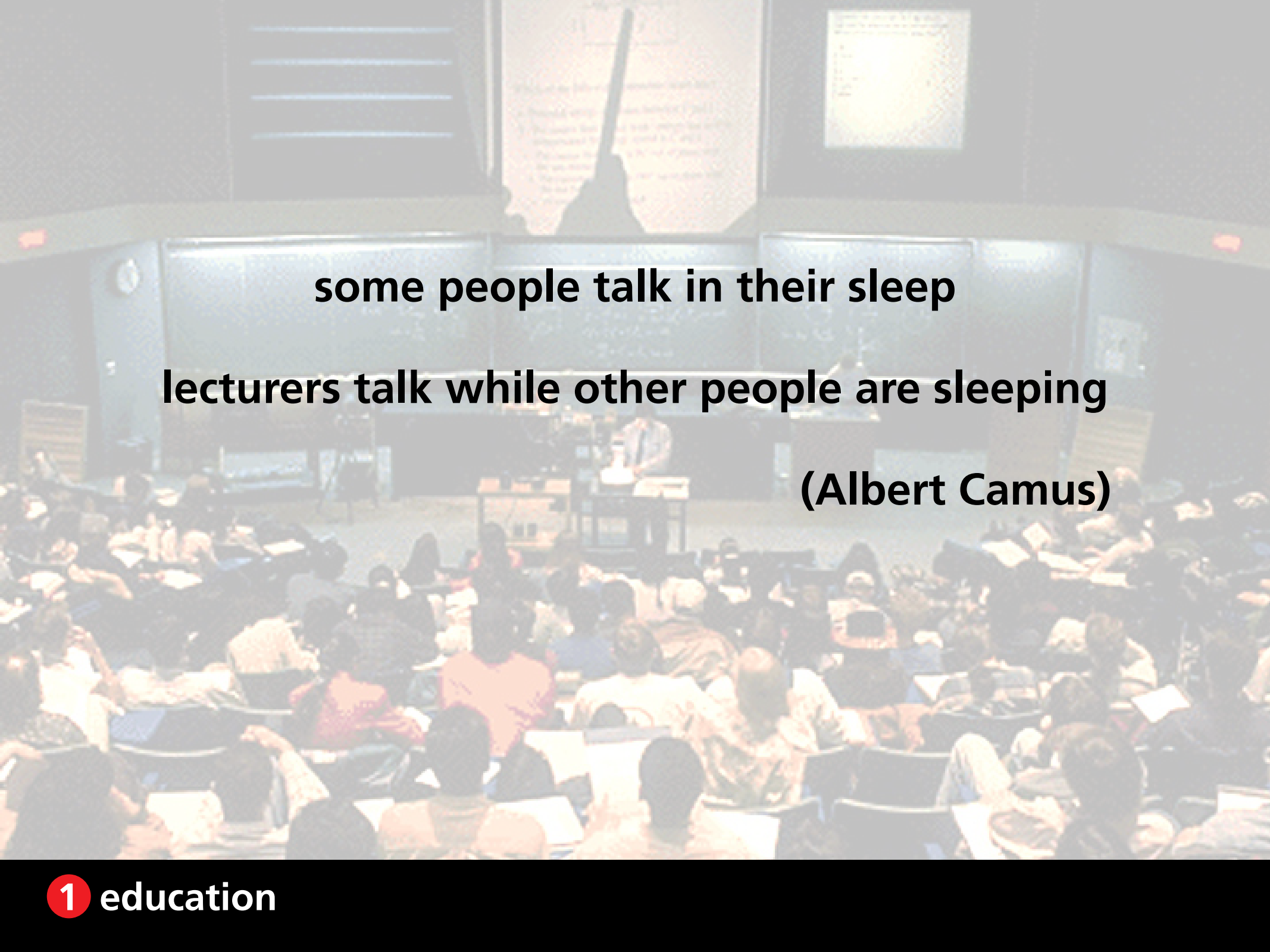
**What happens  
in a lecture?**





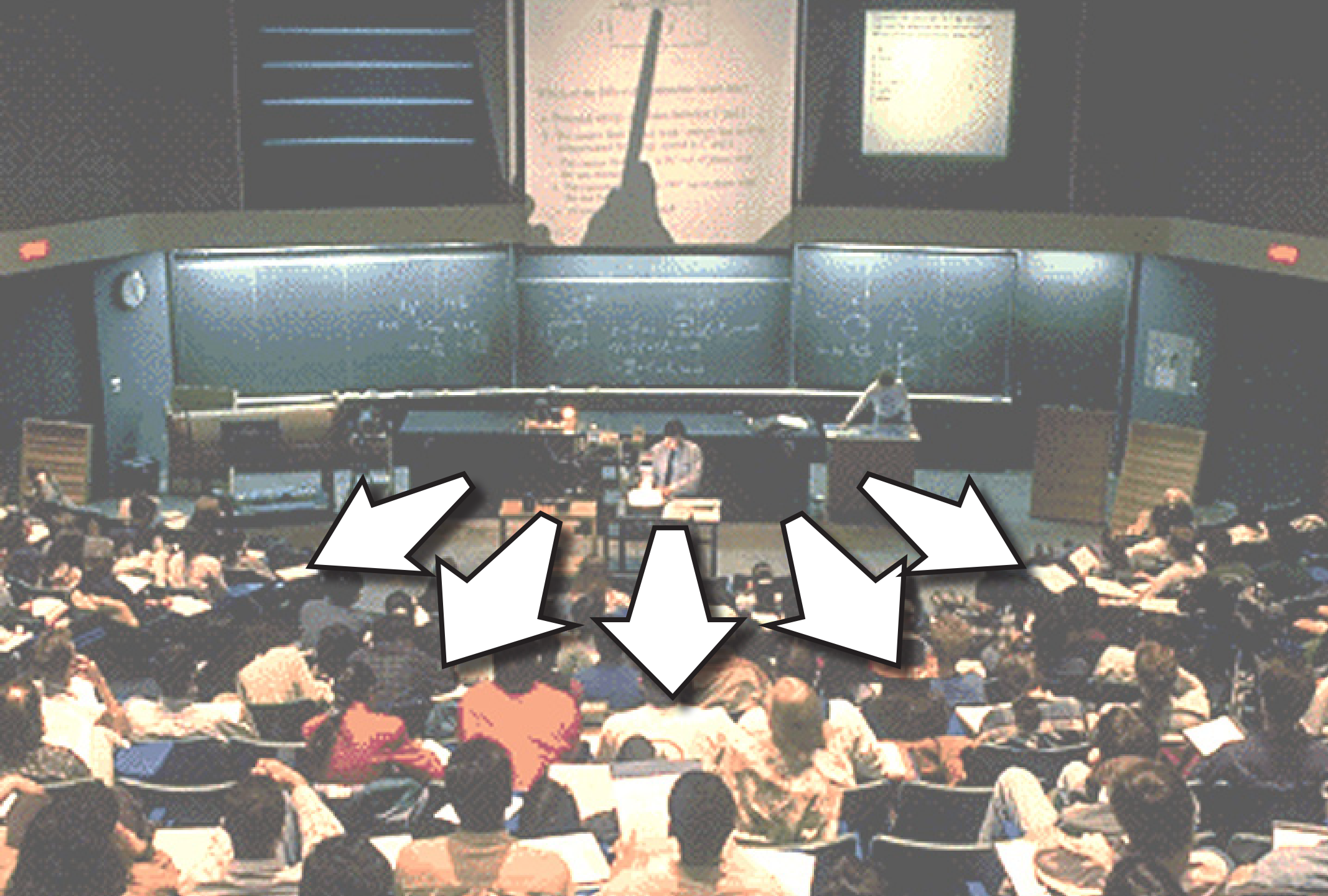
A large lecture hall filled with students sitting at desks, facing a stage where a lecturer is standing. The room has a curved wall and a large screen at the front. The text "some people talk in their sleep" is overlaid on the image.

**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, many of whom appear to be sleeping or resting. The lecturer is standing at a podium in the center, facing the audience. The audience is seated in rows of chairs, and many students have their heads down or are looking away. The room has a high ceiling and large windows. The text is overlaid on the image.

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

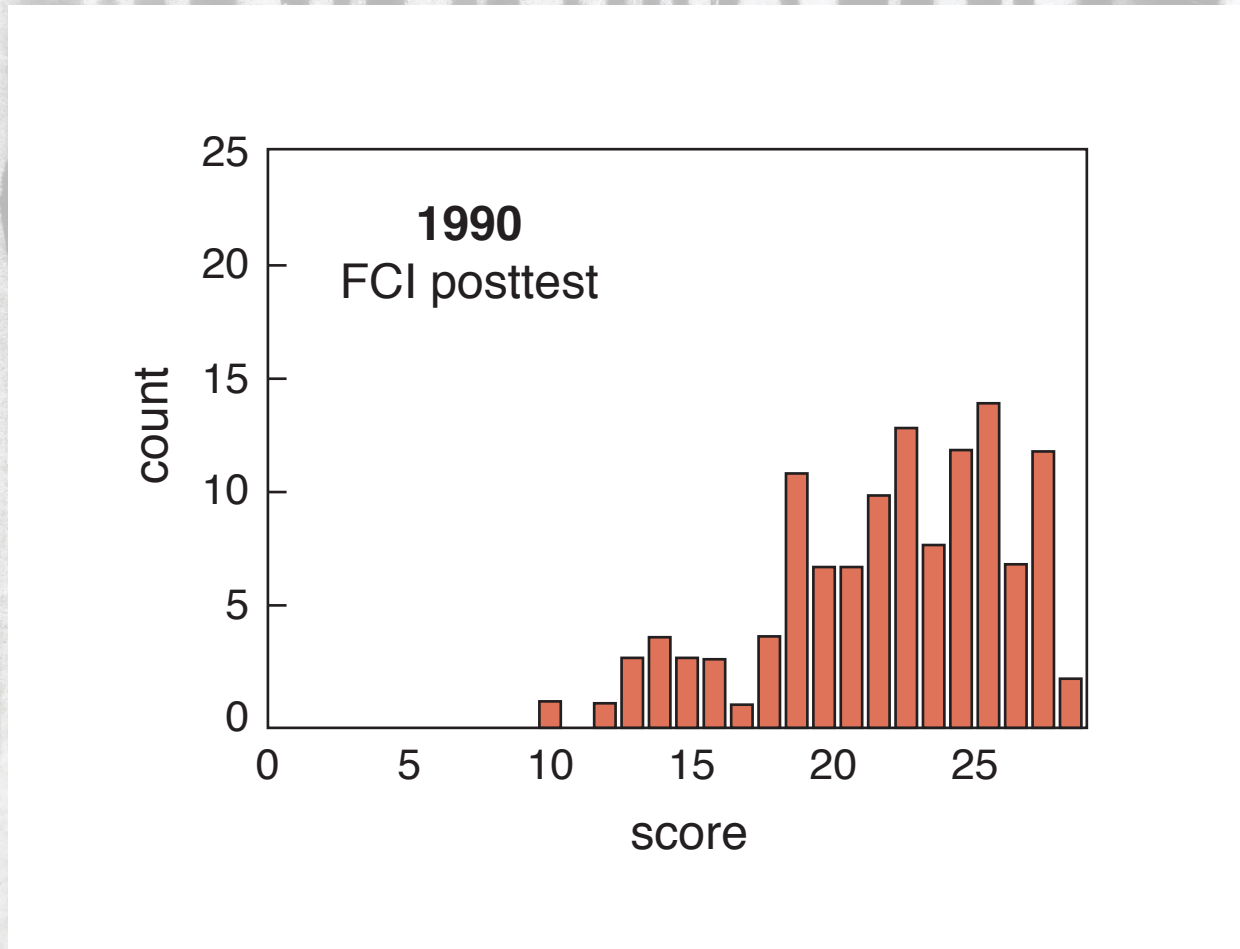




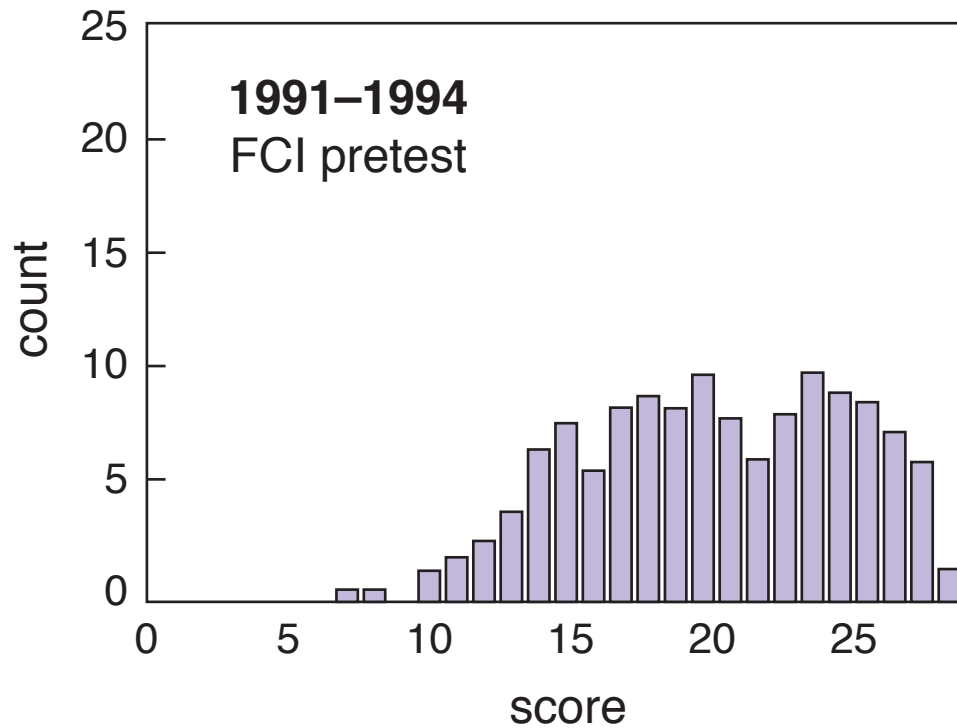
The result?

EDUCACION

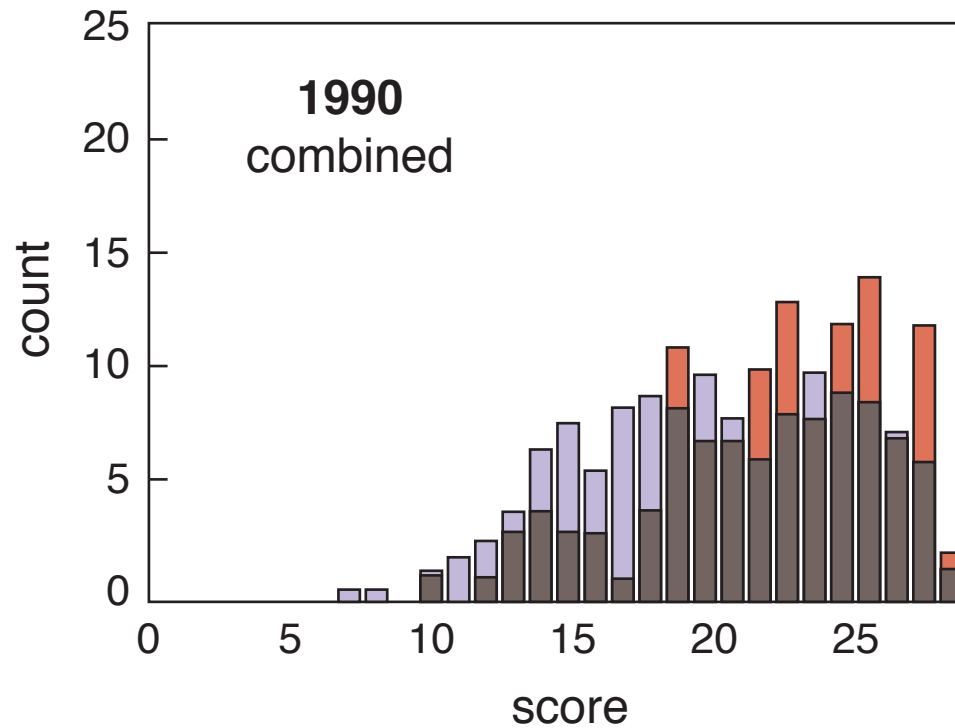
# education is not just information transfer



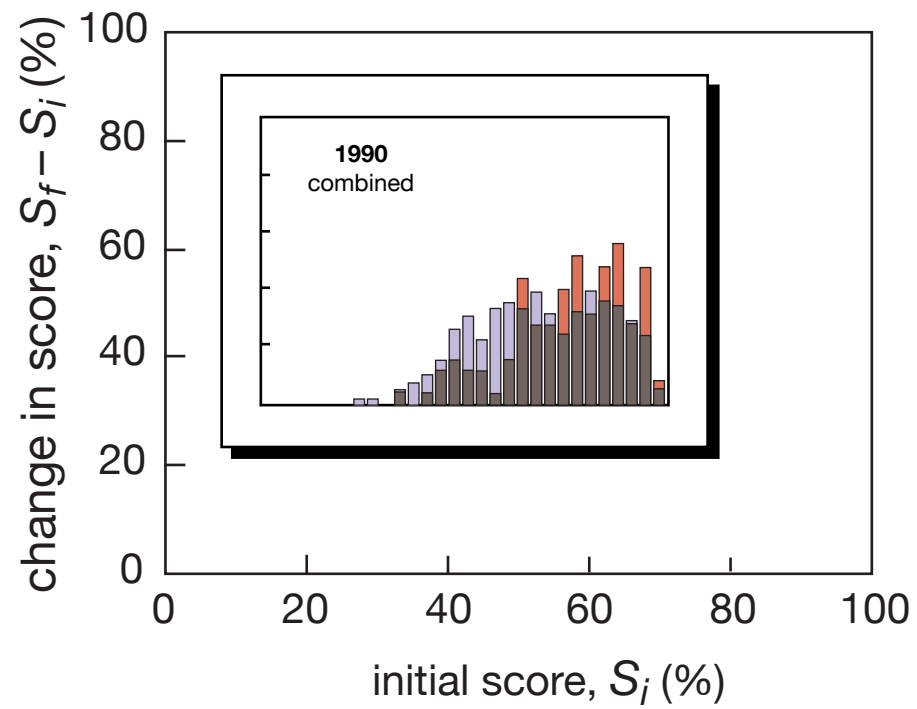
# education is not just information transfer

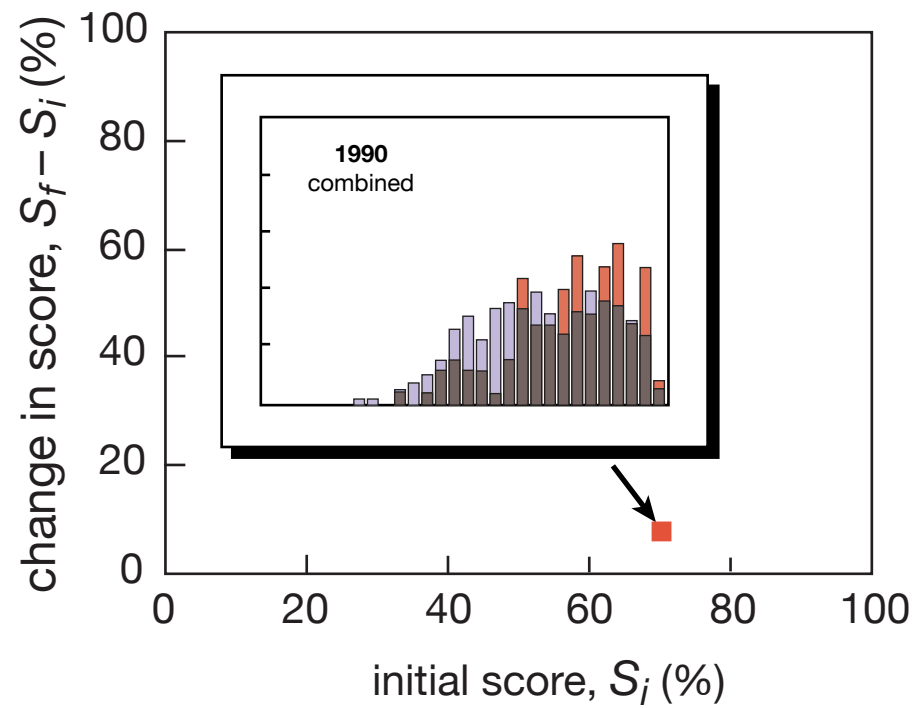


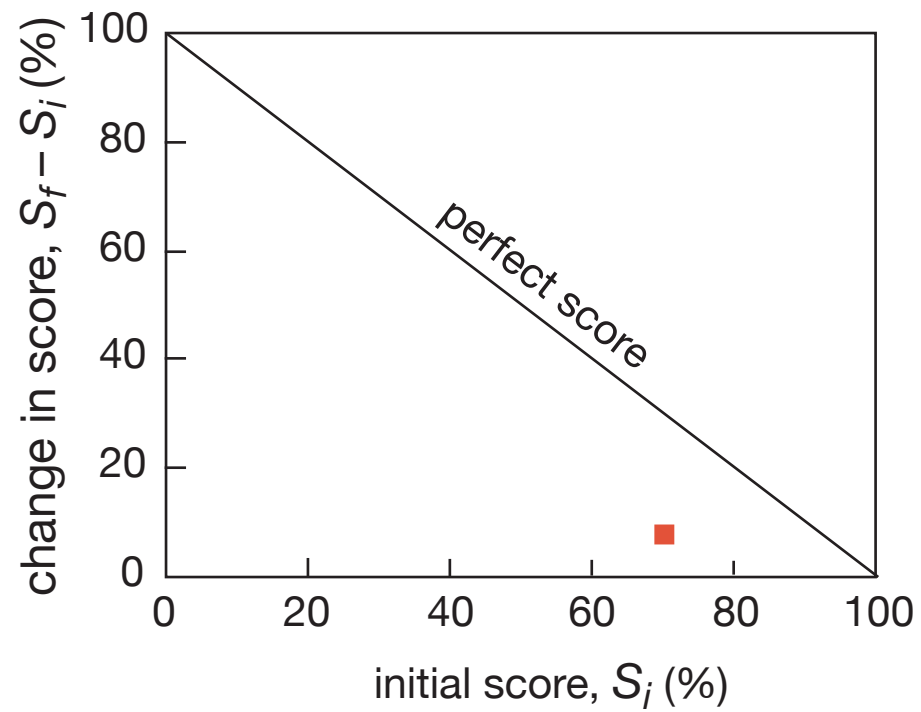
# education is not just information transfer

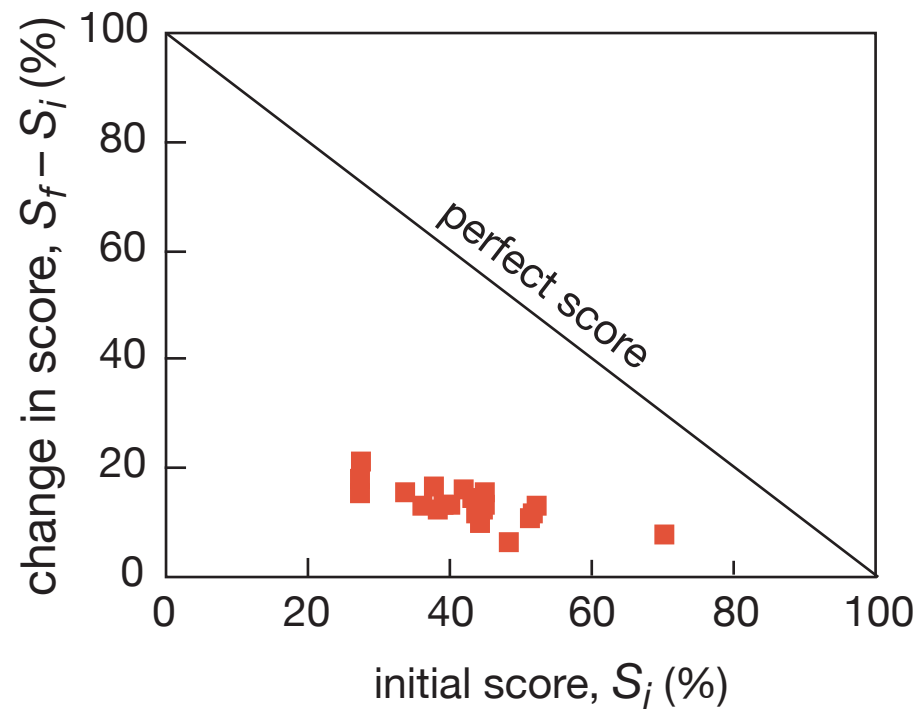






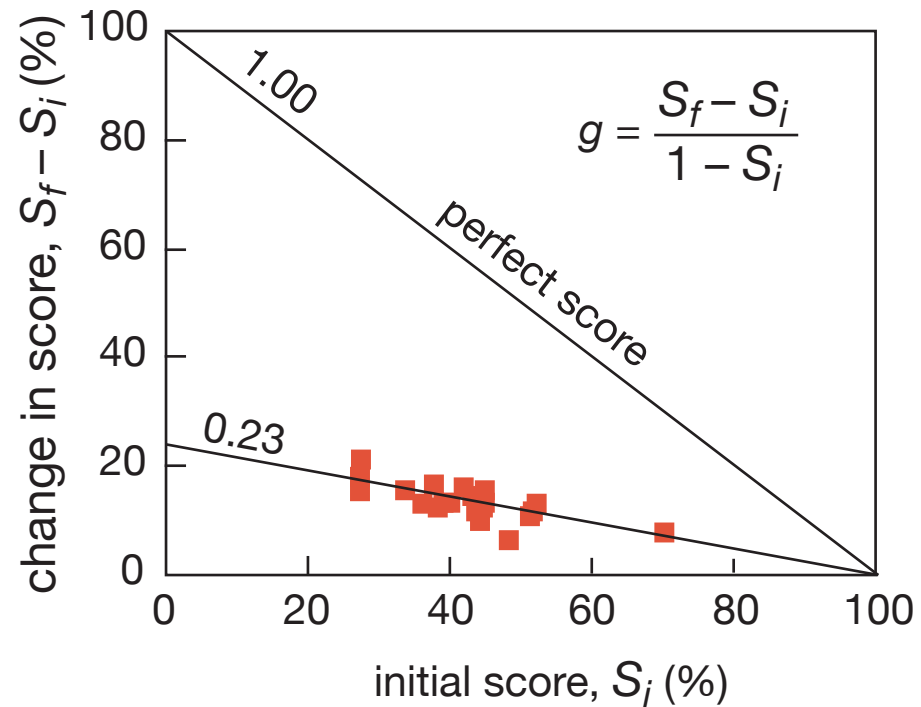






R.R. Hake, *Am. J. Phys.* 66, 64 (1998)

only one quarter of maximum gain realized



R.R. Hake, *Am. J. Phys.* 66, 64 (1998)

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

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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!**

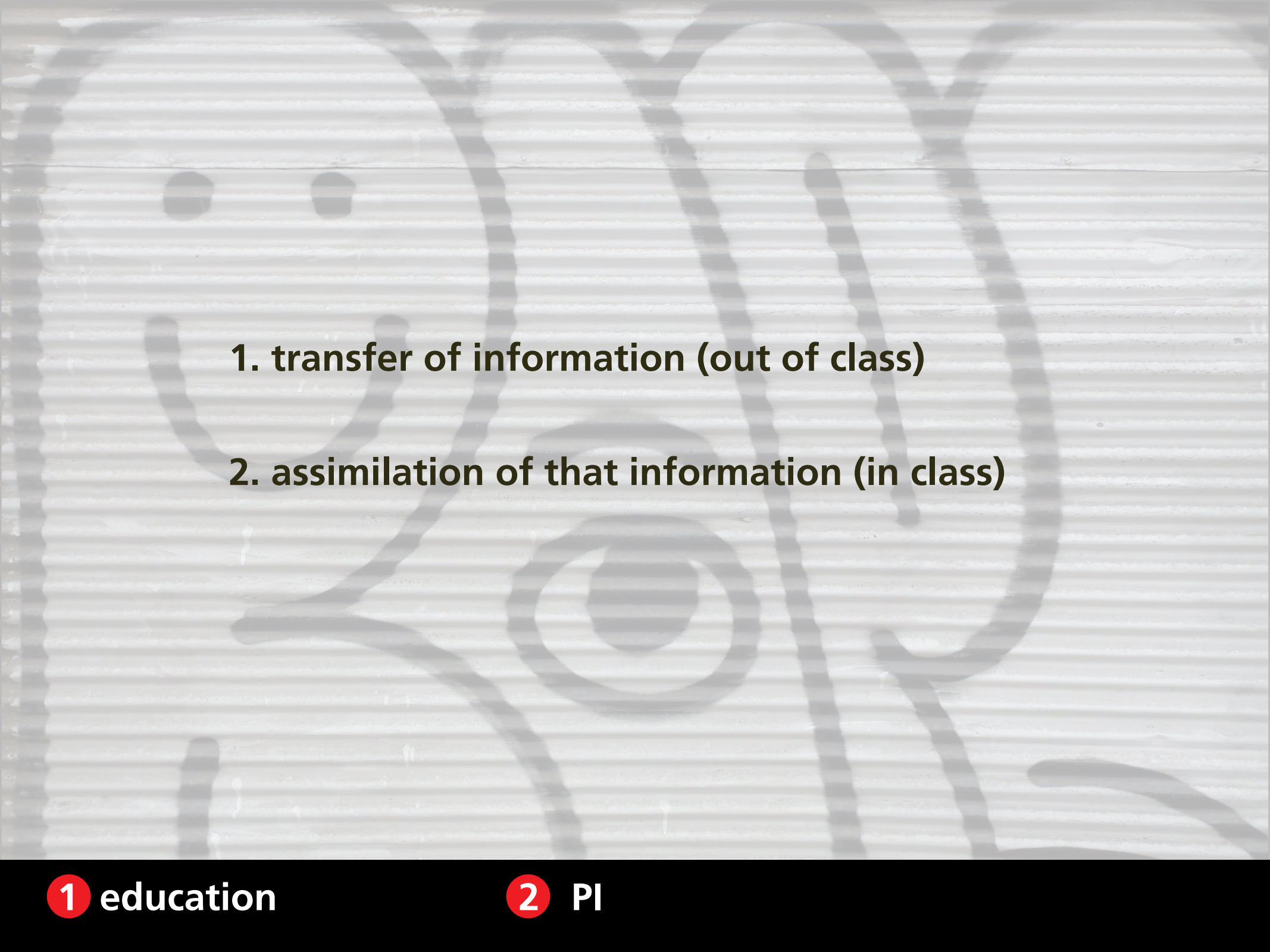
1. transfer of information (in class)

**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**



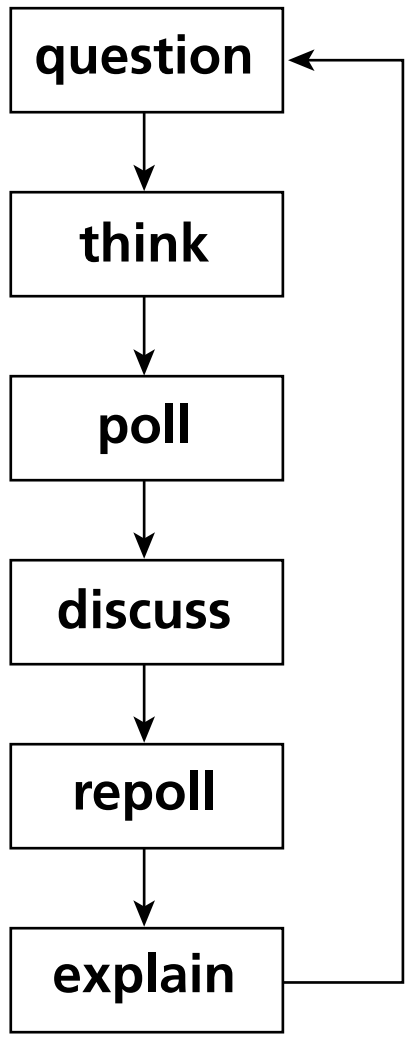
**discuss**

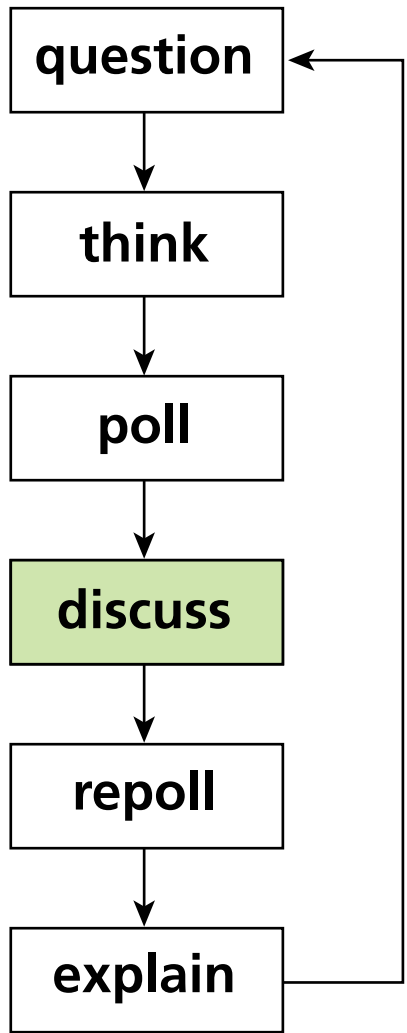


**repoll**



**explain**





**1** education

**2** PI



Let's try it!

QUESTION

think

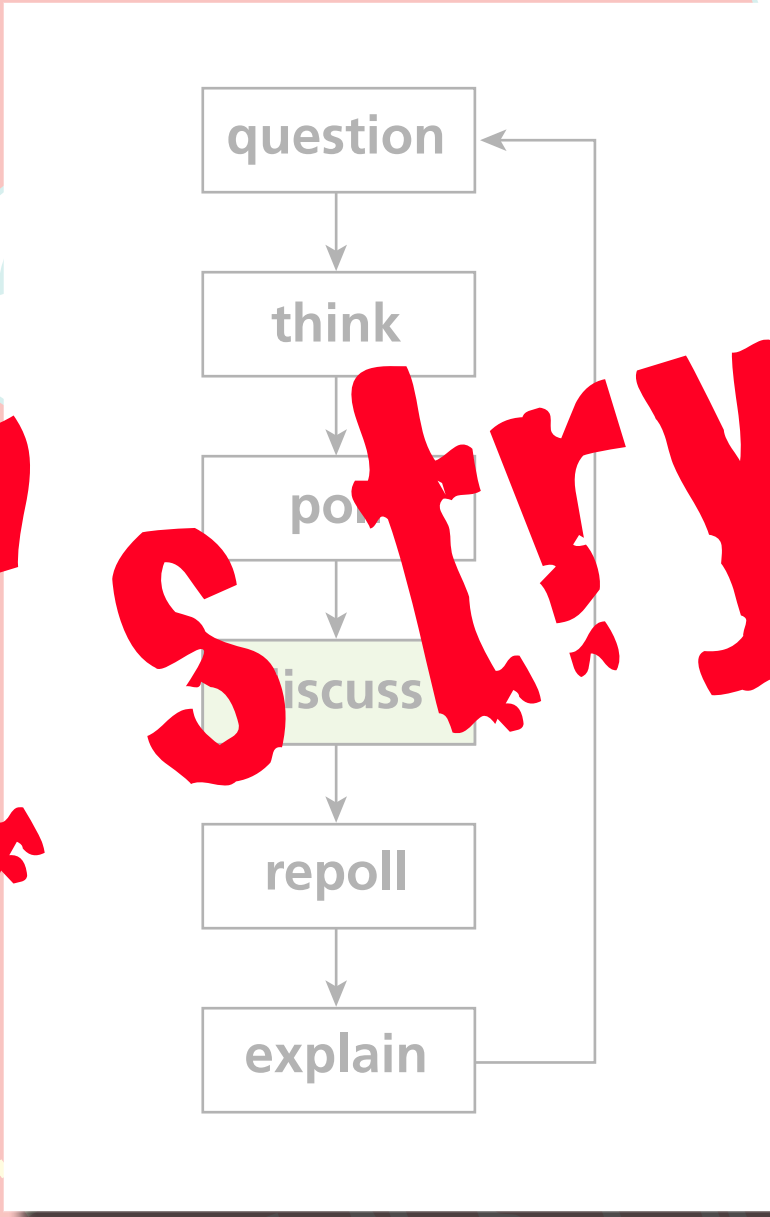
poll

discuss

repoll

explain

ACTION

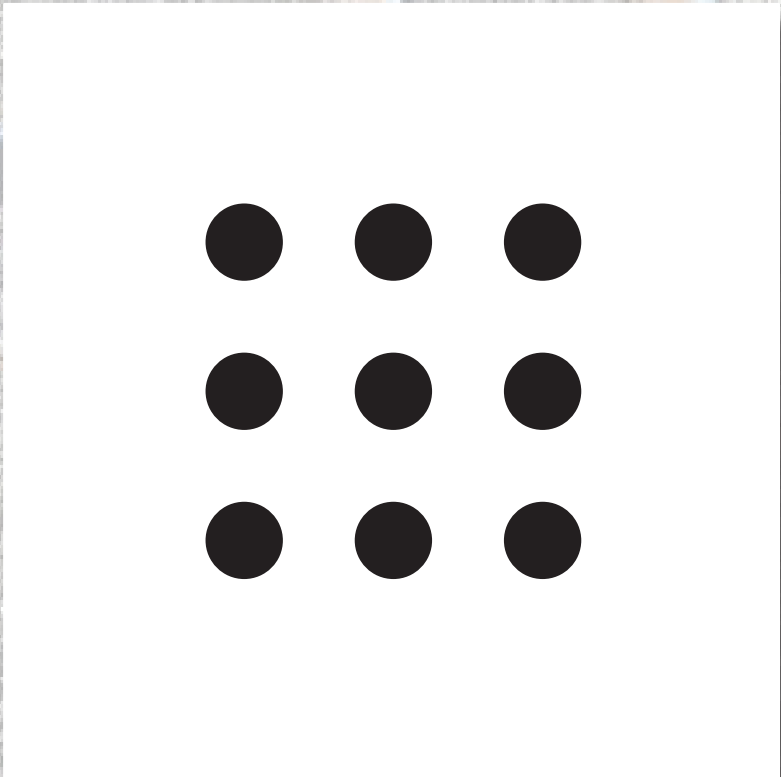
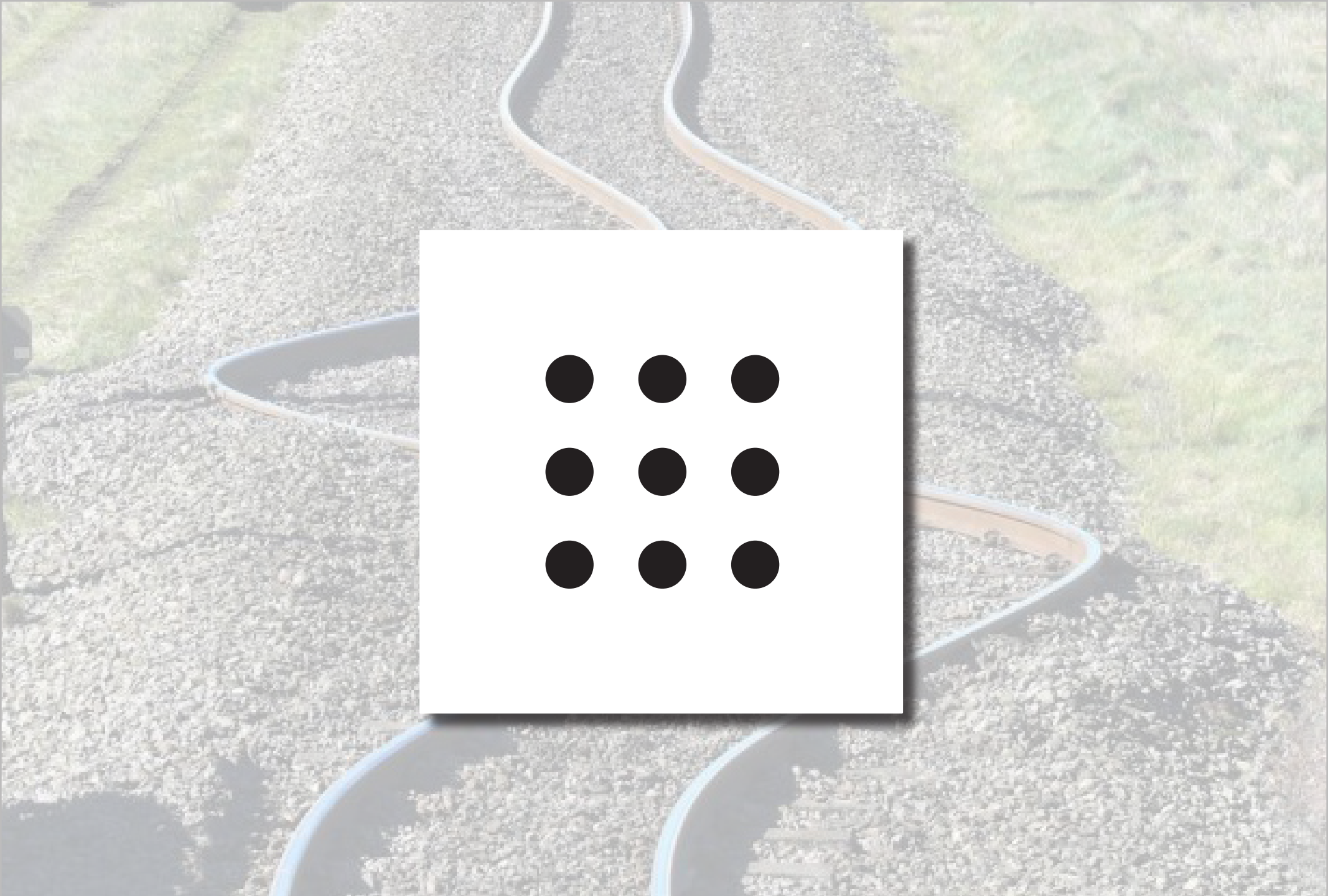


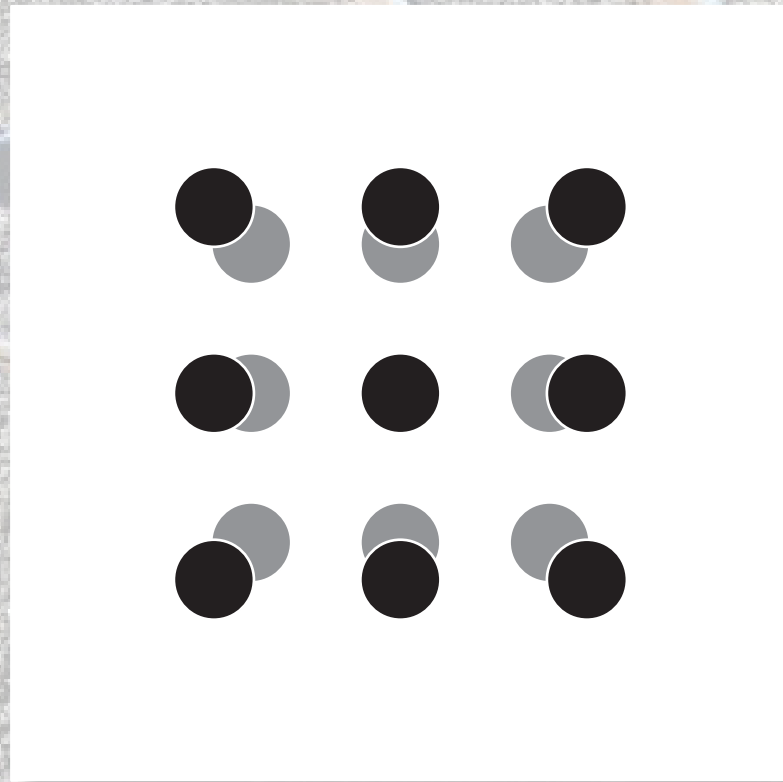
1 education

2 PI

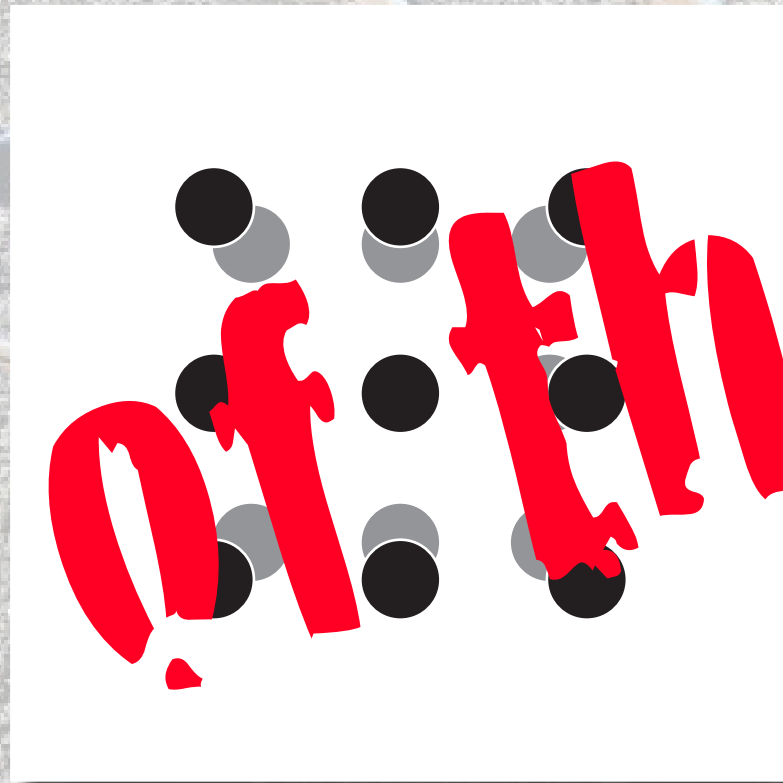
A photograph of a gravel path with a blue wavy line drawn on it, illustrating thermal expansion. The path is made of grey gravel and is bordered by green grass on both sides. The blue line is a thick, wavy line that follows the path's edge, showing how it would expand and contract with temperature changes.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

**thermal expansion**





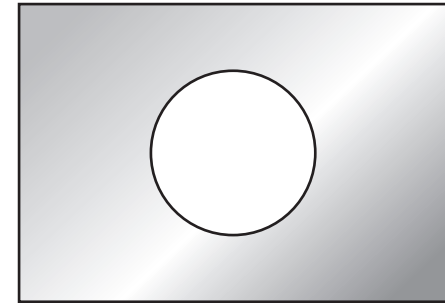
**all of them!**



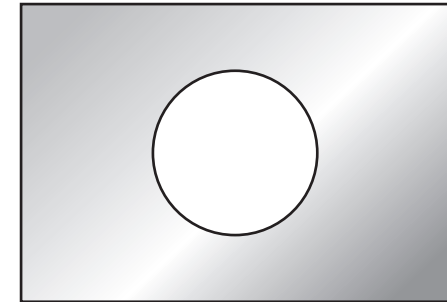
**1** education

**2** PI

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



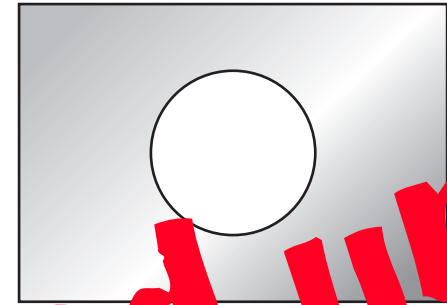
**Consider a rectangular metal plate with a circular hole in it.**



**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

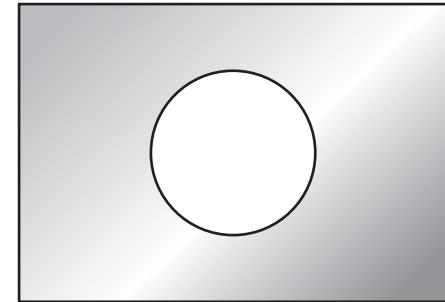
1. increases.
2. stays the same.
3. decreases.

**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.**

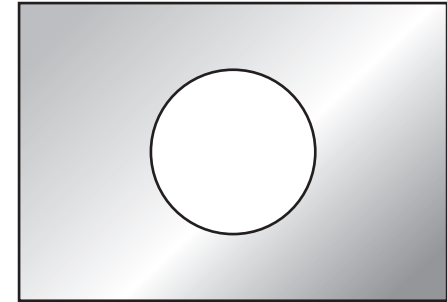
**You...**

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



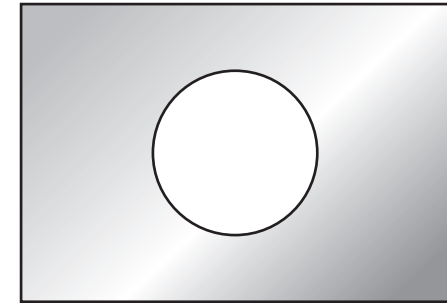
**Consider a rectangular metal plate with a circular hole in it.**

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



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

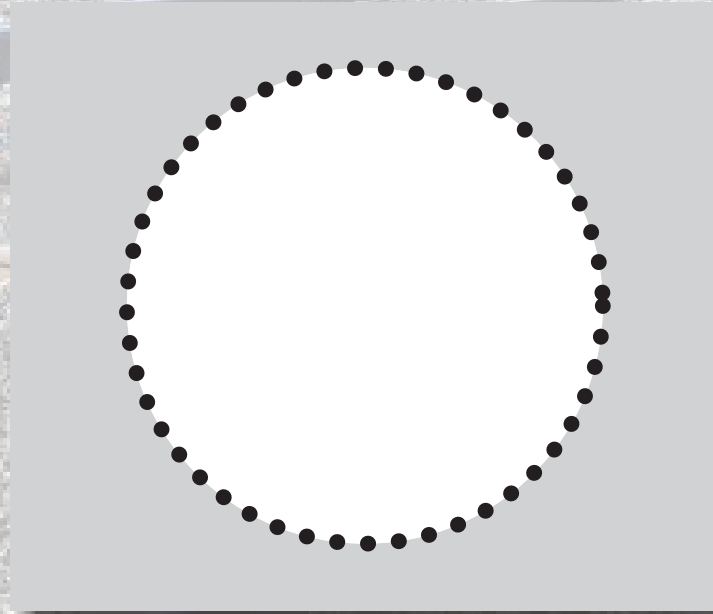
Consider a rectangular metal plate with a circular hole in it.



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

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

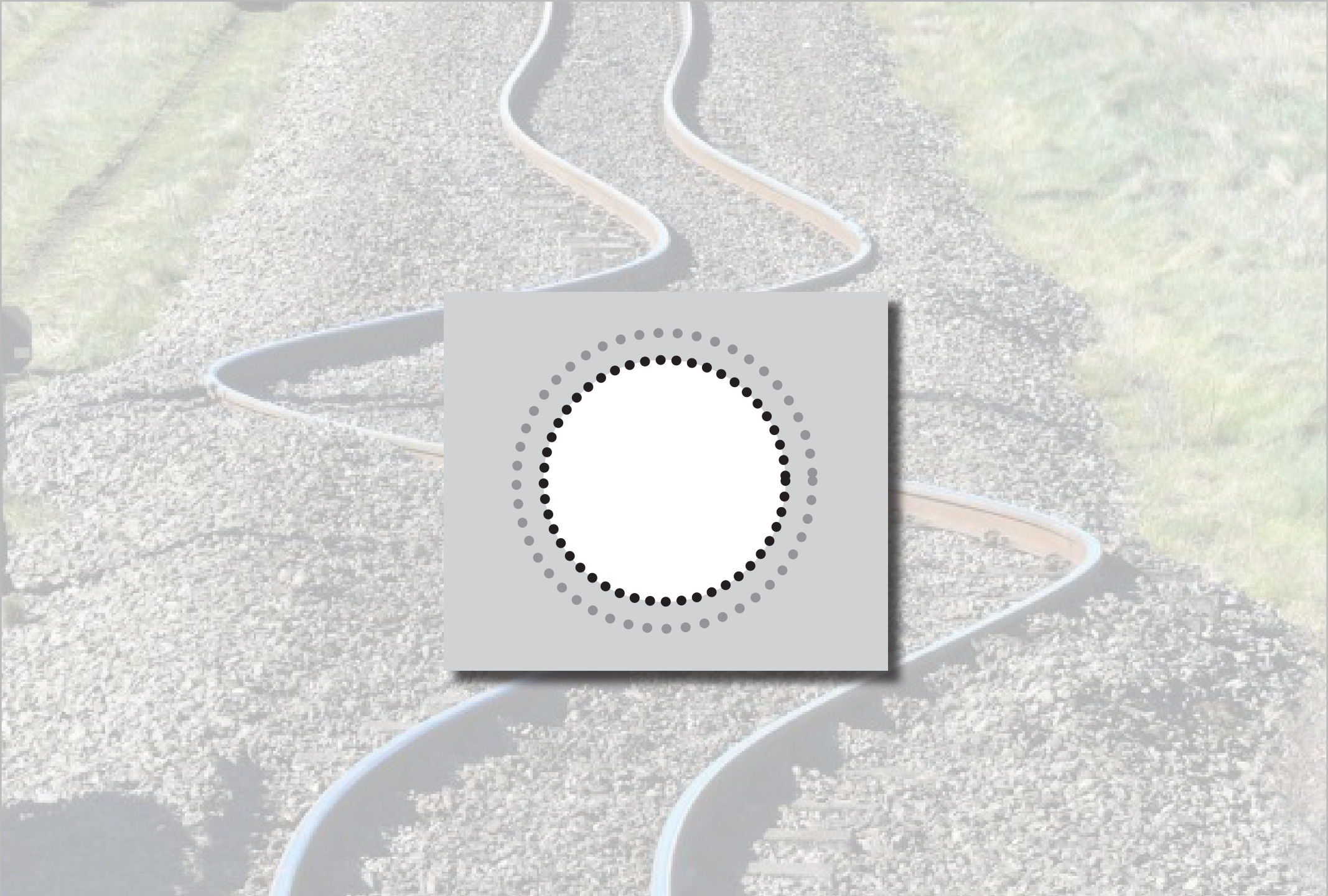
consider atoms at rim of hole



**1** education

**2** PI

**3** test

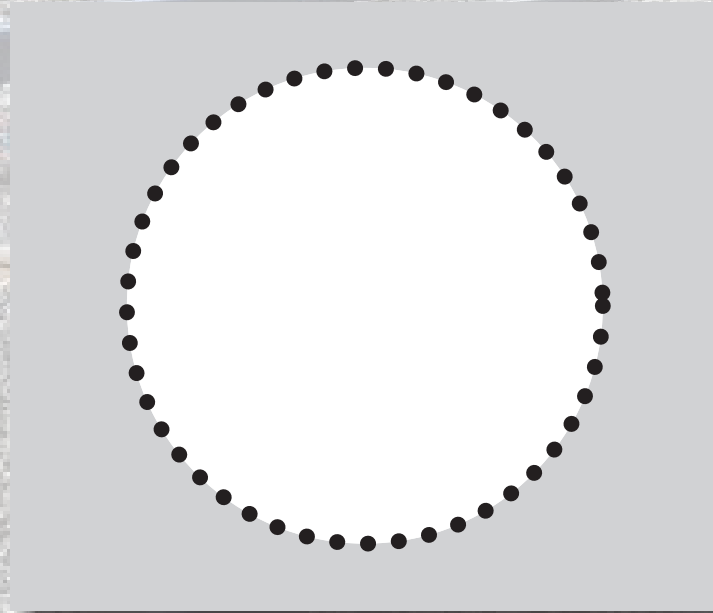


**1** education

**2** PI

**3** test

consider atoms at rim of hole

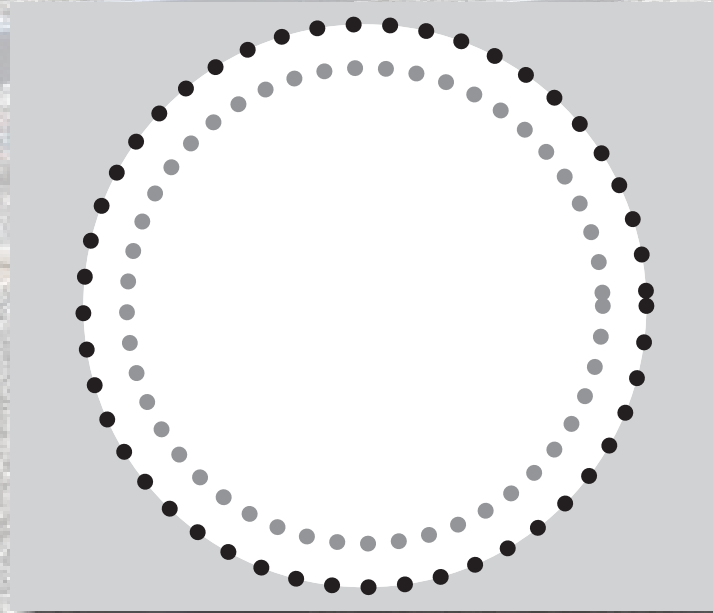


1 education

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**

A diagram of a circular hole with a dotted line representing the rim of atoms. The text "you won't forget this" is written in a large, red, stylized font across the diagram.

1 education

2 PI

3 test

# Peer

## back to pi

### INSTRUCTION

1 education

2 PI

3 test



# Peer

is it any good?

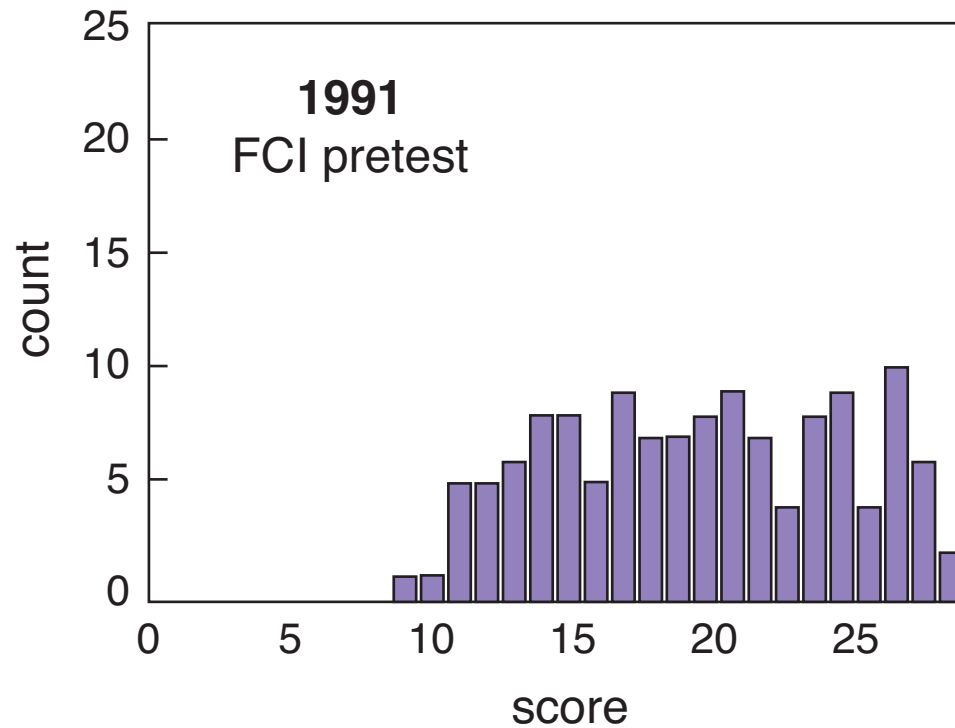
# INSTRUCTION

1 education

2 PI

3 test

## first year of implementing PI

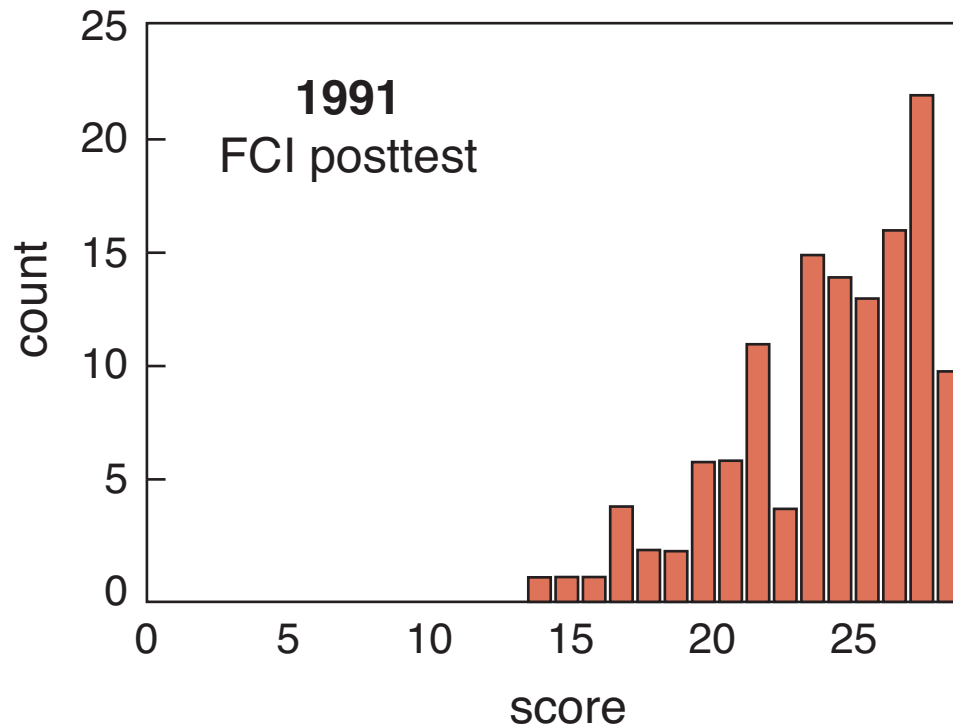


1 education

2 PI

3 test

## first year of implementing PI

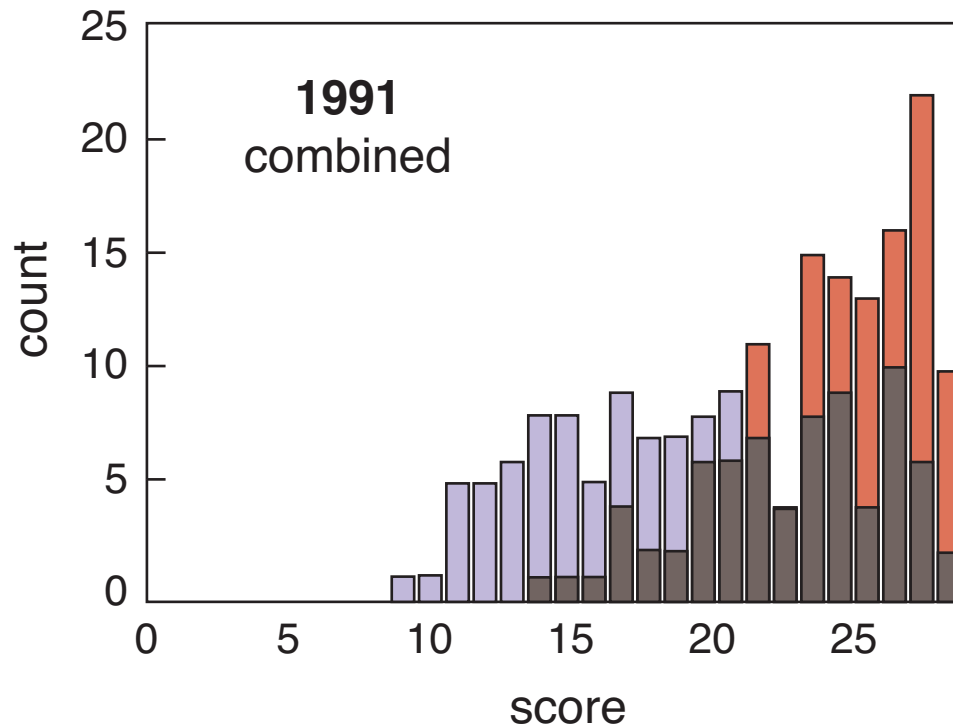


1 education

2 PI

3 test

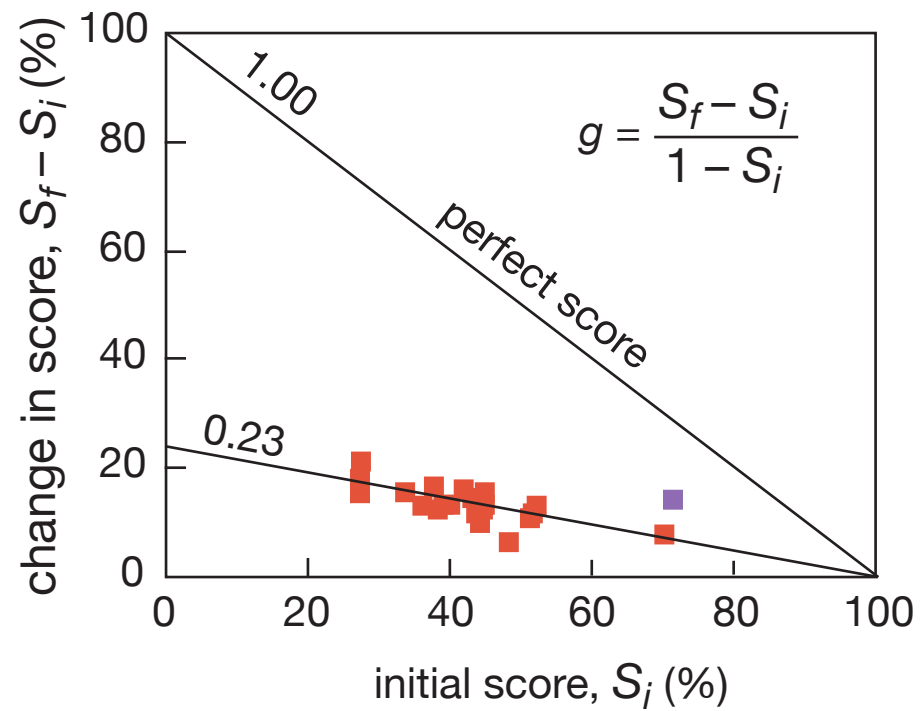
## first year of implementing PI



1 education

2 PI

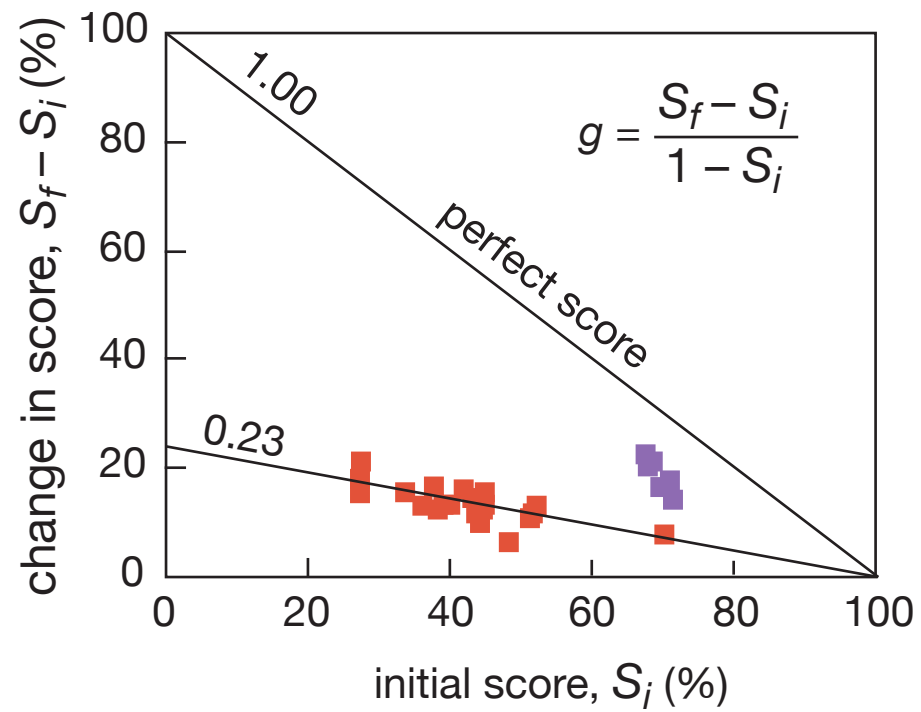
3 test



1 education

2 PI

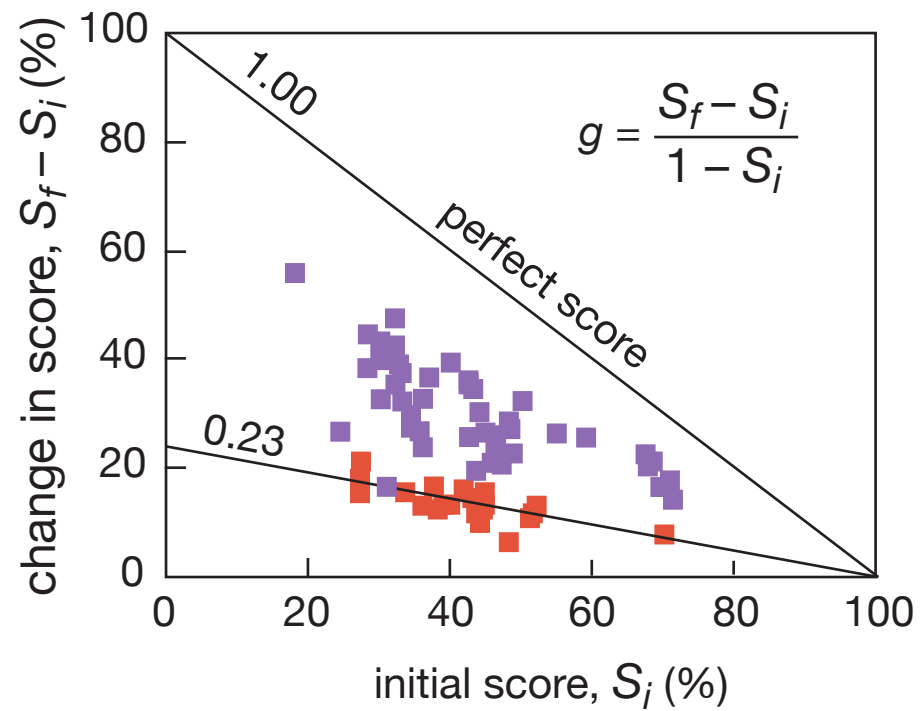
3 test



1 education

2 PI

3 test

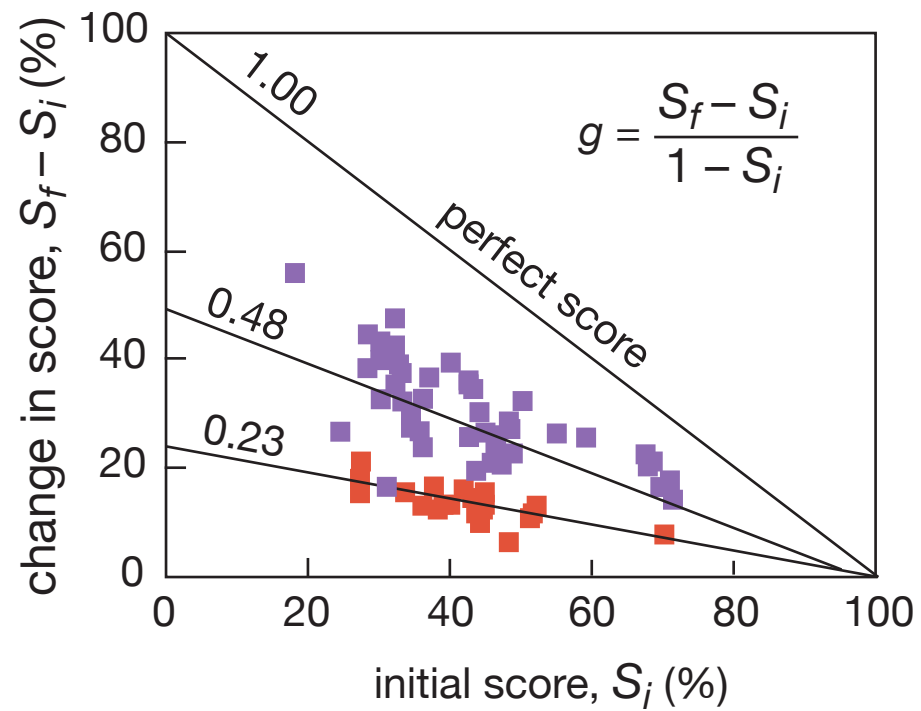


R.R. Hake, *Am. J. Phys.* 66, 64 (1998)

1 education

2 PI

3 test



R.R. Hake, *Am. J. Phys.* 66, 64 (1998)

1 education

2 PI

3 test





Peer

what about problem solving?

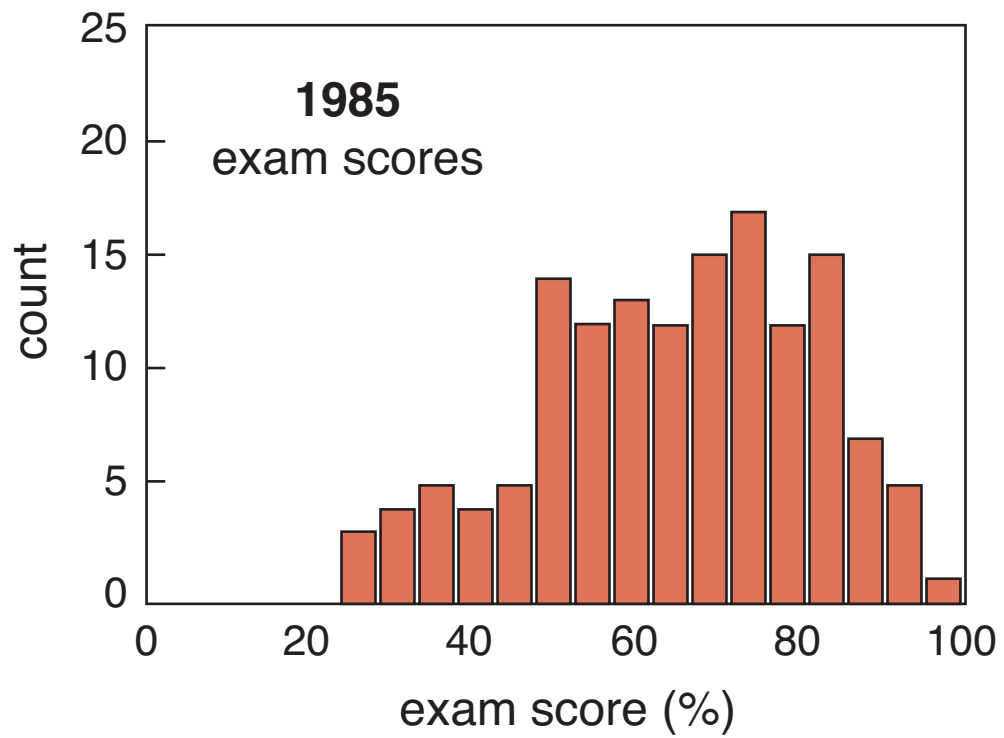


INSTRUCTION

1 education

2 PI

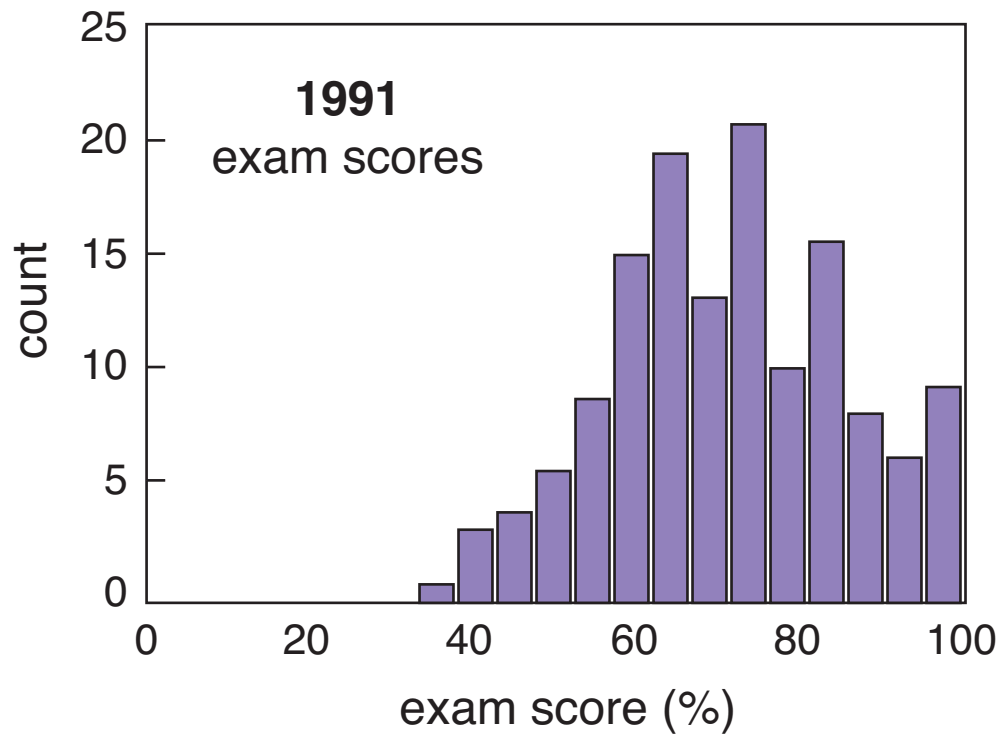
3 test



1 education

2 PI

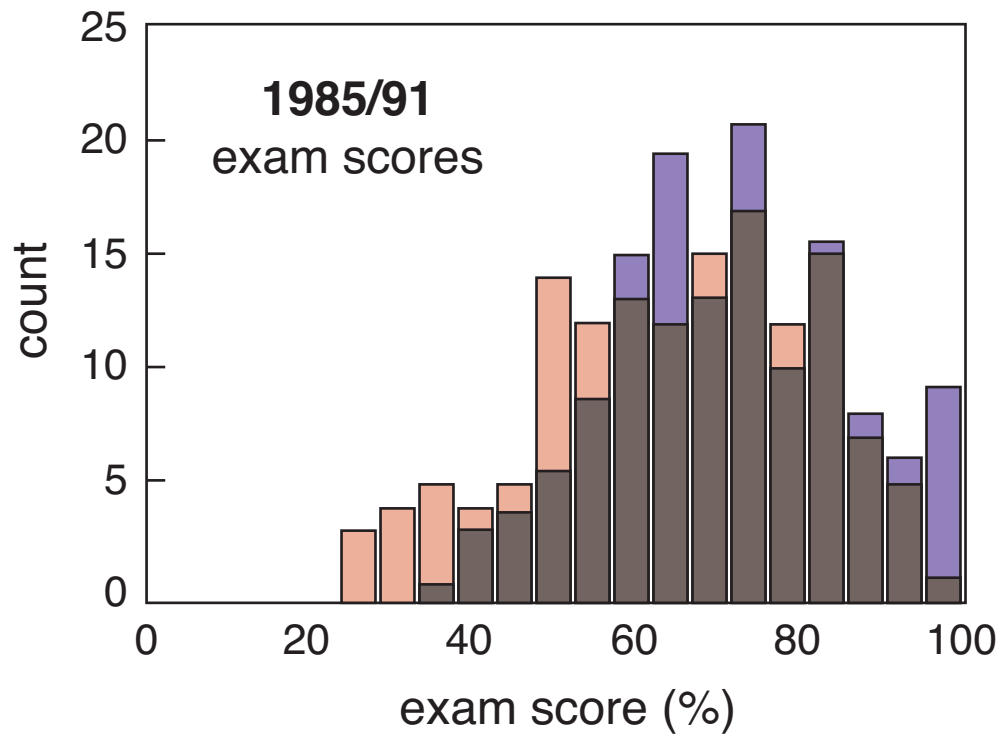
3 test



**1** education

**2** PI

**3** test



**1** education

**2** PI

**3** test



**So better understanding leads to better  
problem solving!**

**1** education

**2** PI

**3** test



**So better understanding leads to better problem solving!**

**(but “good” problem solving doesn’t always indicate understanding!)**

**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**

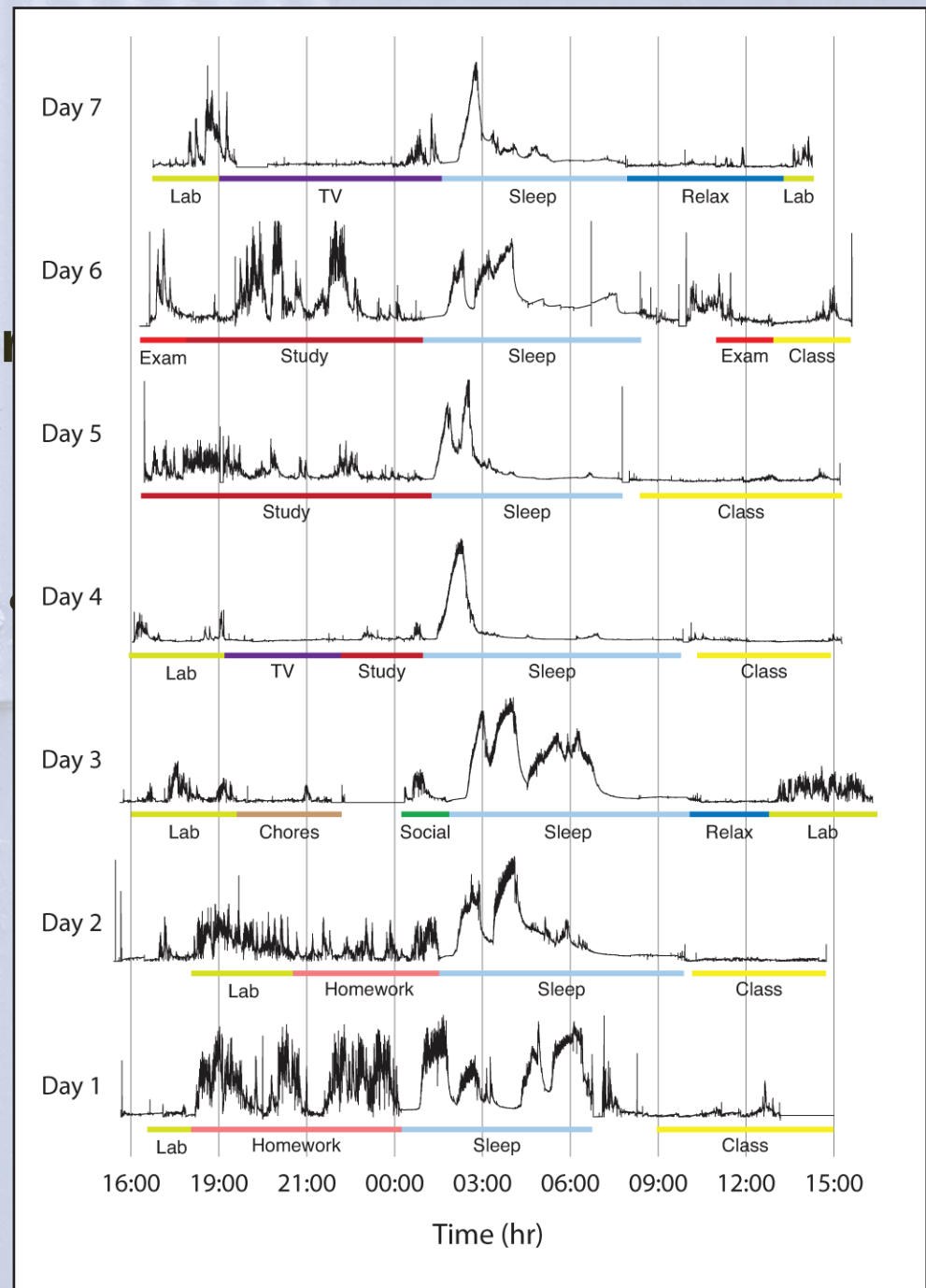
**1** education

**2** PI

**3** test

in a lecture

1. don't pay utmost



doi: 10.1109/TBME.2009.2038487

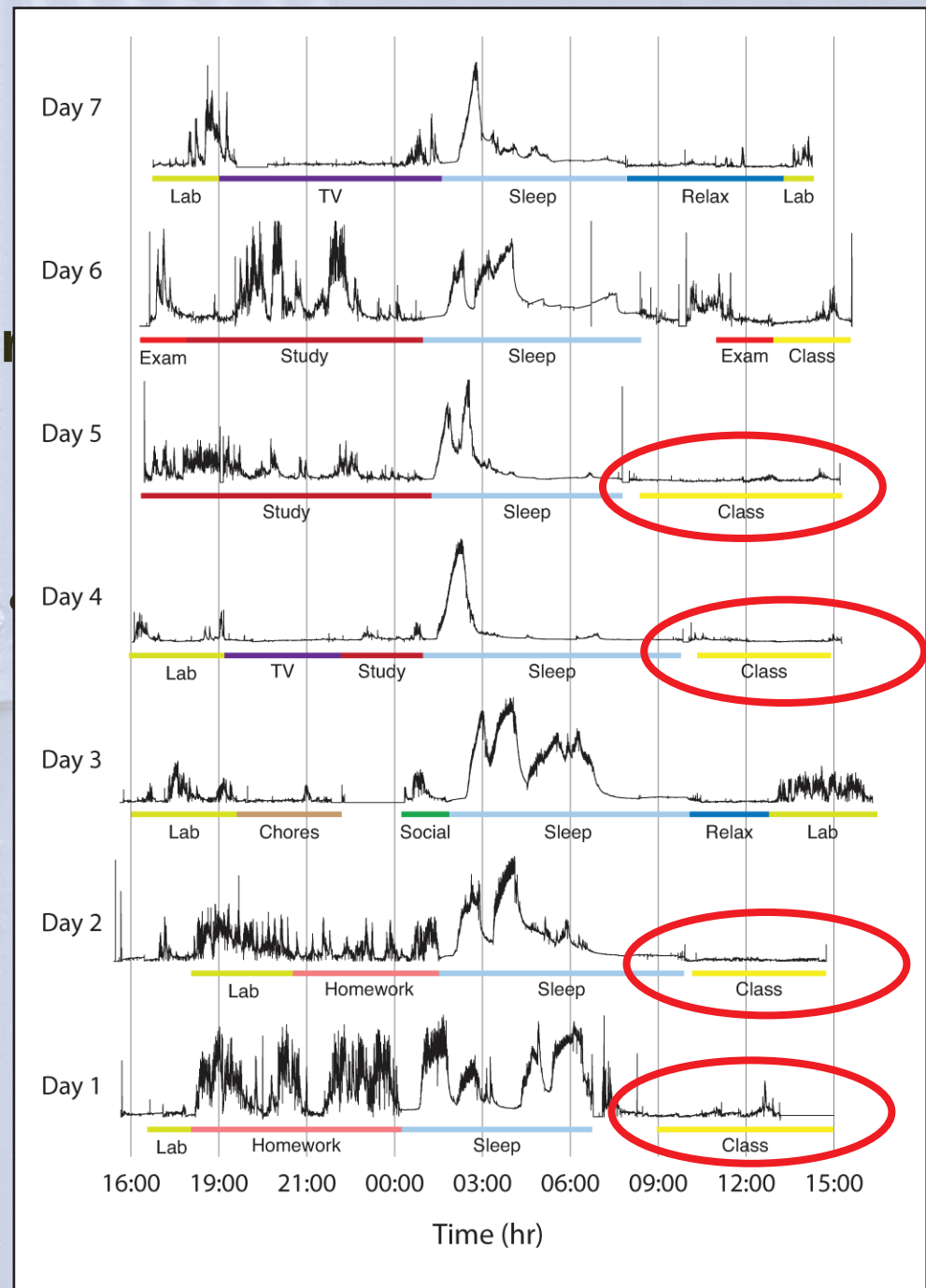
1 education

2 PI

3 test

in a lecture

1. don't pay utmost



doi: 10.1109/TBME.2009.2038487

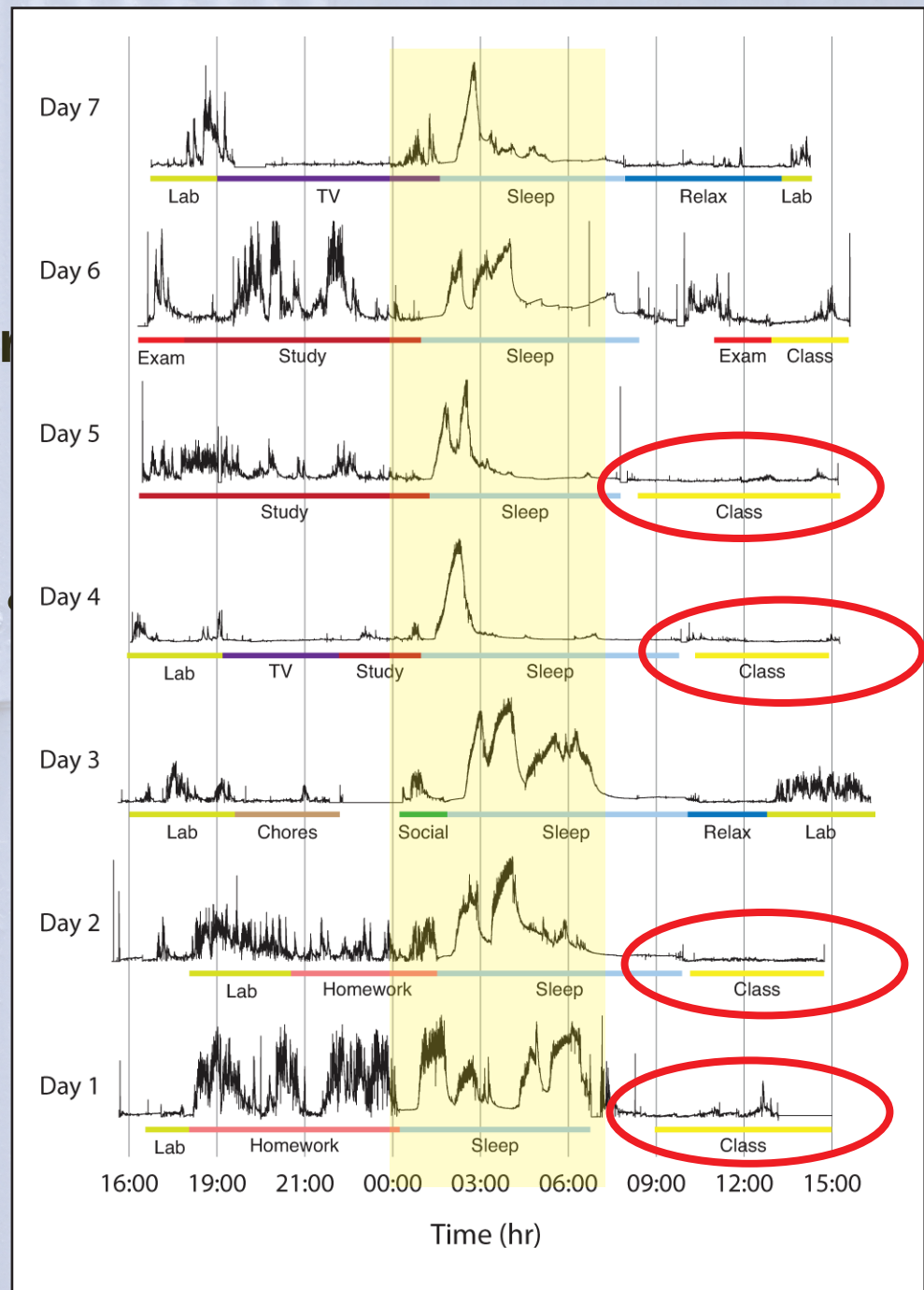
1 education

2 PI

3 test

in a lecture

1. don't pay utmost



doi: 10.1109/TBME.2009.2038487

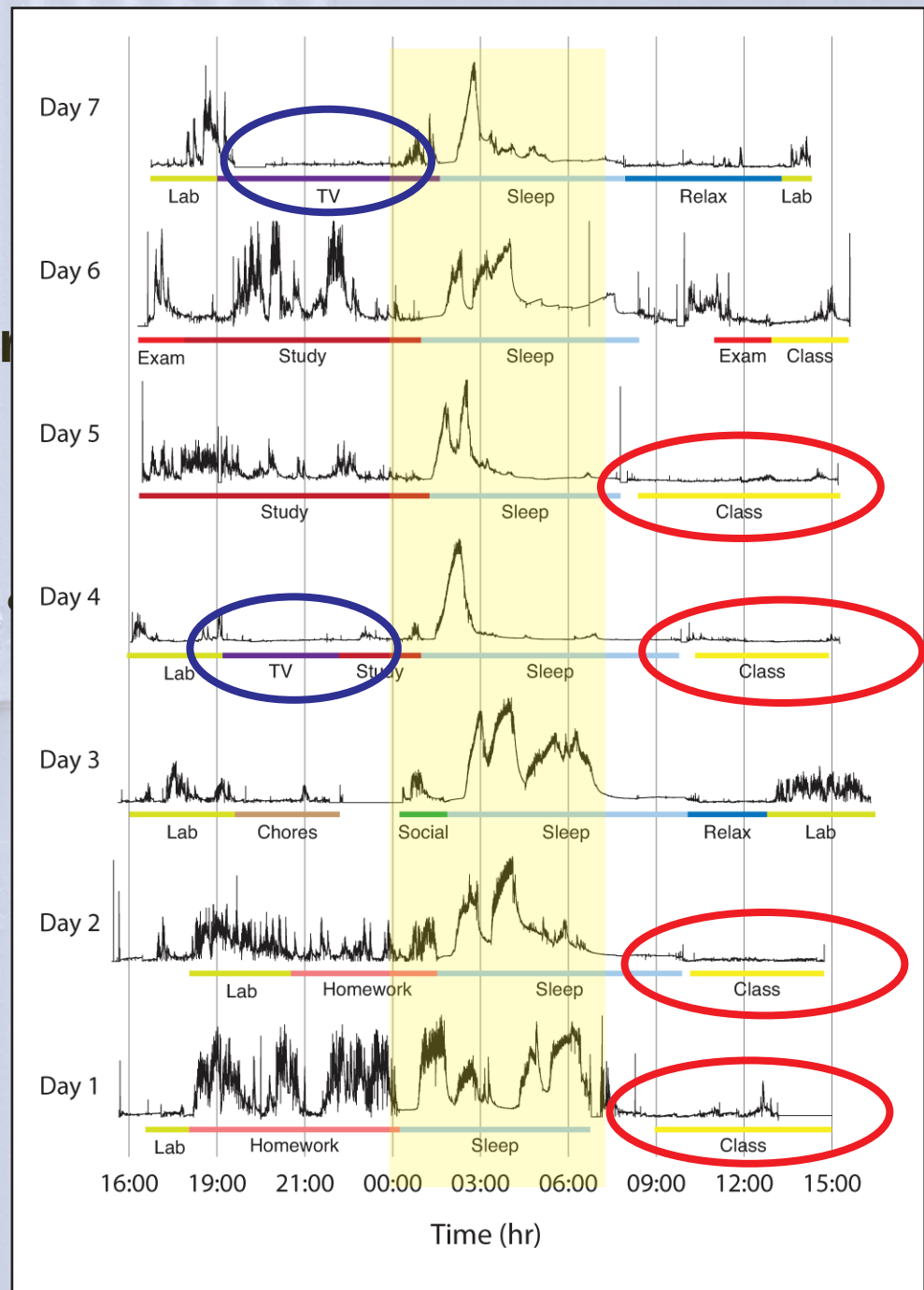
1 education

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

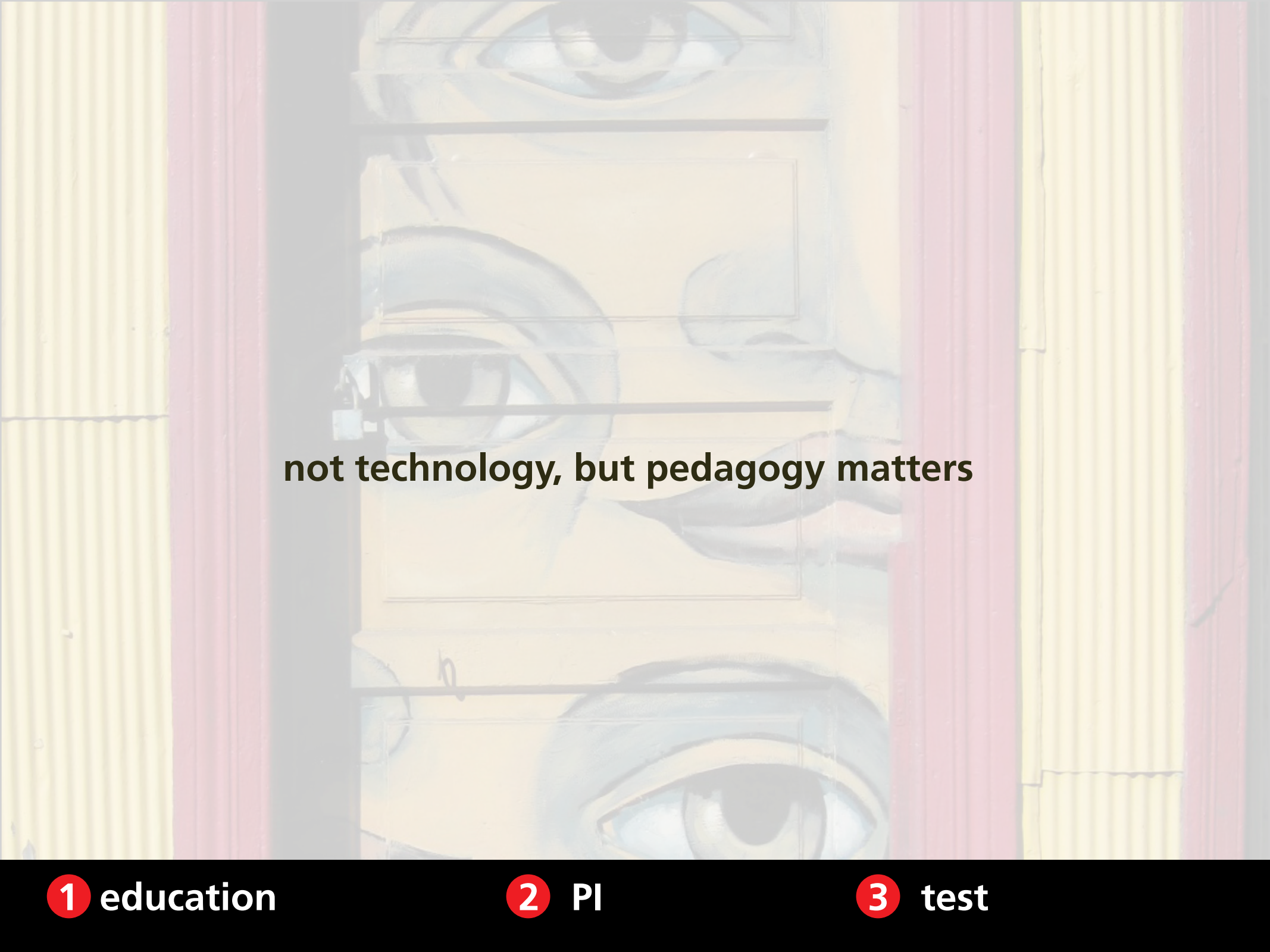
**3** test



**Education is not just about:**

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

**active participation a must!**



**not technology, but pedagogy matters**

**1** education

**2** PI

**3** test



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**Funding:**

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