

Memorización o comprensión: estamos enseñando lo correcto?



Programa Universia sobre Innovación en la Enseñanza
Pontificia Universidad Católica del Perú
Lima, Perú, 19 de Marzo 2013



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- no ON/OFF button
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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?

EDUCACION

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 history of the subject.

2. The second part is devoted to the theory of the subject.

3. The third part is devoted to the practice of the subject.

4. The fourth part is devoted to the future of the subject.

5. The fifth part is devoted to the conclusion of the lecture.

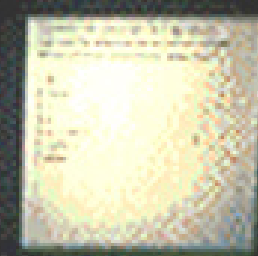
1. The first part of the lecture is devoted to the history of the subject.

2. The second part is devoted to the theory of the subject.

3. The third part is devoted to the practice of the subject.

4. The fourth part is devoted to the future of the subject.

5. The fifth part is devoted to the conclusion of the lecture.









1 education

2 PI


3 test



1 education

2 PI

3 test

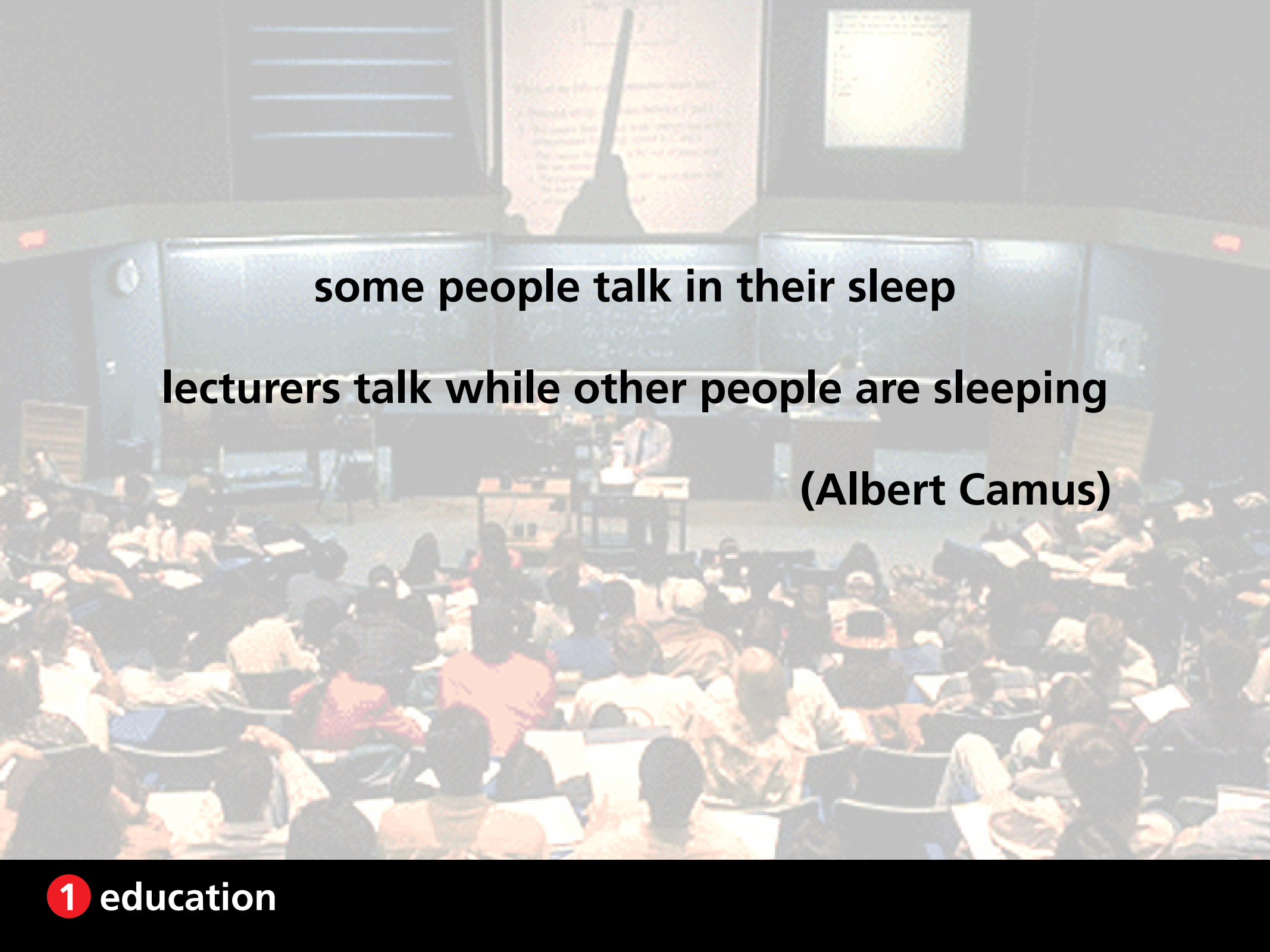


**What happens
in a lecture?**



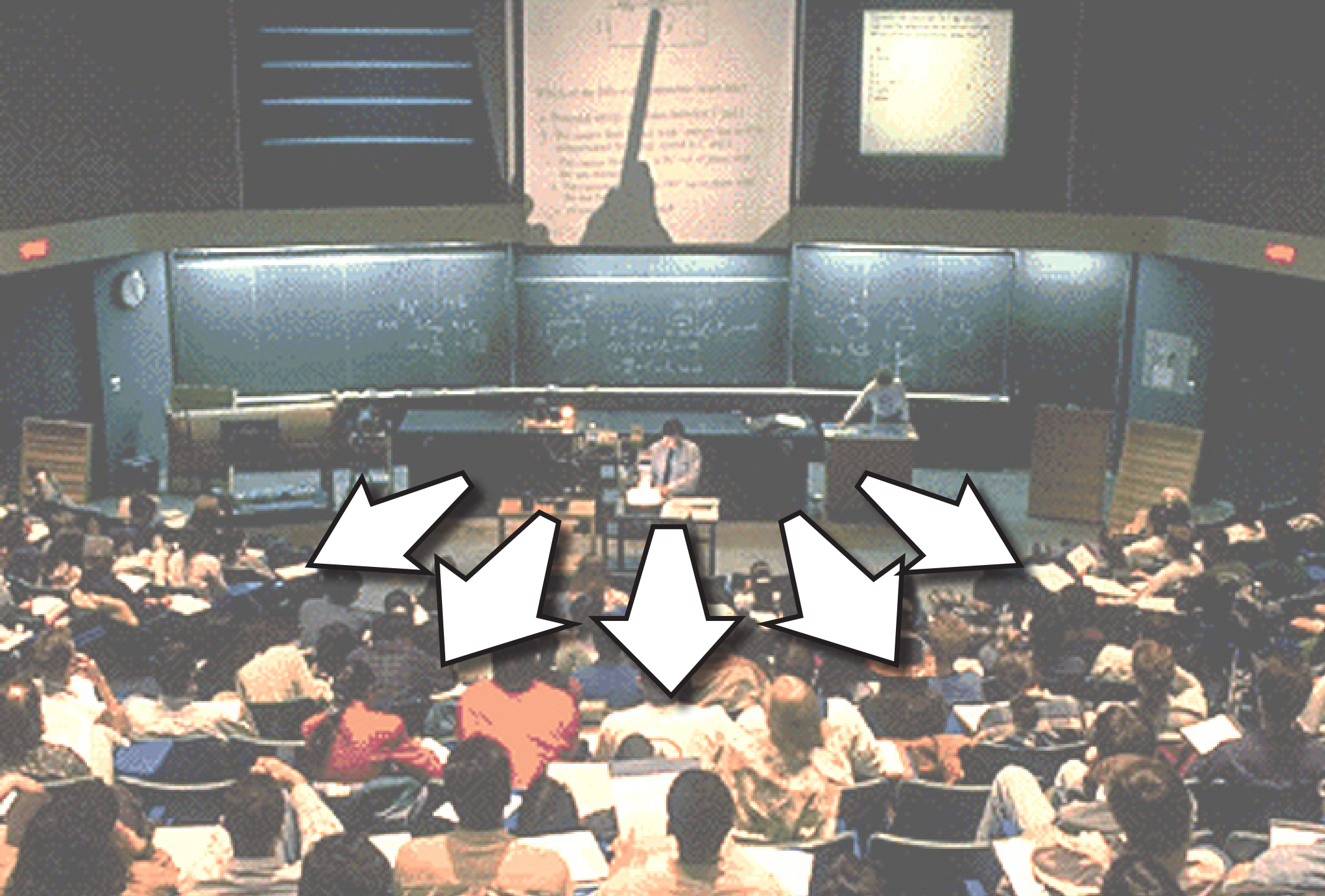
A wide-angle photograph of a large lecture hall. The room is filled with students seated in rows of chairs. Many students appear to be asleep, with their heads resting on their desks or hands. At the front of the room, a lecturer is standing near a podium, addressing the class. Behind the lecturer are 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. In the foreground, many students are sleeping with their heads down. In the background, a lecturer is standing at a podium, addressing the class. The room has a curved wall and a large screen displaying text.

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

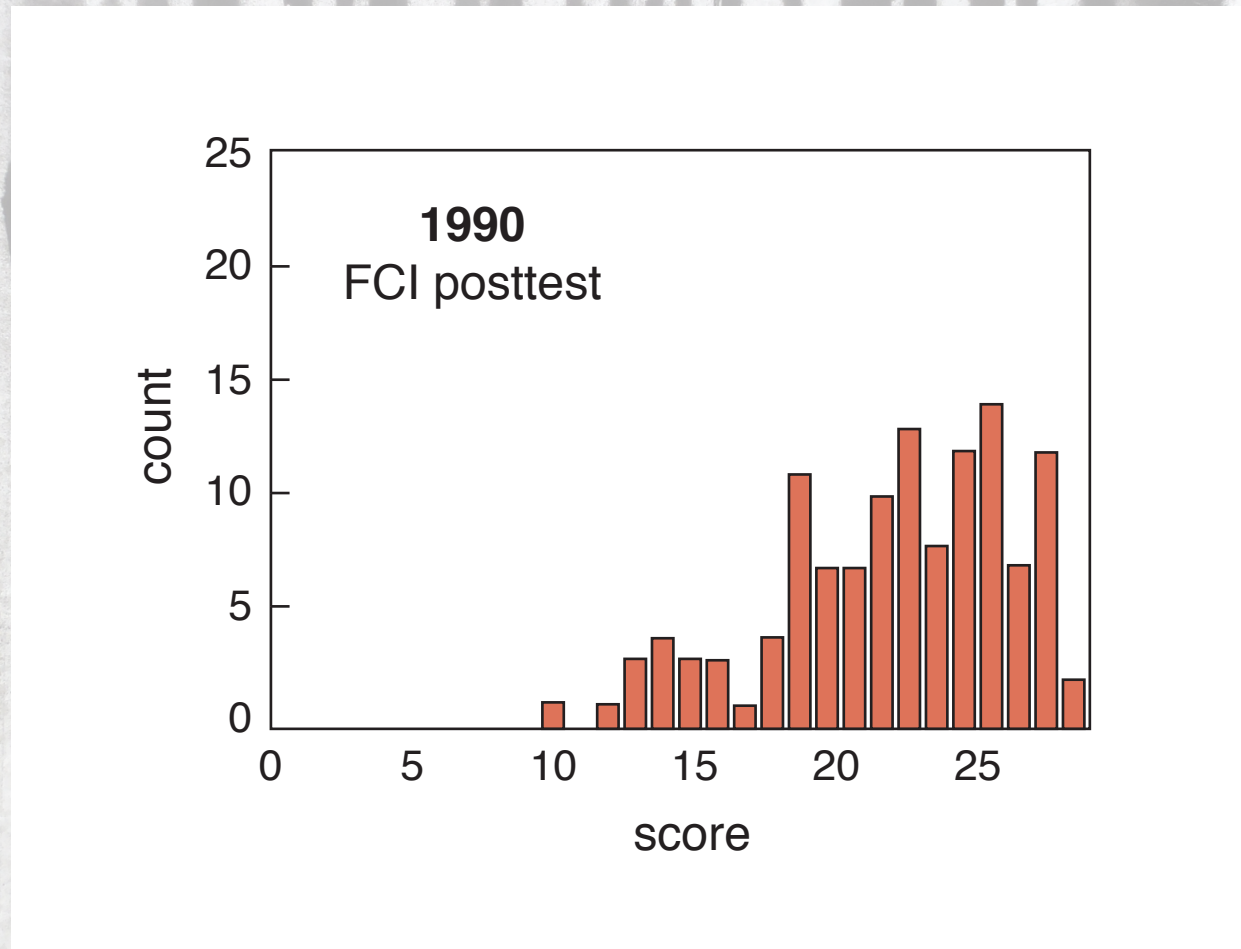




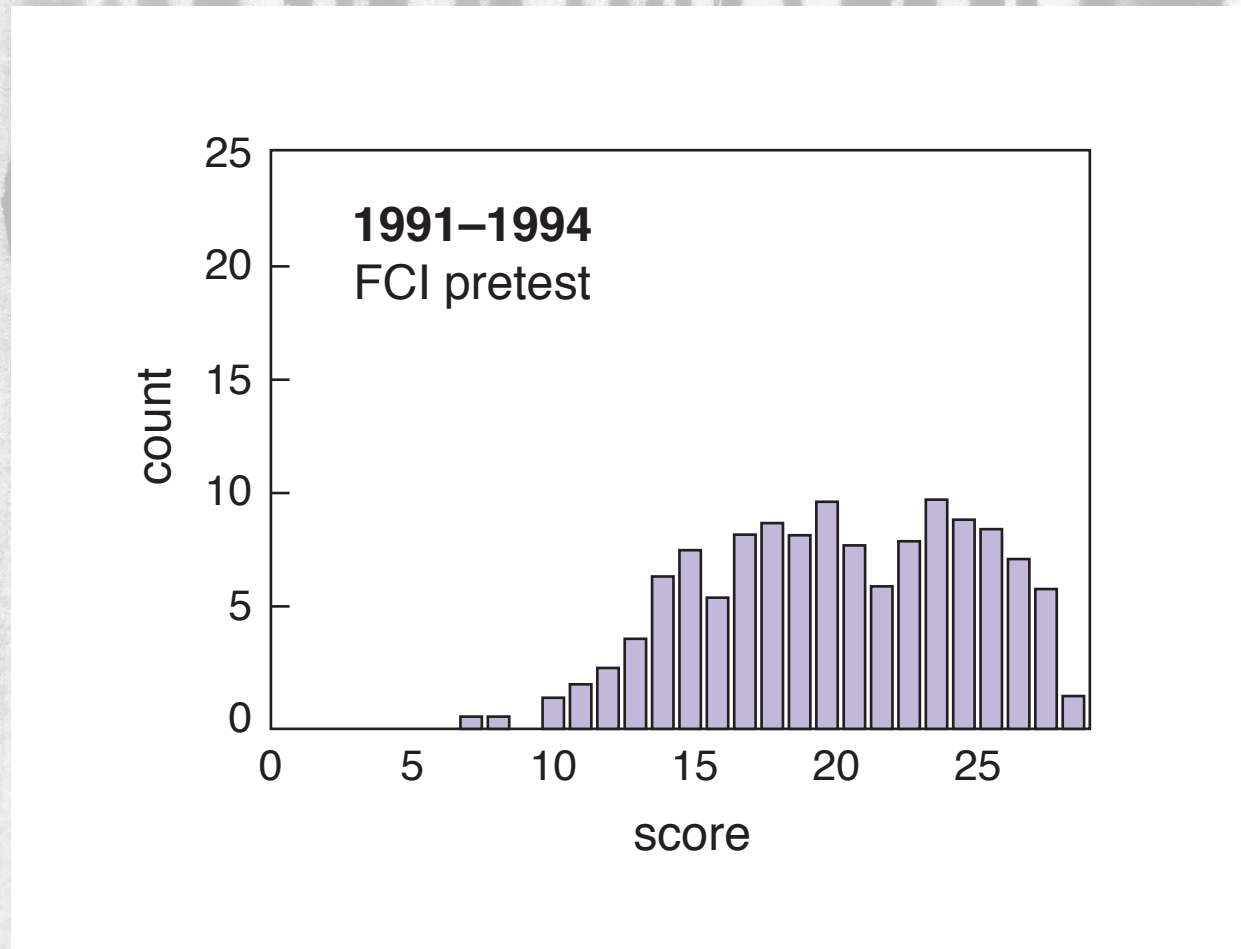
The result?

EDUCACION

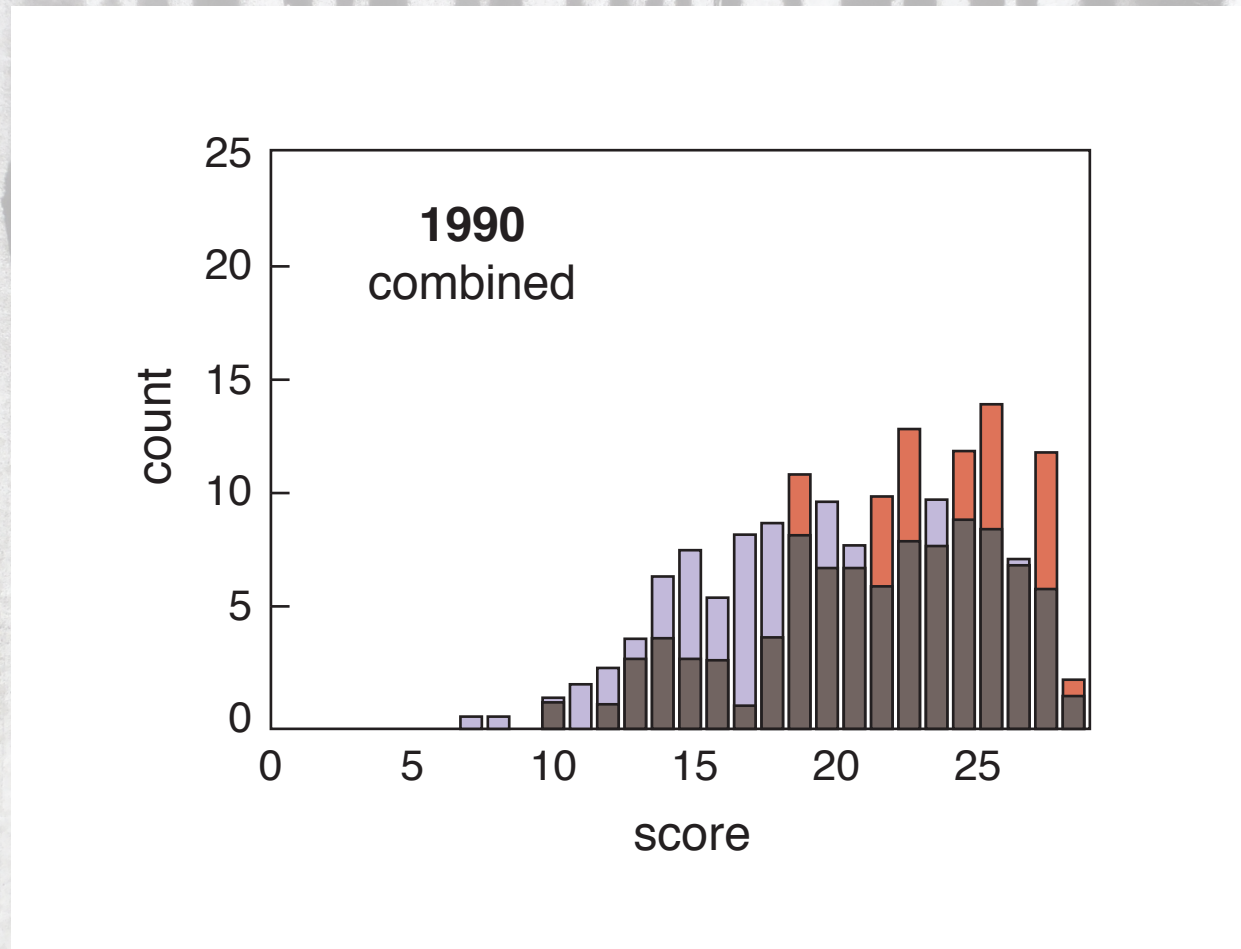
education is not just information transfer

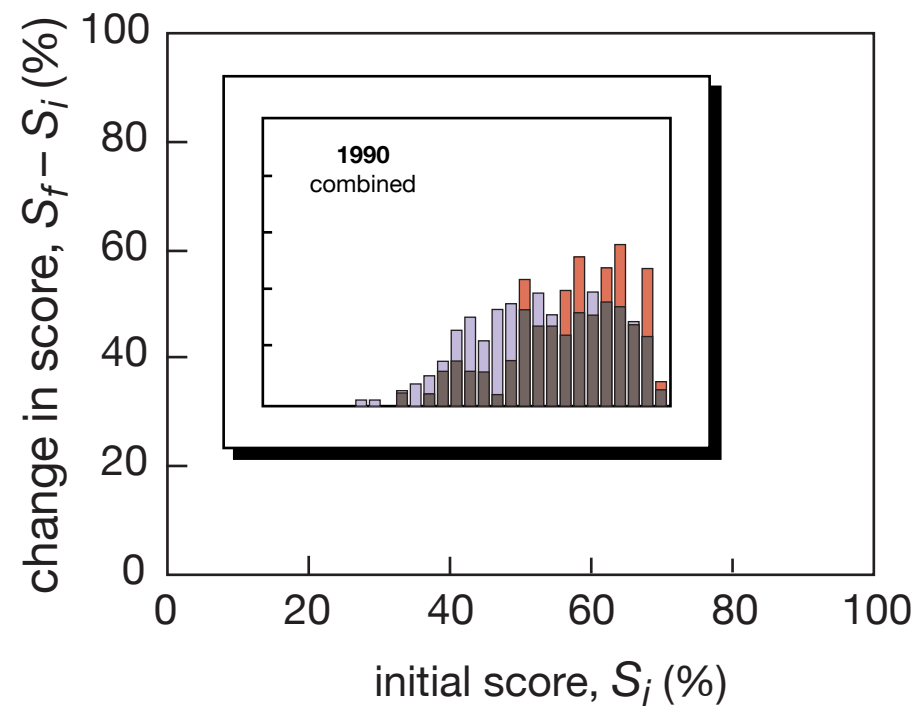


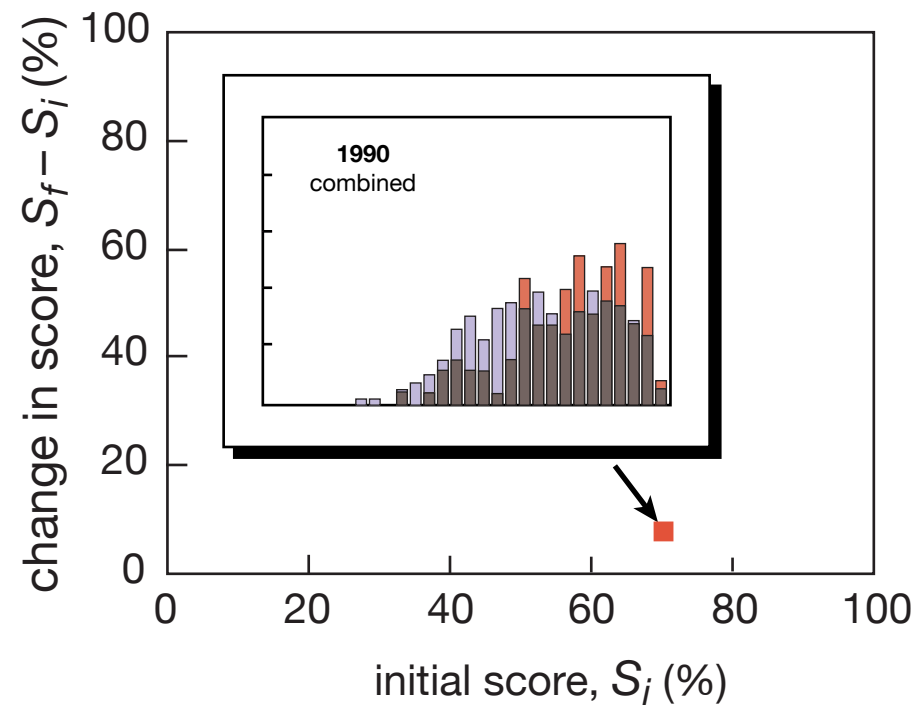
education is not just information transfer

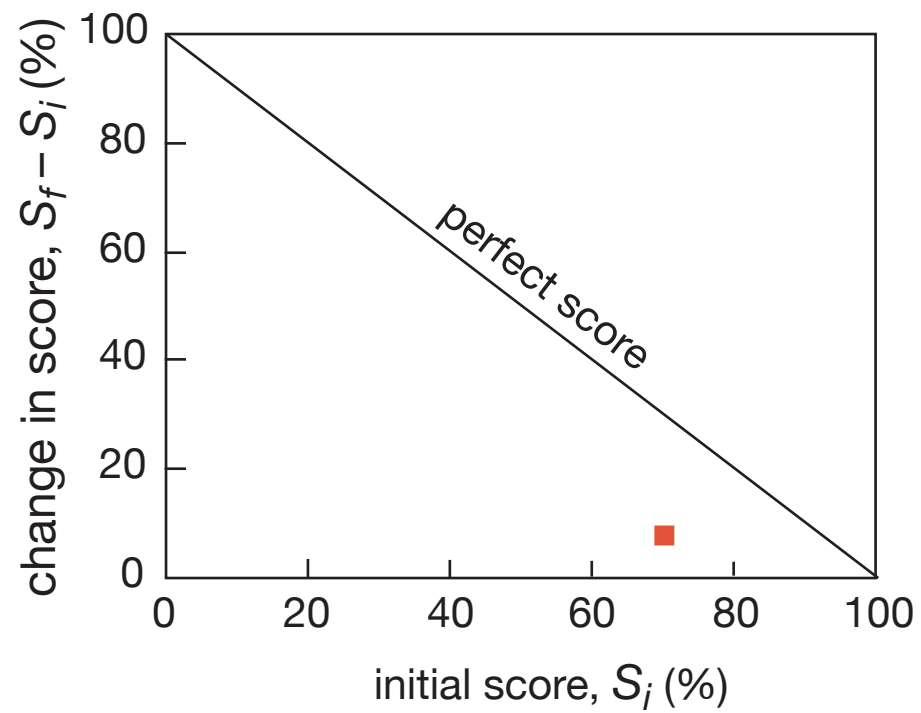


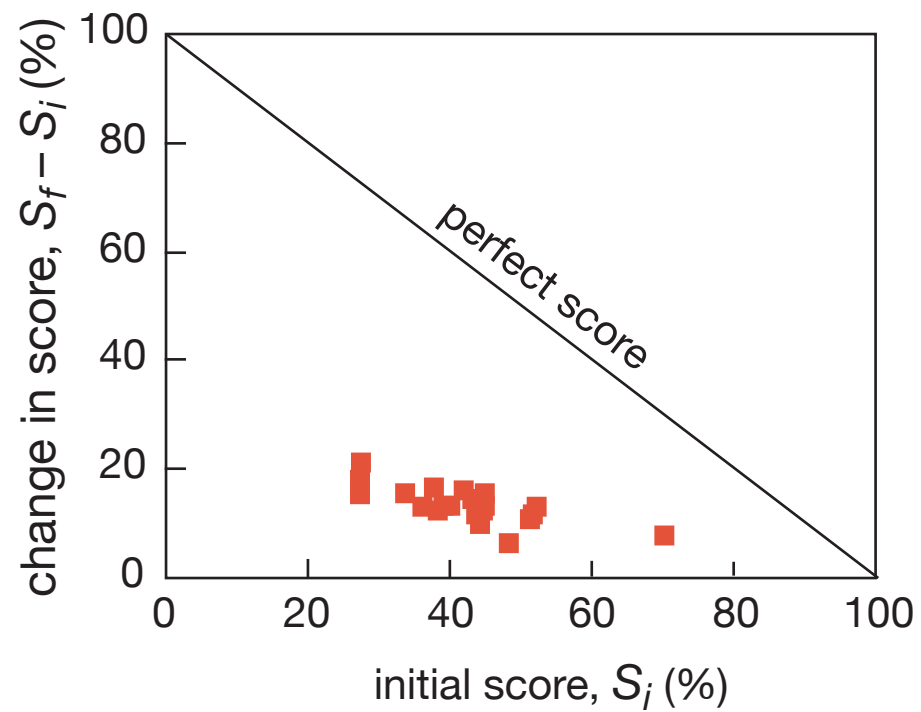
education is not just information transfer





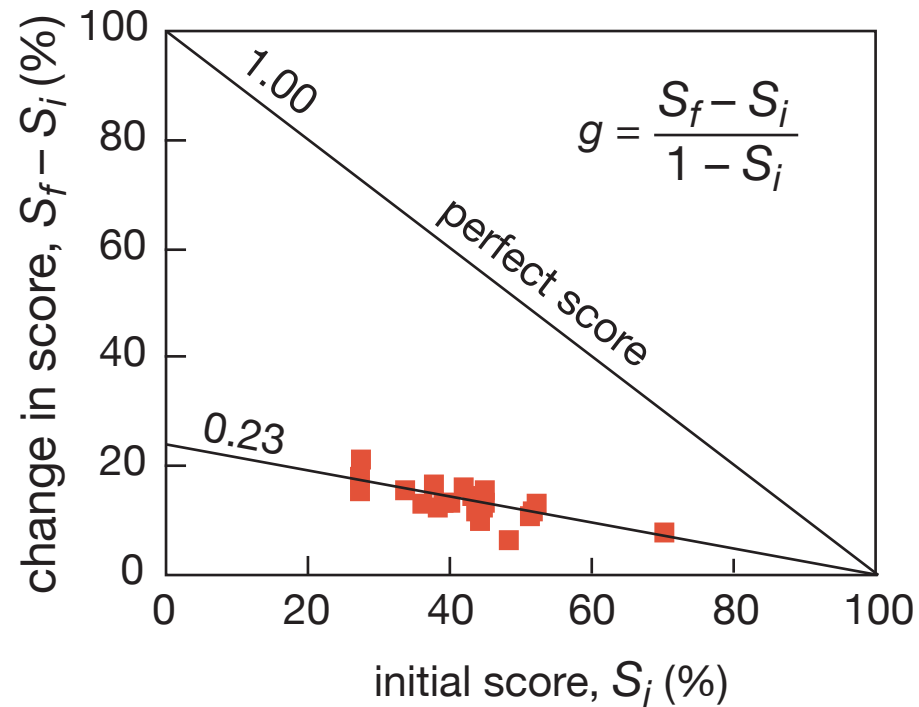






R.R. Hake, *Am. J. Phys.* 66, 64 (1998)

only one quarter of maximum gain realized



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

not transfer but assimilation of information is key





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





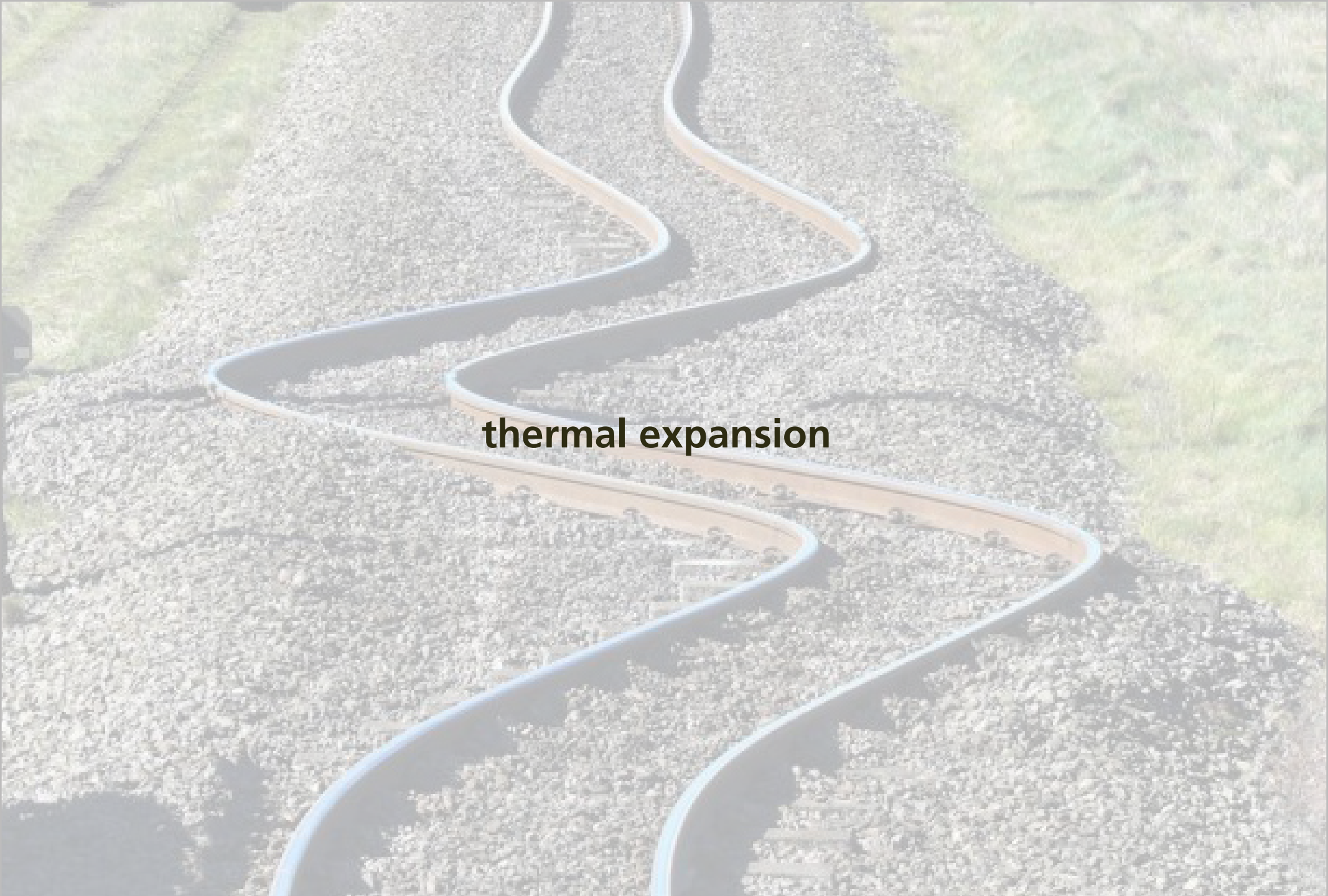
1 education

2 PI

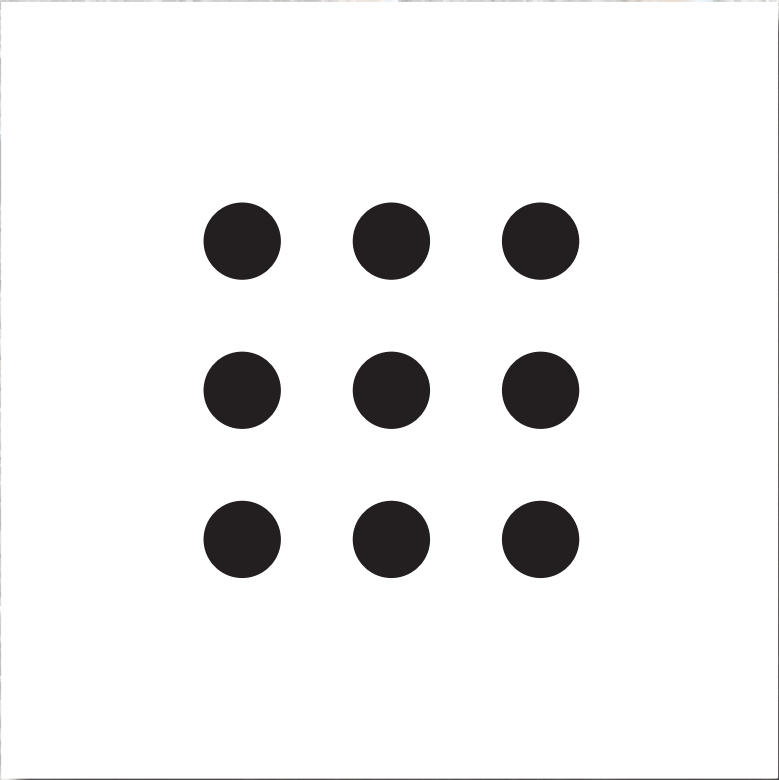


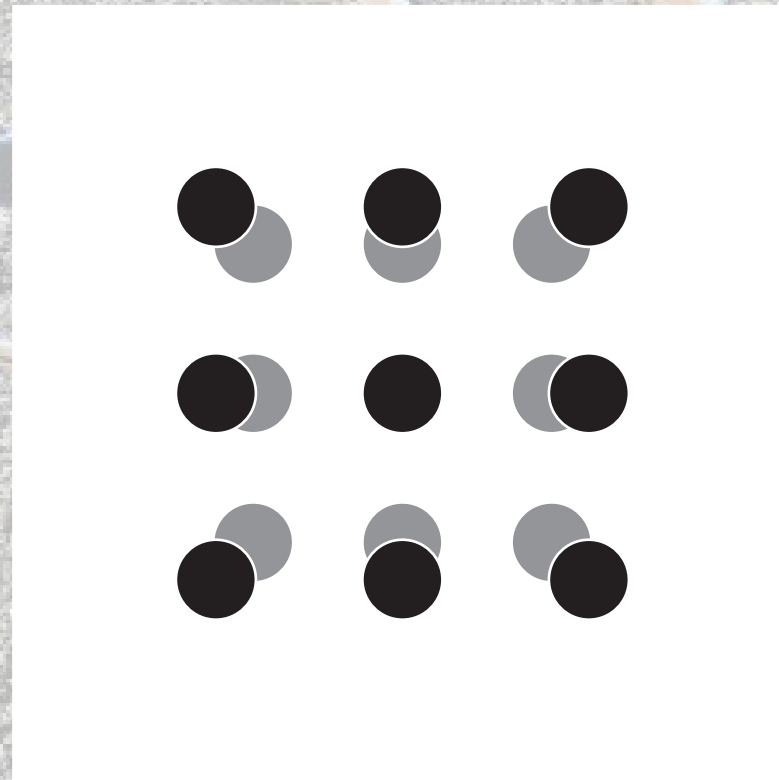
1 education

2 PI

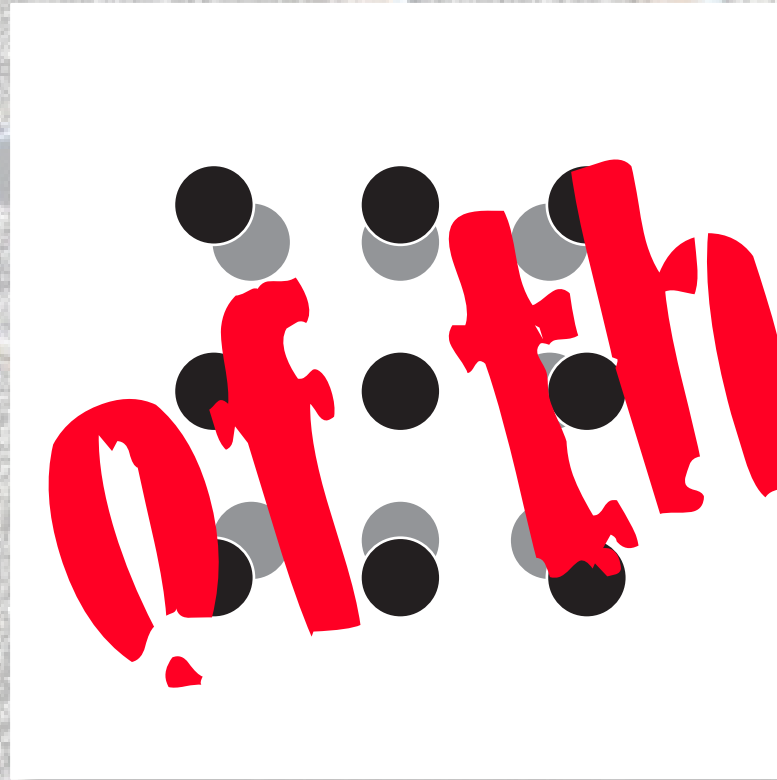
An aerial photograph of a railway track. The track is composed of two parallel steel rails, which are highlighted with a blue-to-orange gradient. The rails are laid on a bed of dark grey gravel. The track is not straight but follows a wavy, S-shaped path across the landscape. The surrounding area is covered in green grass. The text "thermal expansion" is written in a bold, black, sans-serif font, centered over the middle of the track.

thermal expansion





all of them



1 education

2 PI

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



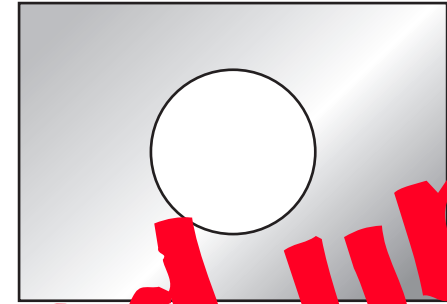
Consider a rectangular metal plate with a circular hole in it.



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.**

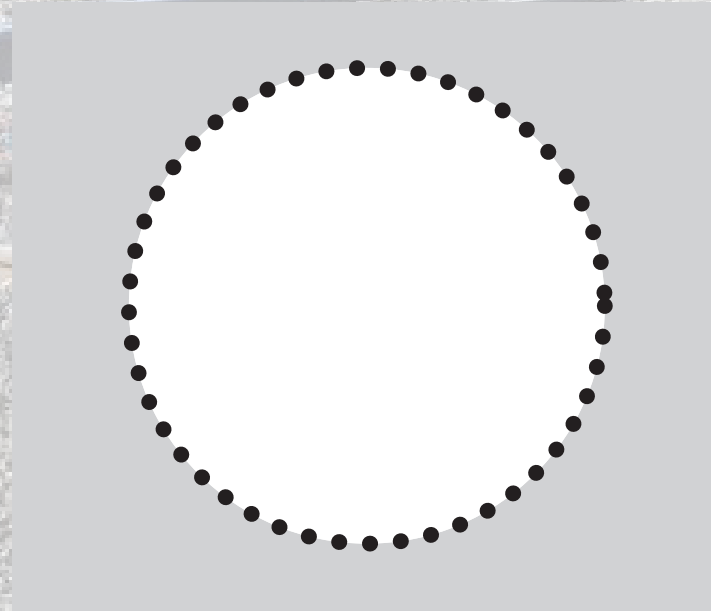
Consider a rectangular metal plate with a circular hole in it.



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

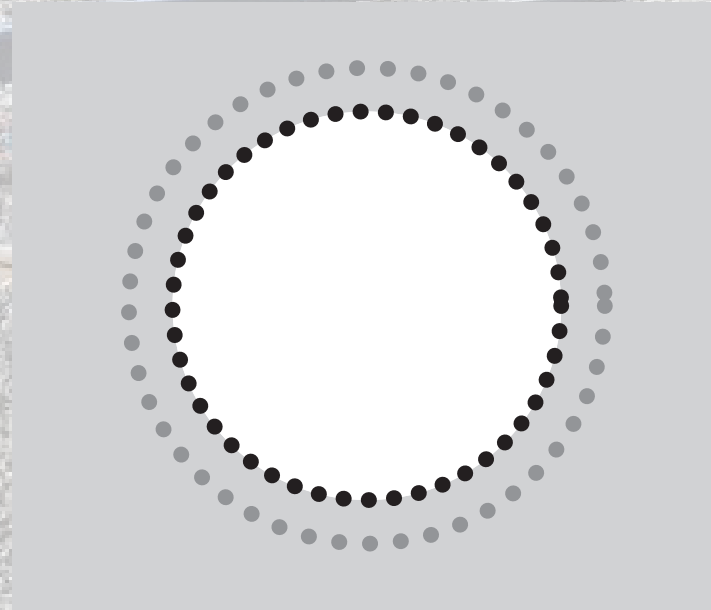


1 education

2 PI

3 test

consider atoms at rim of hole

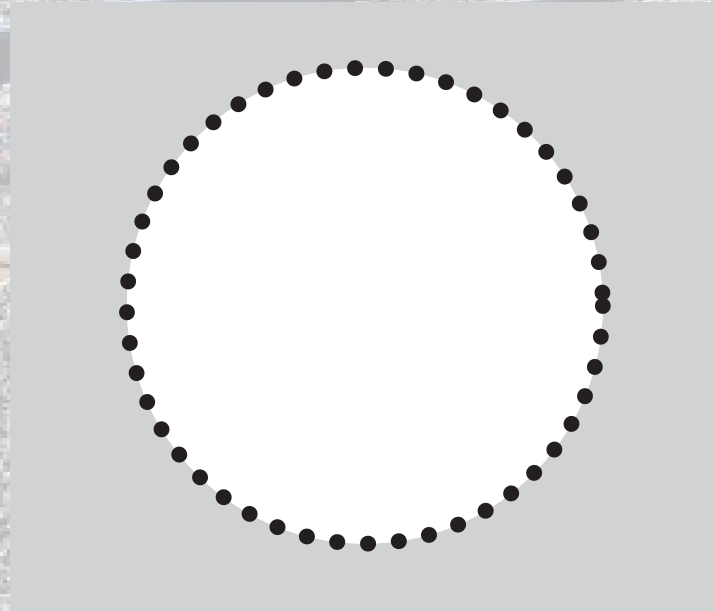


1 education

2 PI

3 test

consider atoms at rim of hole

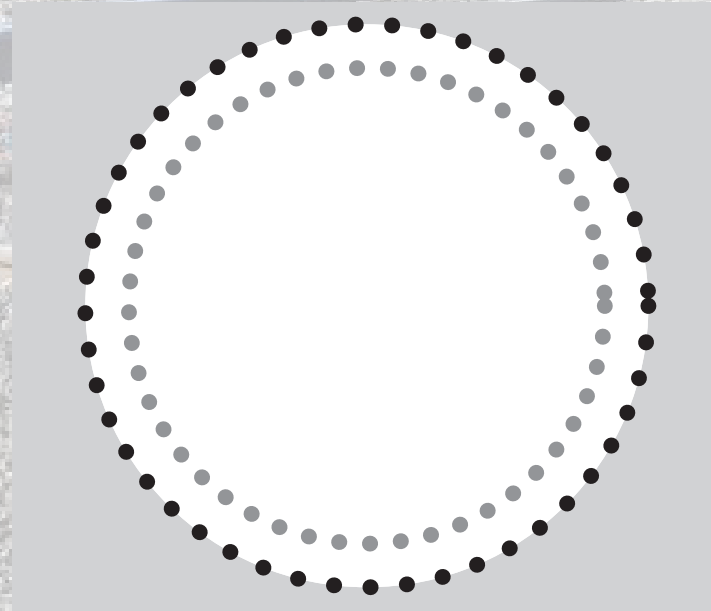


1 education

2 PI

3 test

consider atoms at rim of hole



consider atoms at rim of hole

you won't forget this

1 education

2 PI

3 test

Peer

back to PI

INSTRUCTION

① education

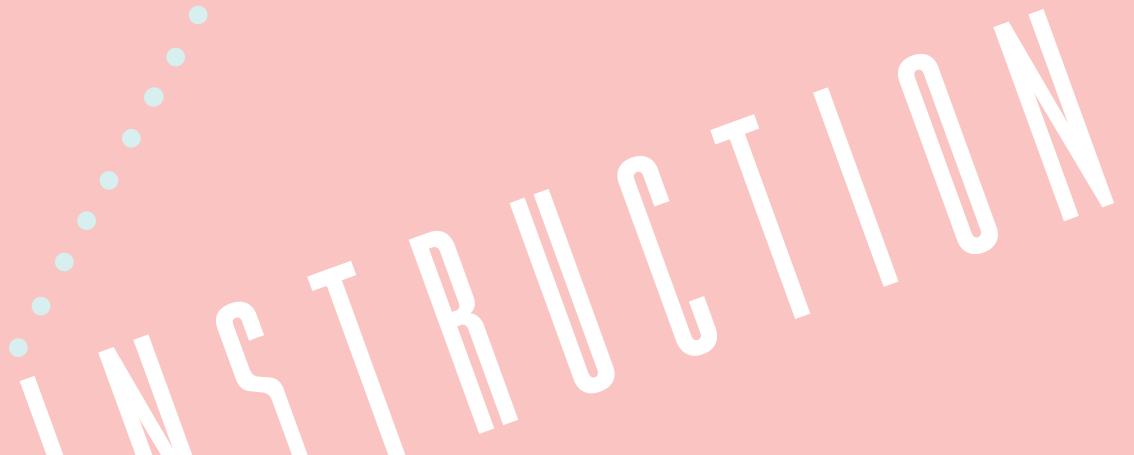
② PI

③ test



Peer

is it any good?



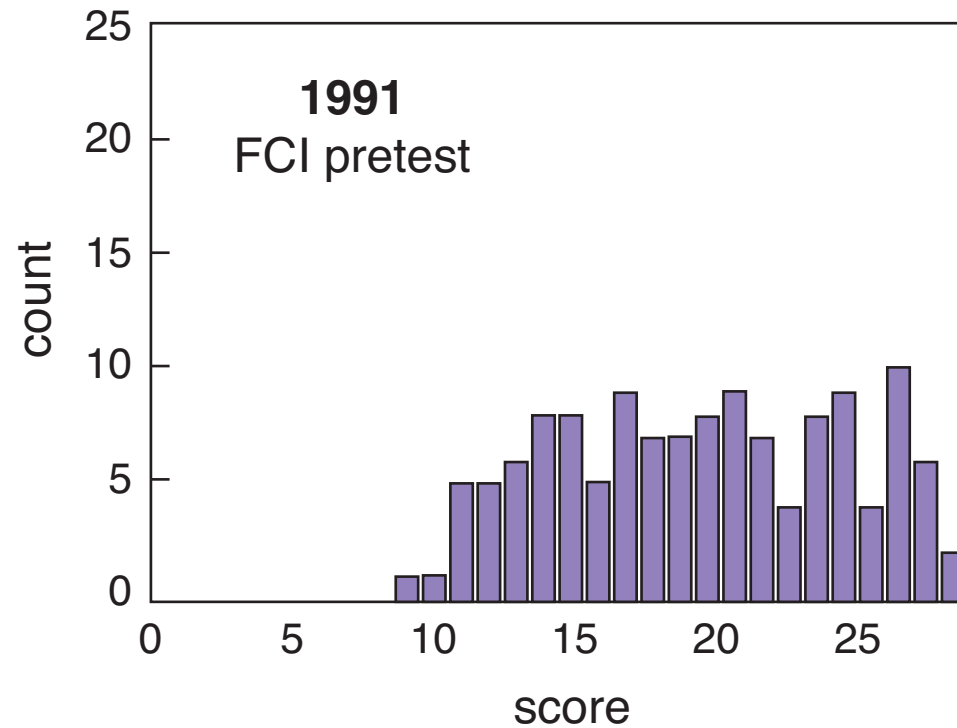
INSTRUCTION

1 education

2 PI

3 test

first year of implementing PI

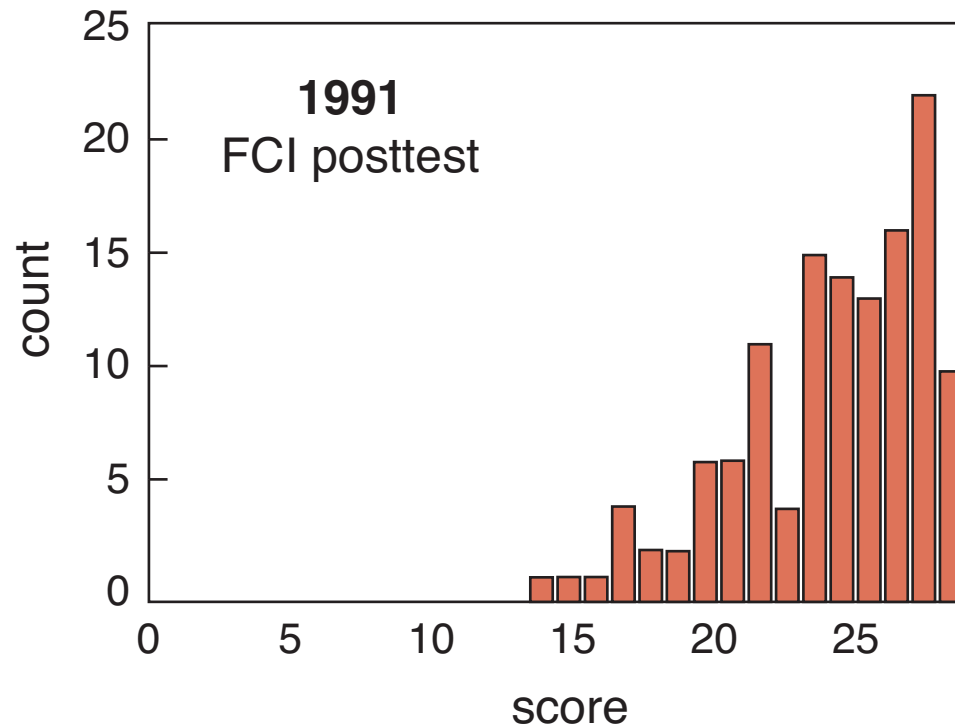


1 education

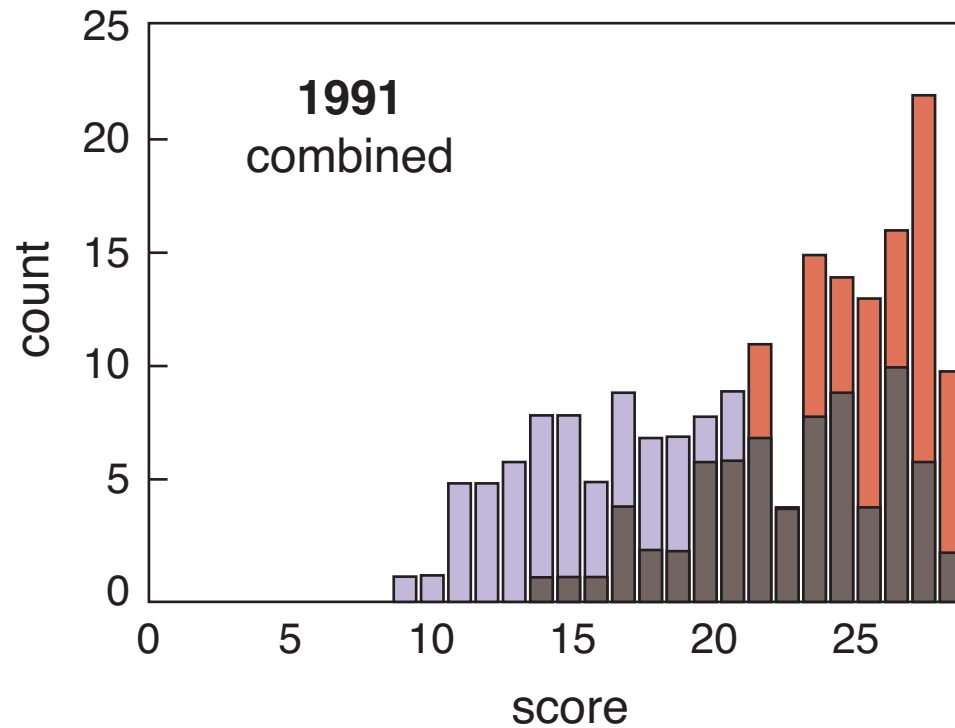
2 PI

3 test

first year of implementing PI



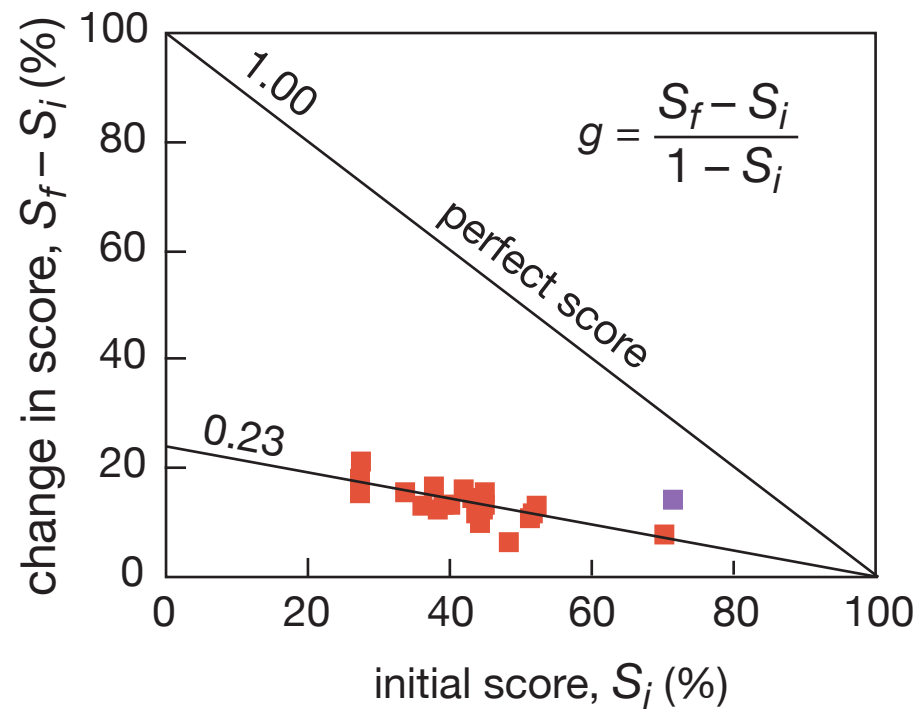
first year of implementing PI



1 education

2 PI

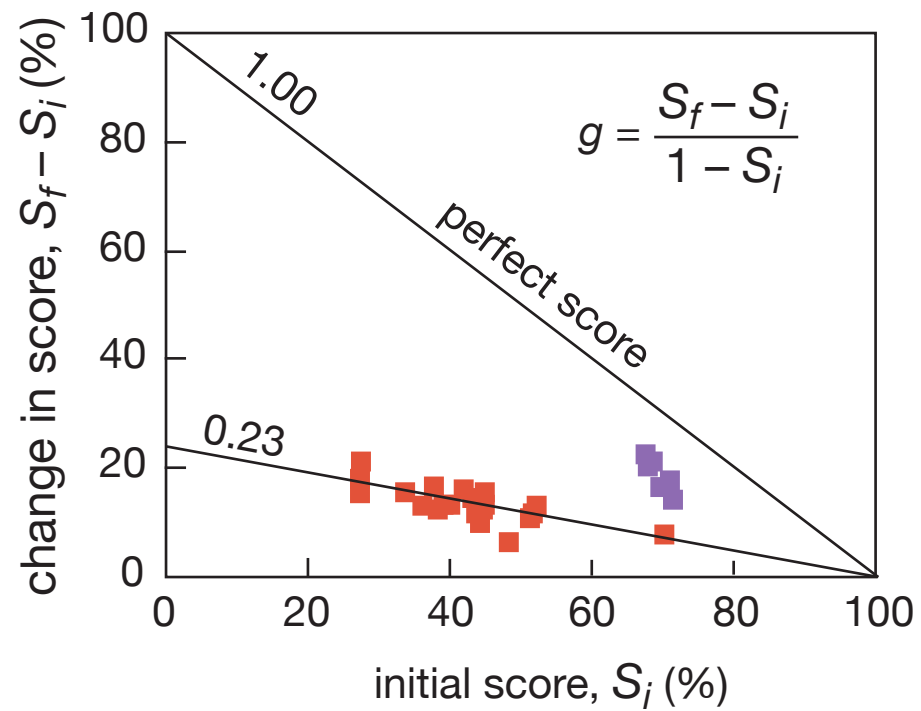
3 test



1 education

2 PI

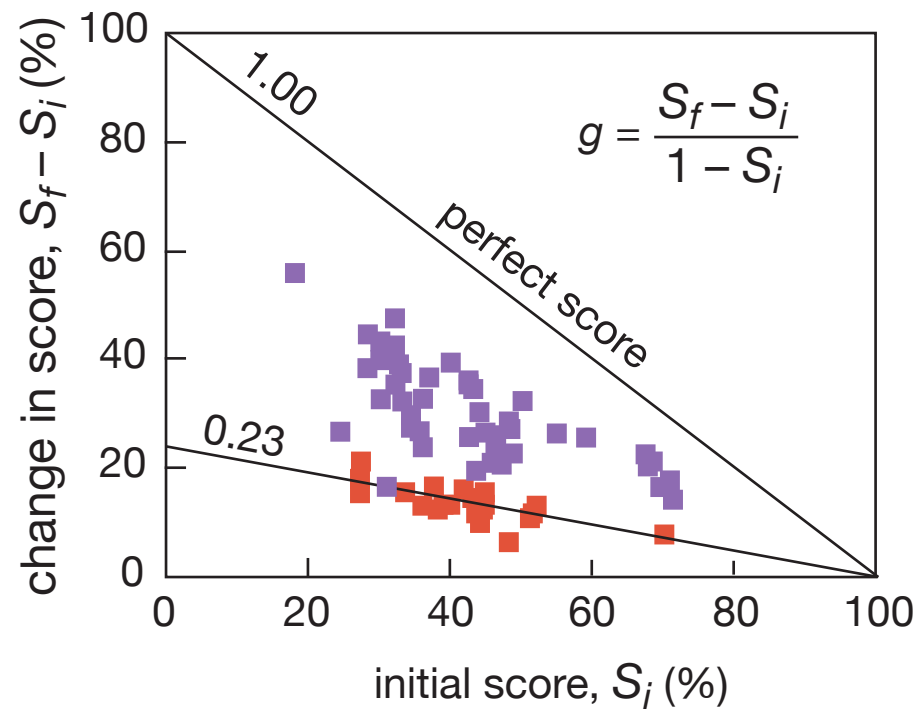
3 test



1 education

2 PI

3 test

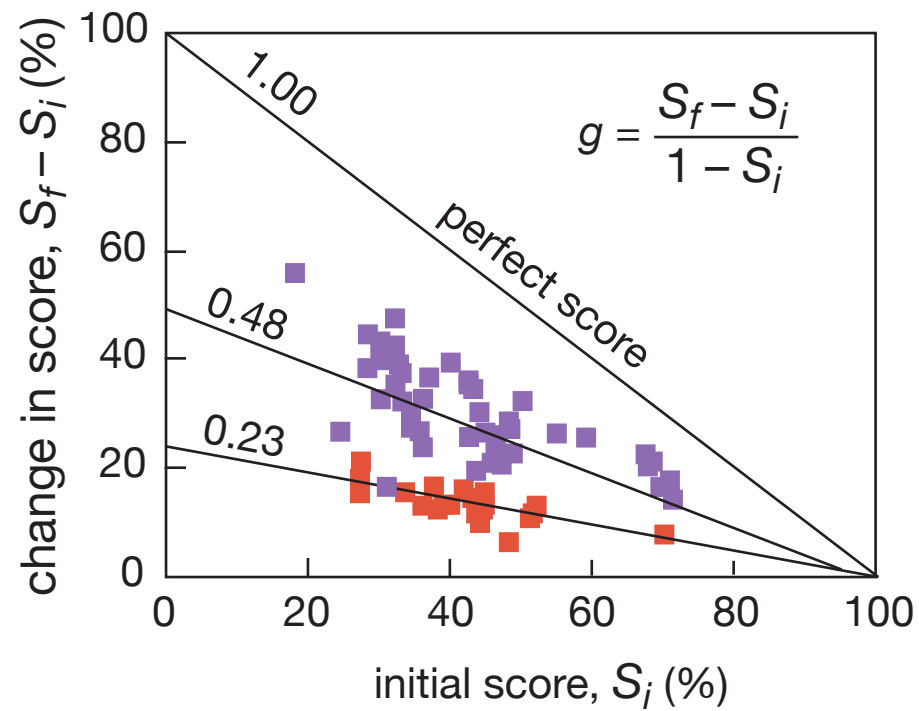


R.R. Hake, *Am. J. Phys.* 66, 64 (1998)

1 education

2 PI

3 test



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

1 education

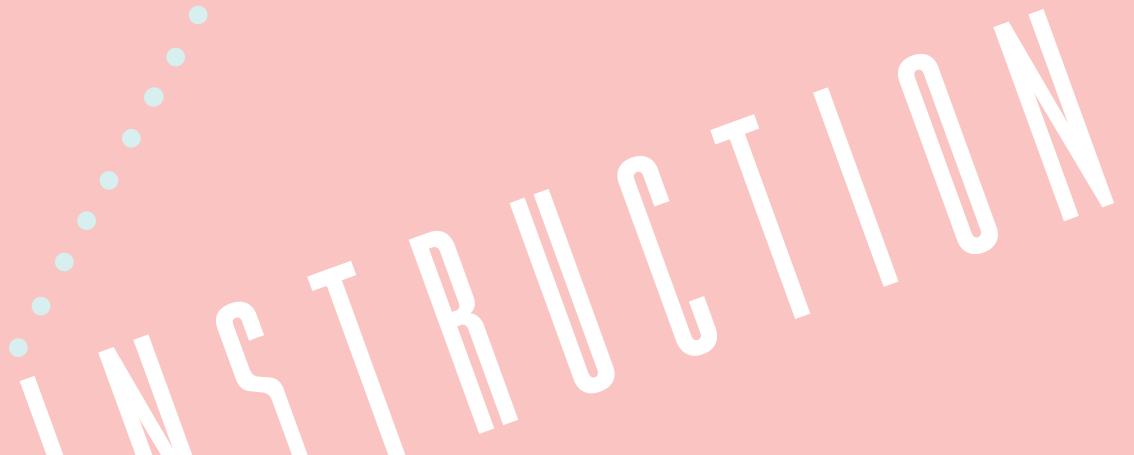
2 PI

3 test



Peer

what about problem solving?

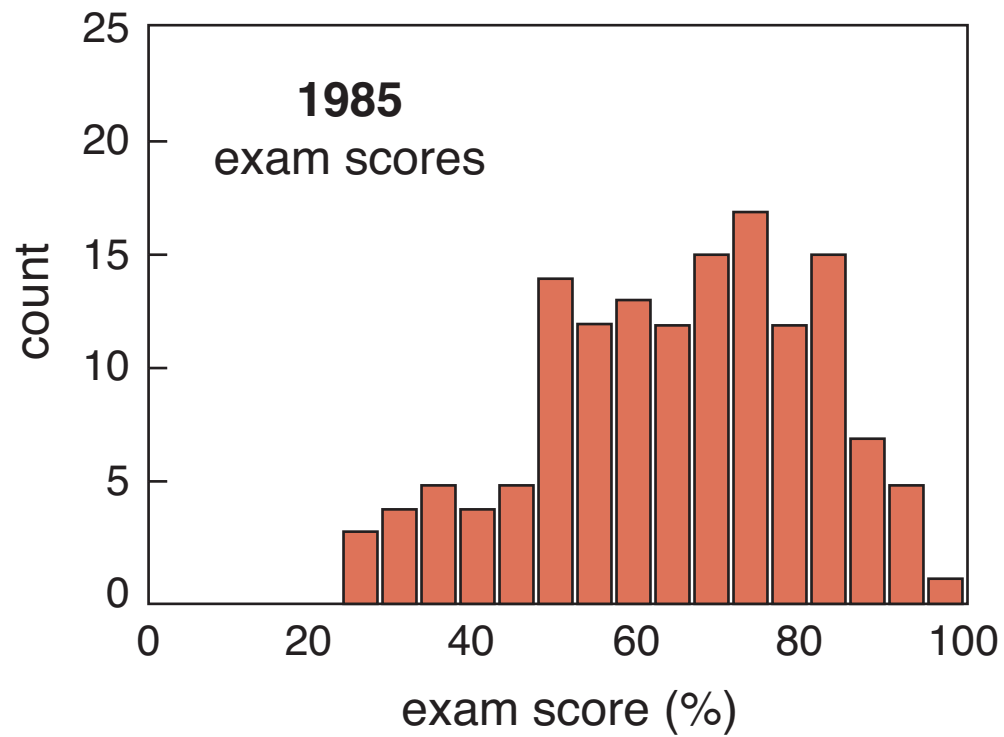


INSTRUCTION

1 education

2 PI

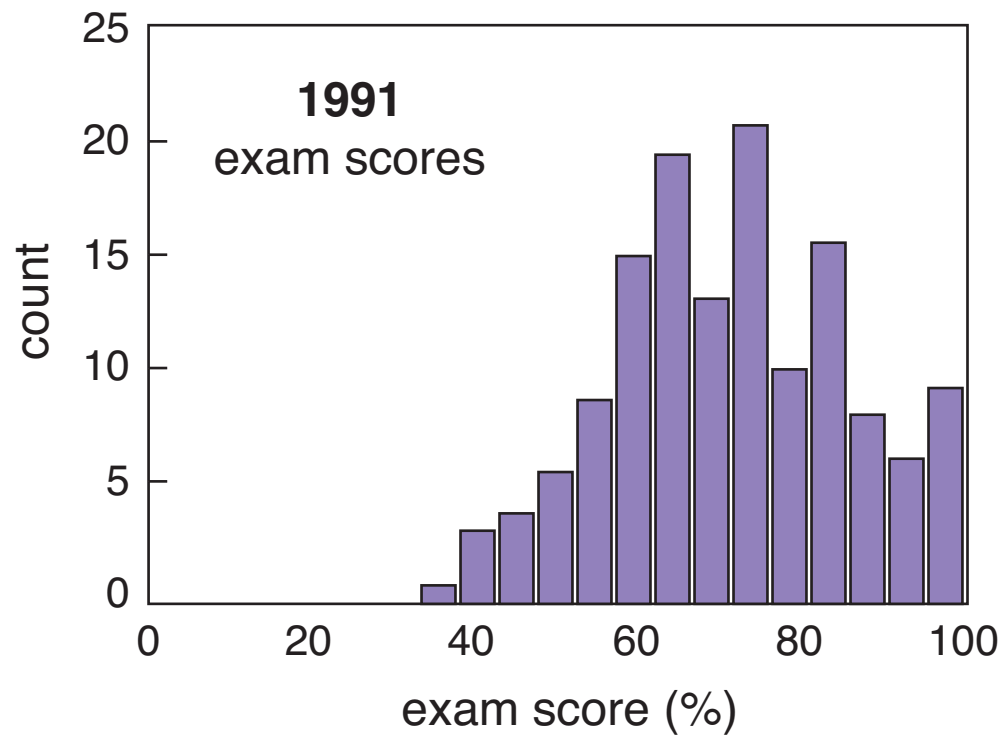
3 test



1 education

2 PI

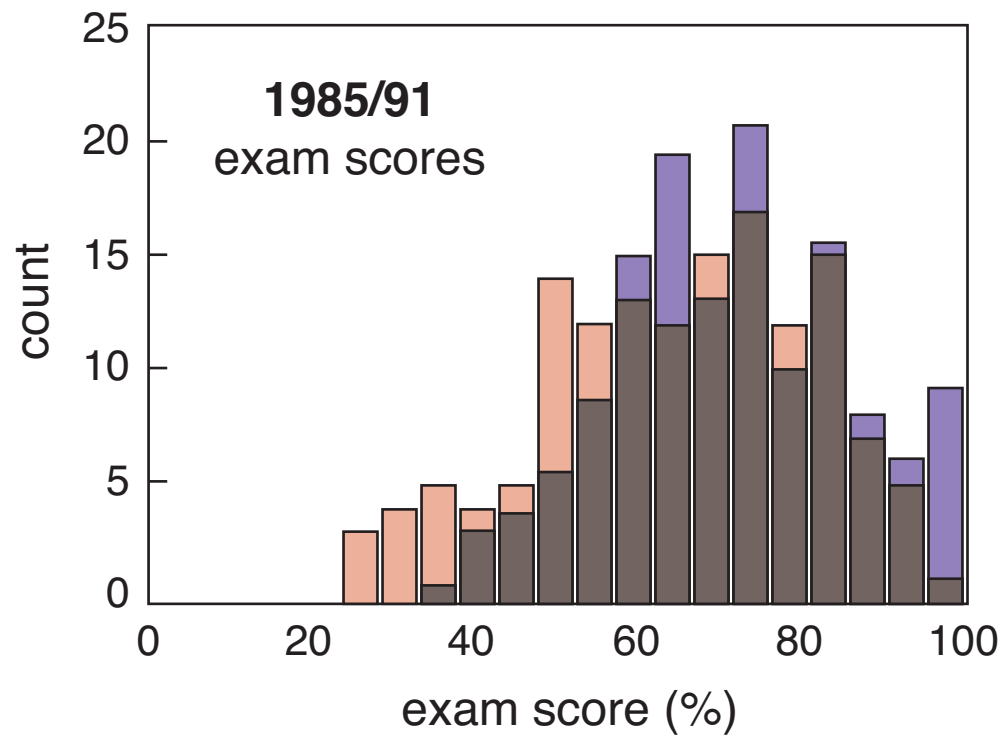
3 test



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!)

1 education

2 PI

3 test



1 education

2 PI

3 test

in a lecture, students...

1 education

2 PI

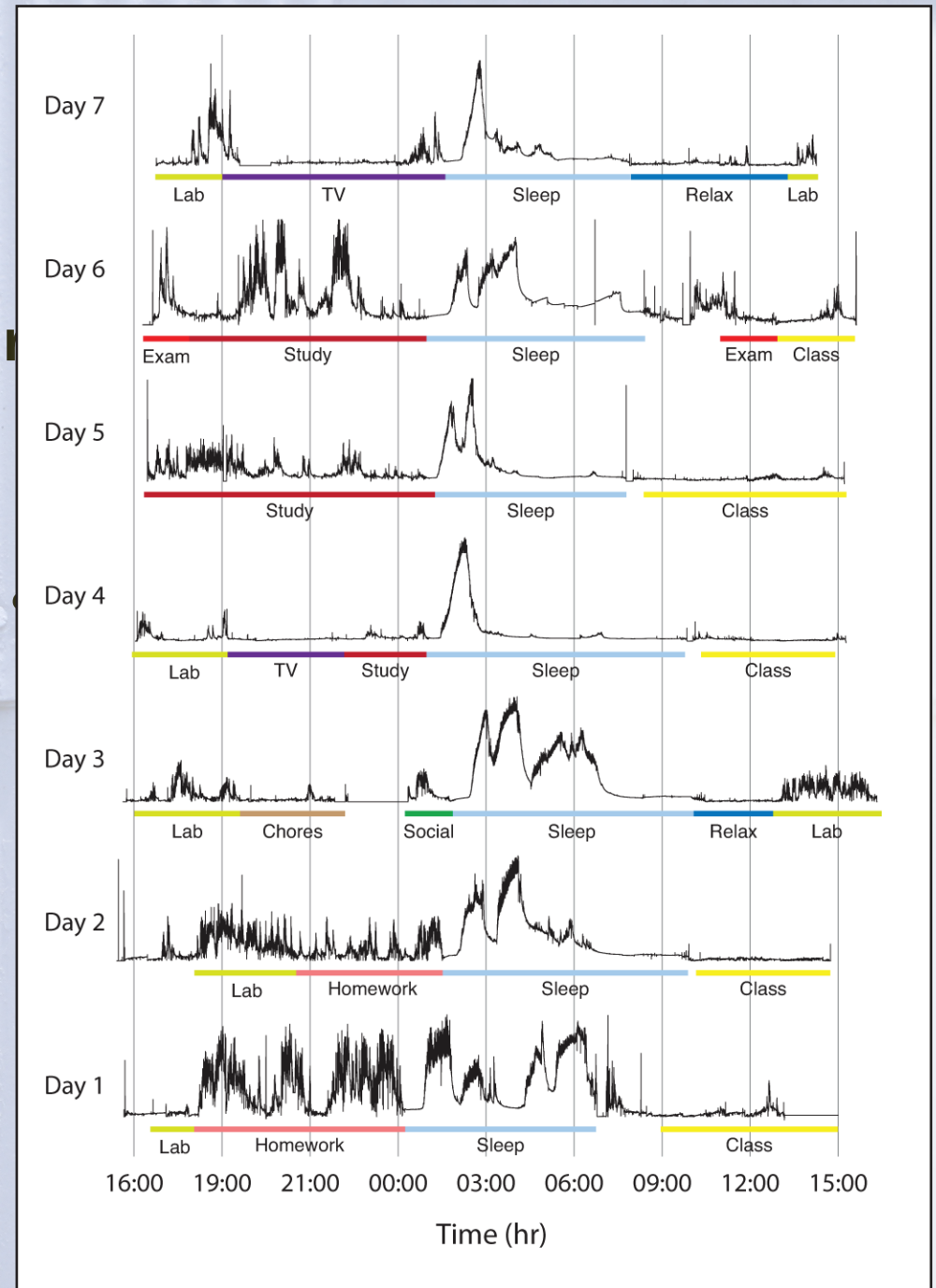
3 test

in a lecture, students...

1. don't pay utmost attention

in a lecture

1. don't pay utmost



doi: 10.1109/TBME.2009.2038487

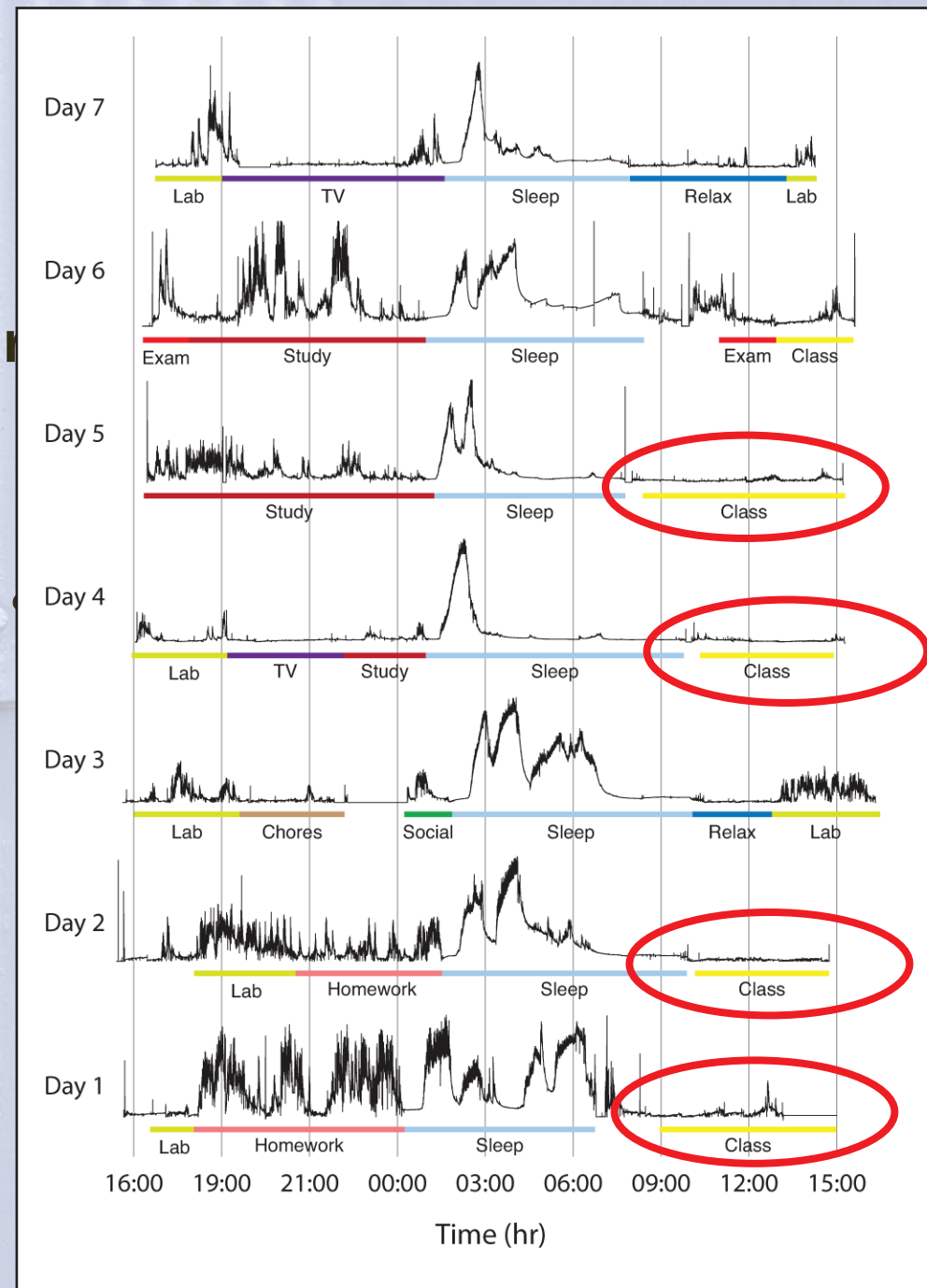
1 education

2 PI

3 test

in a lecture

1. don't pay utmost



doi: 10.1109/TBME.2009.2038487

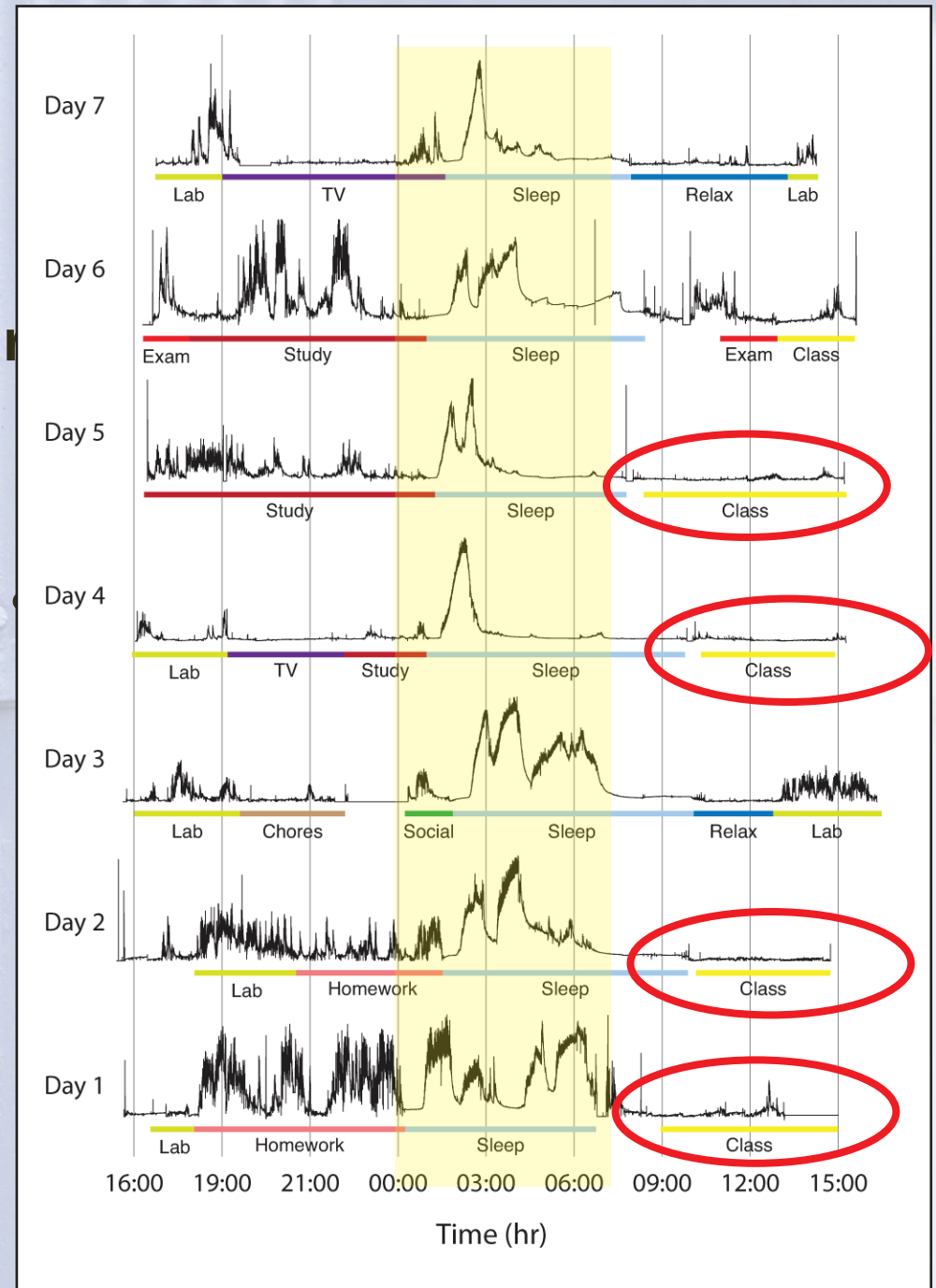
1 education

2 PI

3 test

in a lecture

1. don't pay utmost



doi: 10.1109/TBME.2009.2038487

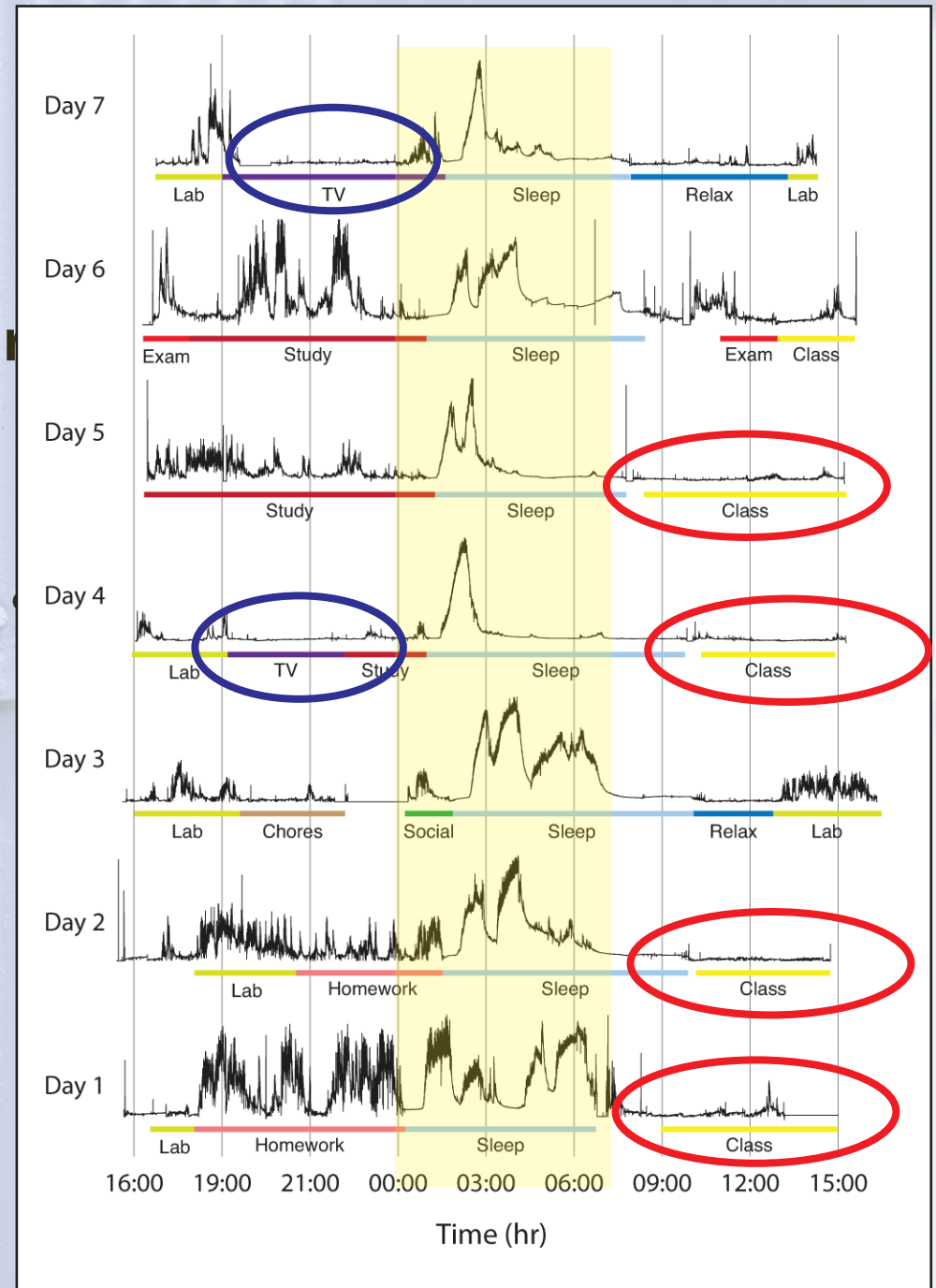
1 education

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

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, with blue and grey tones for the eyes and surrounding features. The painting is set against a background of vertical stripes in yellow and red. 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:

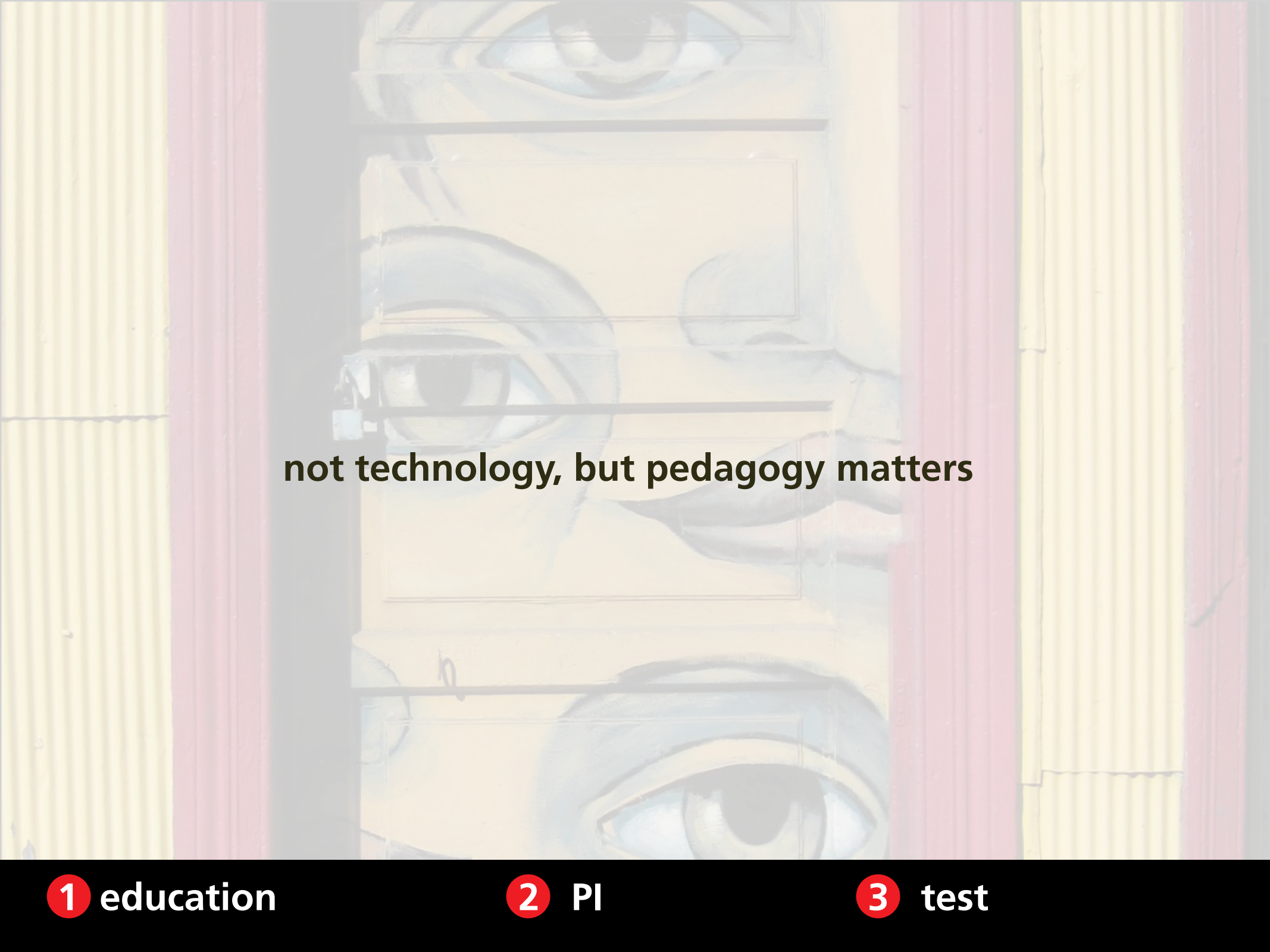
- **transferring information**
- **getting students to do what we do**



Education is not just about:

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

active participation a must!



not technology, but pedagogy matters

1 education

2 PI

3 test

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