

# Interactive teaching, Flipped classrooms and Peer Instruction



Indian Institute of Technology Bombay  
Mumbai, India, 11 November 2013

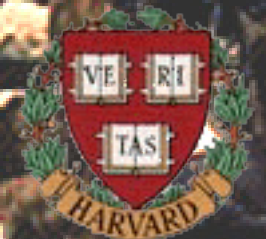


# Interactive teaching, Flipped classrooms and Peer Instruction



**@eric\_mazur**

Indian Institute of Technology Bombay  
Mumbai, India, 11 November 2013





**Think of something you are good at**

**EDUCACION**



**Think of something you are good at**

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

**EDUCACION**











1 education

2 PI



1 education

2 PI

3 test





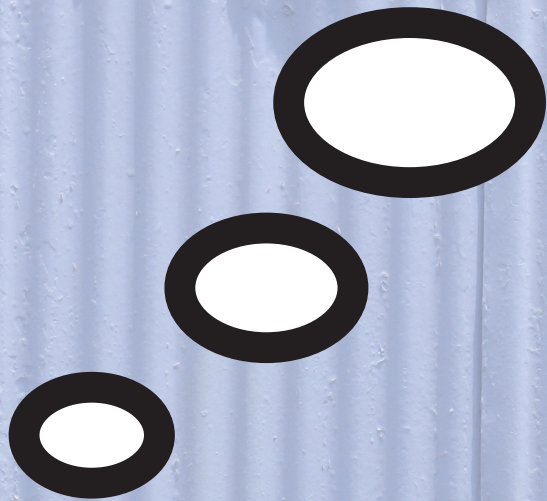
**better pay  
attention!**

**1** education

**2** PI

**3** test

**What happens  
in a lecture?**



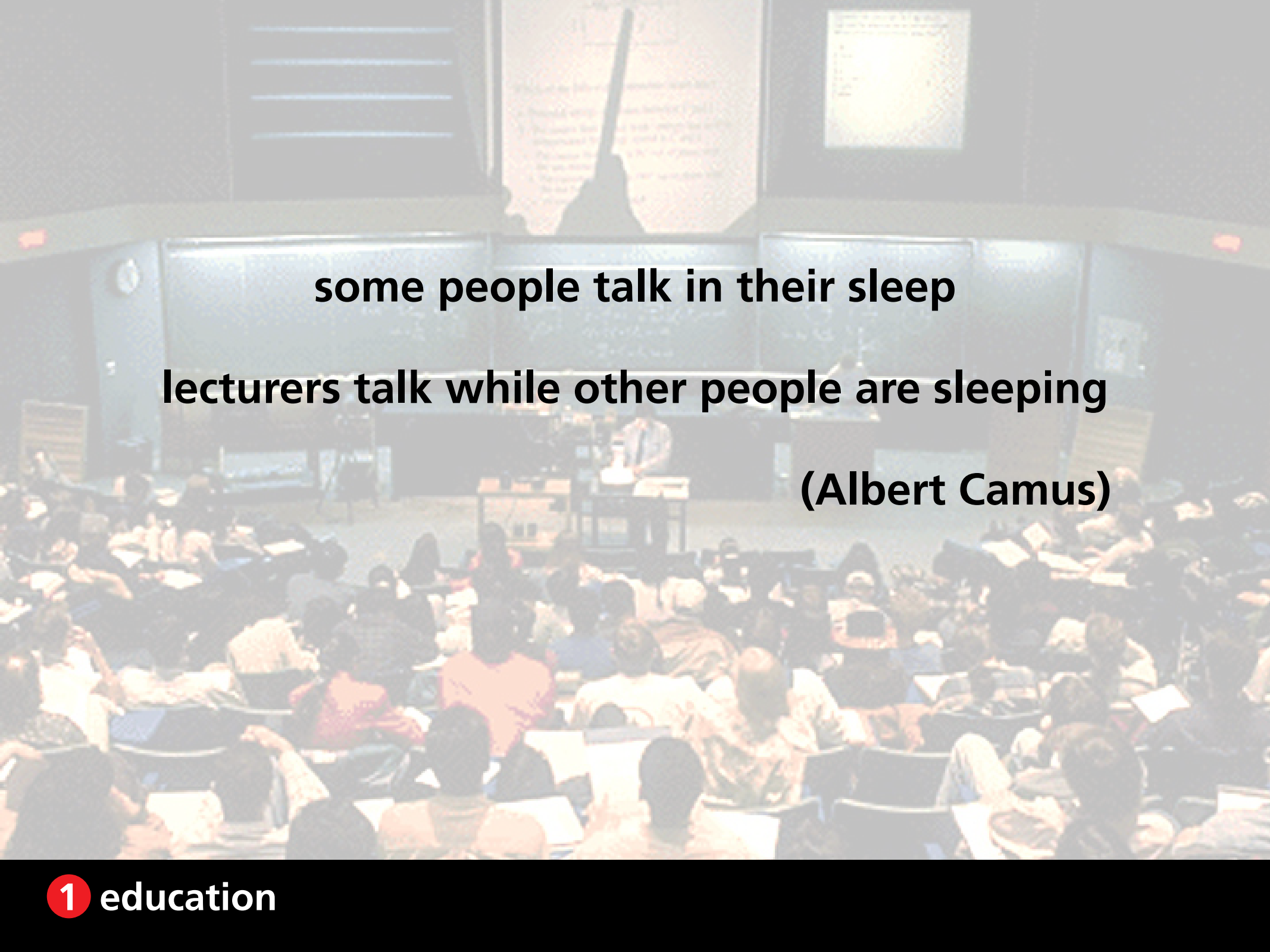






A large lecture hall with a professor at a podium and students in the audience. The professor is standing at a podium on the stage, facing the audience. The audience is seated in rows of chairs, filling the lecture hall. The stage has a large screen behind the professor displaying text. The text on the screen is partially legible and appears to be a list of items or a document. The overall scene is a typical classroom or lecture hall setting.

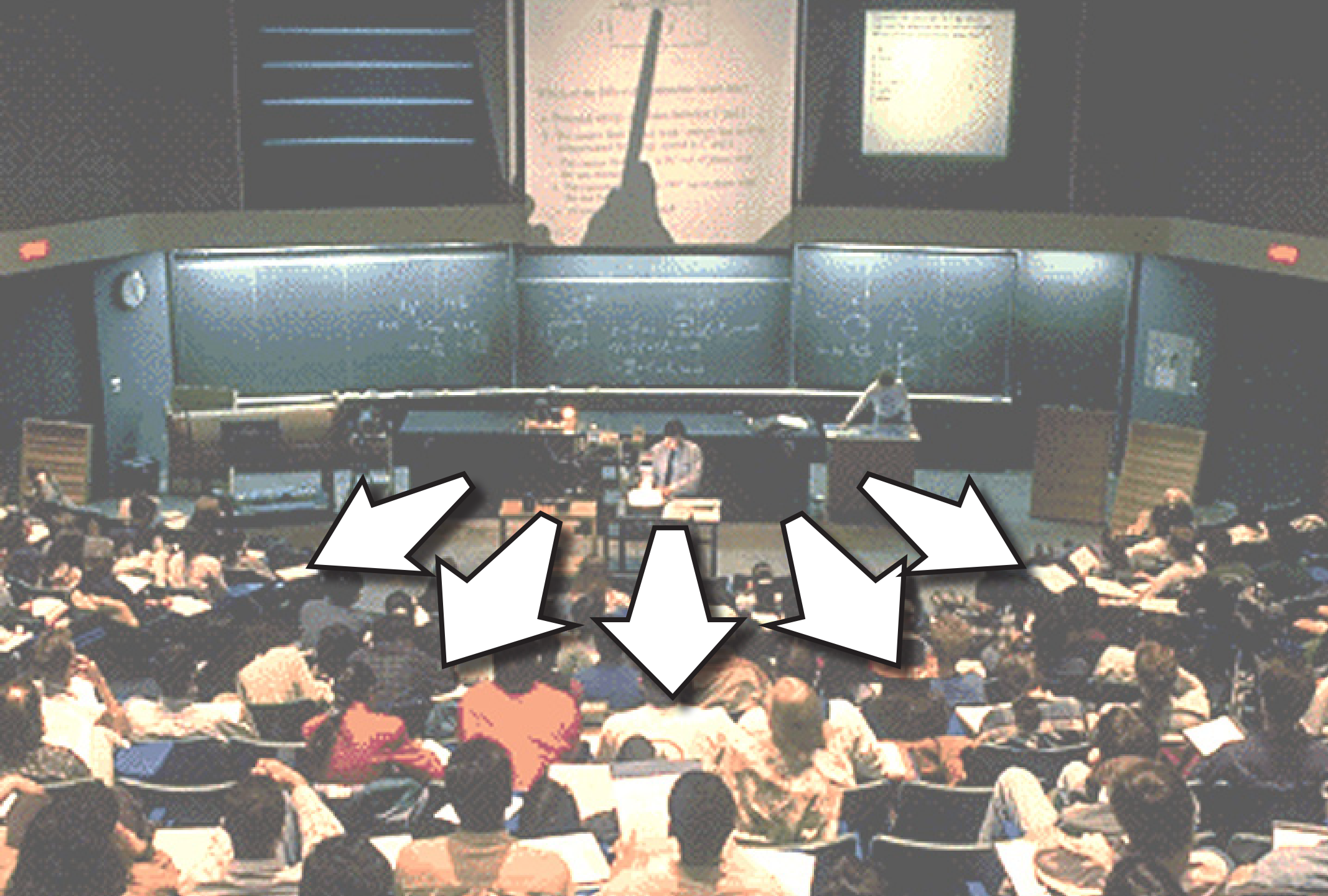
**some people talk in their sleep**

A large lecture hall with a lecturer at a podium and a large audience of students. The room is filled with people, many of whom appear to be sleeping or resting. The lecturer is standing at a podium in the center of the stage, facing the audience. The audience is seated in rows of chairs, filling the foreground and middle ground. The room has a high ceiling and large windows or screens in the background. The overall atmosphere is one of a large-scale educational event.

**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**

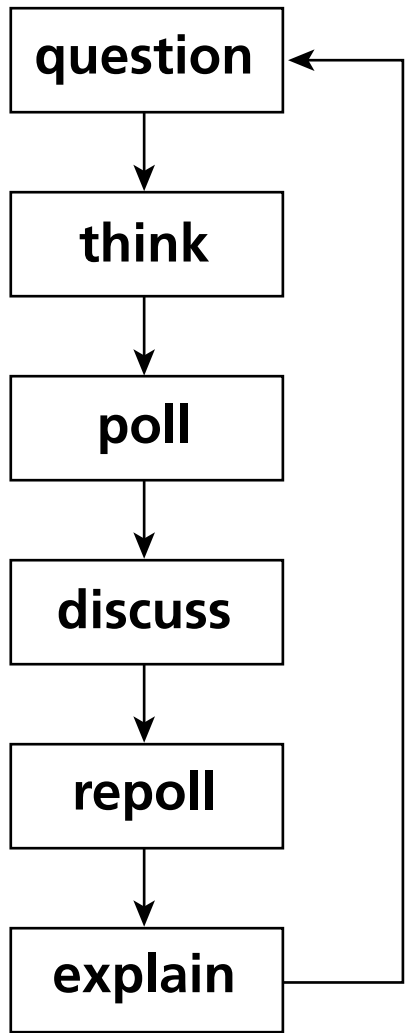


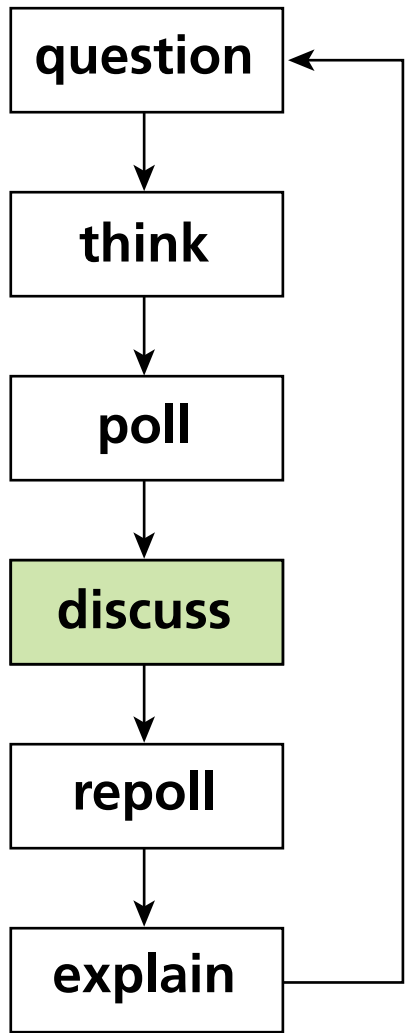
**repoll**



**explain**









**1** education

**2** PI

Let's try it!

QUESTION

think

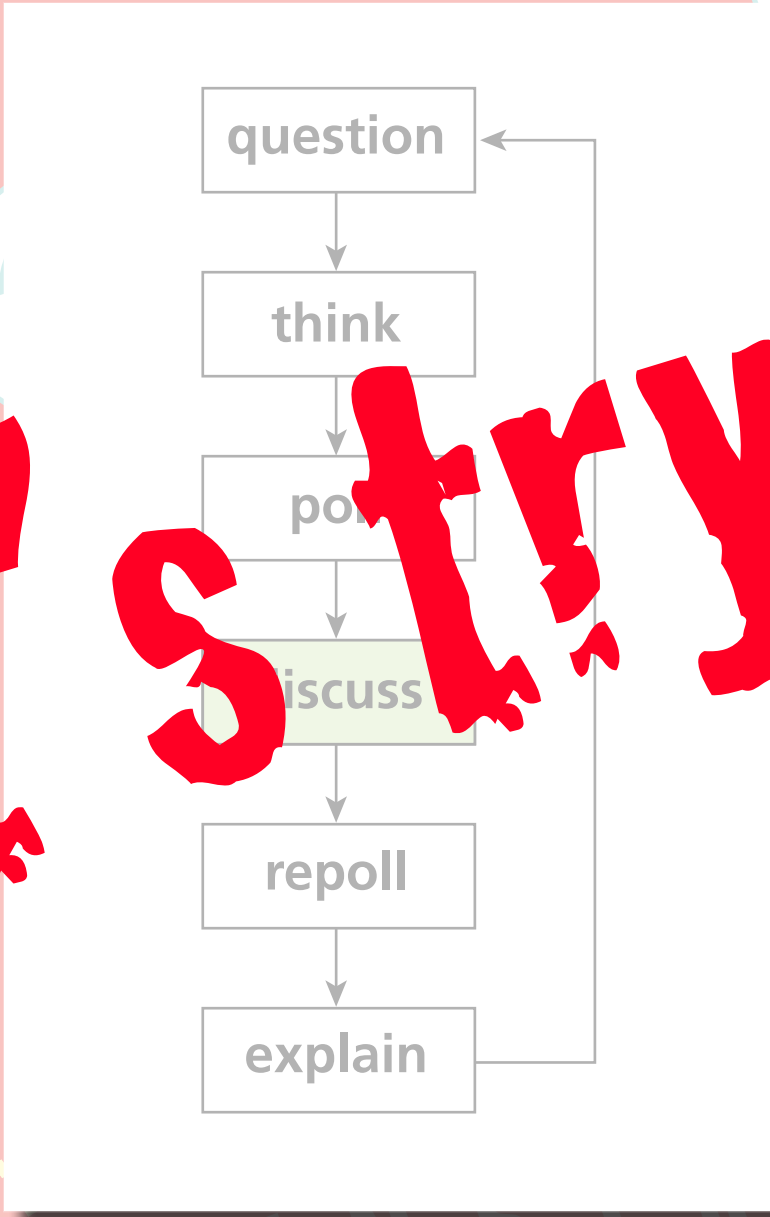
poll

discuss

repoll

explain

ACTION



1 education

2 PI



A photograph of a wavy metal track on a gravel surface. The track is made of a thin, light-colored metal strip that has been bent into a series of connected, rounded curves. A small, rectangular wooden block is placed on the track, positioned between two of the curves. The track is set on a bed of grey gravel, and the background shows a green lawn.

## Archimedes' Principle

**1** education

**2** PI

**3** test

**An object submerged either fully or partially in a fluid experiences an upward buoyant force the magnitude of which is equal to the magnitude of the force of gravity exerted on the fluid displaced by the object.**



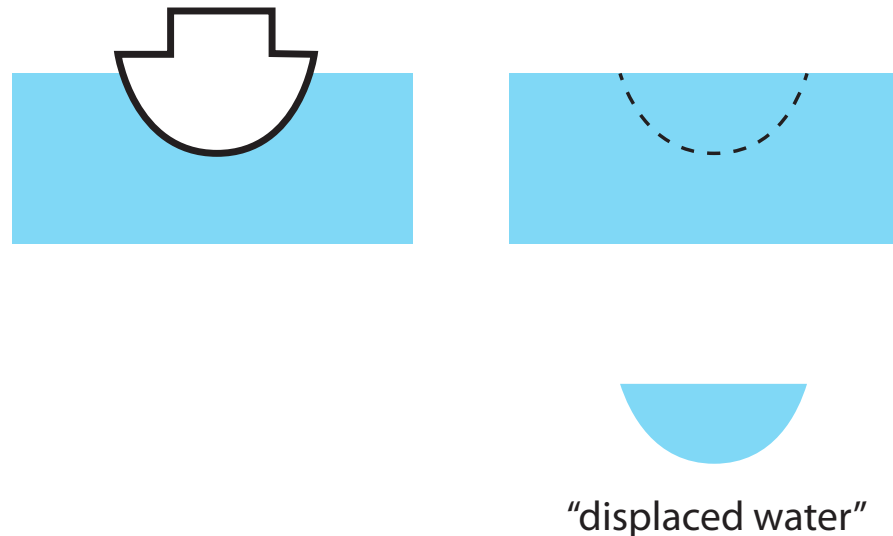
**An object submerged either fully or partially in a fluid experiences an upward buoyant force the magnitude of which is equal to the magnitude of the force of gravity exerted on the fluid displaced by the object. The volume of displaced fluid is equal to the volume of the submerged portion of the object.**

**An object submerged either fully or partially in a fluid experiences an upward buoyant force the magnitude of which is equal to the magnitude of the force of gravity exerted on the fluid displaced by the object. The volume of displaced fluid is equal to the volume of the submerged portion of the object.**

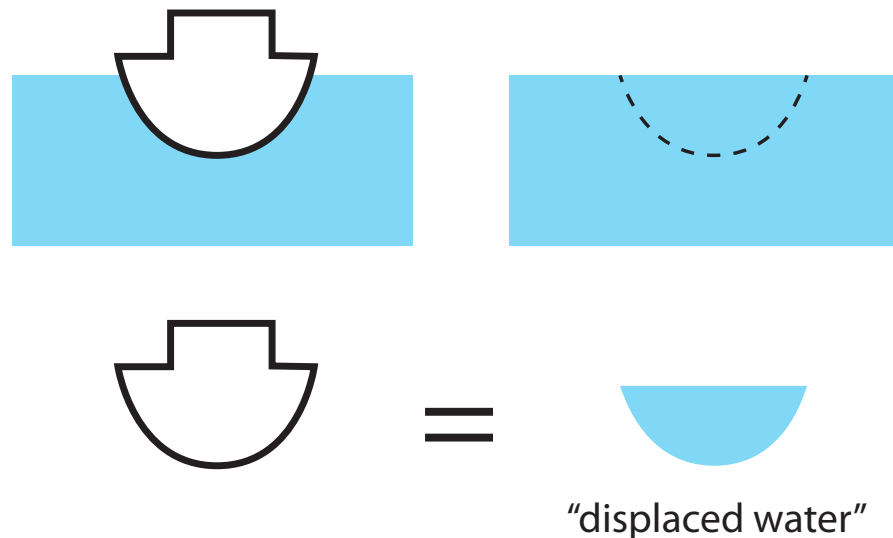




An object submerged either fully or partially in a fluid experiences an upward buoyant force the magnitude of which is equal to the magnitude of the force of gravity exerted on the fluid displaced by the object. The volume of displaced fluid is equal to the volume of the submerged portion of the object.

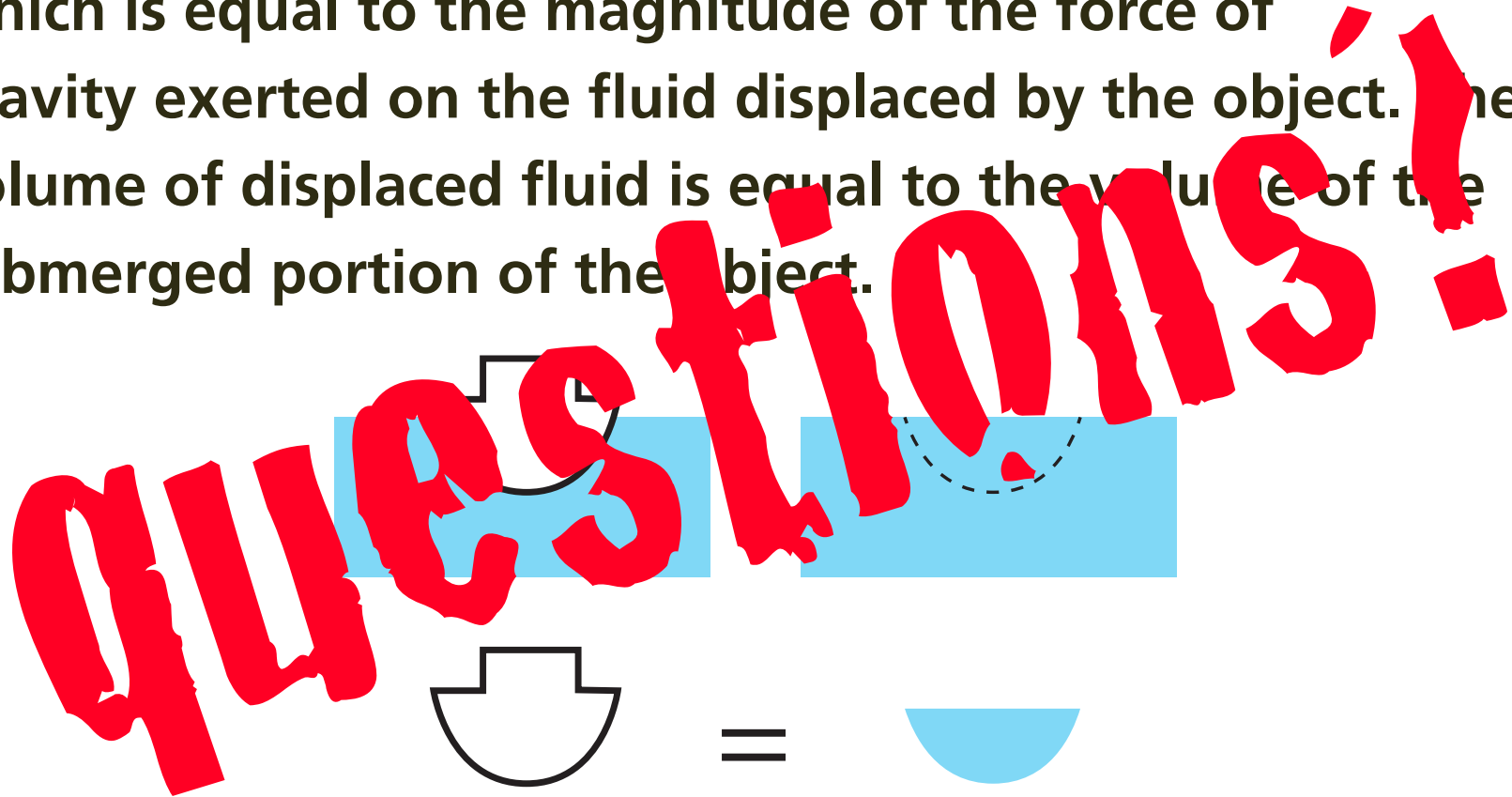


An object submerged either fully or partially in a fluid experiences an upward buoyant force the magnitude of which is equal to the magnitude of the force of gravity exerted on the fluid displaced by the object. The volume of displaced fluid is equal to the volume of the submerged portion of the object.



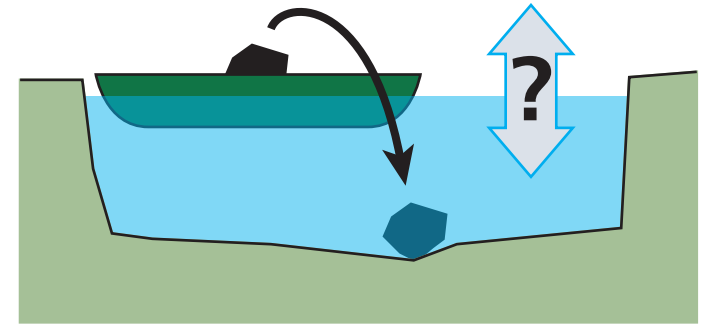


An object submerged either fully or partially in a fluid experiences an upward buoyant force the magnitude of which is equal to the magnitude of the force of gravity exerted on the fluid displaced by the object. The volume of displaced fluid is equal to the volume of the submerged portion of the object.



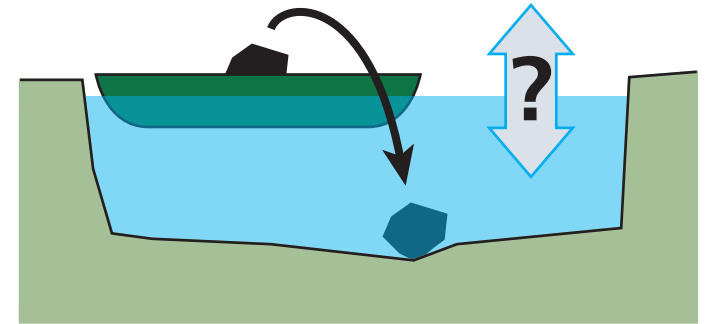
"displaced water"

A boat carrying a large boulder is floating on a small pond. The boulder is thrown overboard and sinks to the bottom of the pond.





A boat carrying a large boulder is floating on a small pond. The boulder is thrown overboard and sinks to the bottom of the pond.

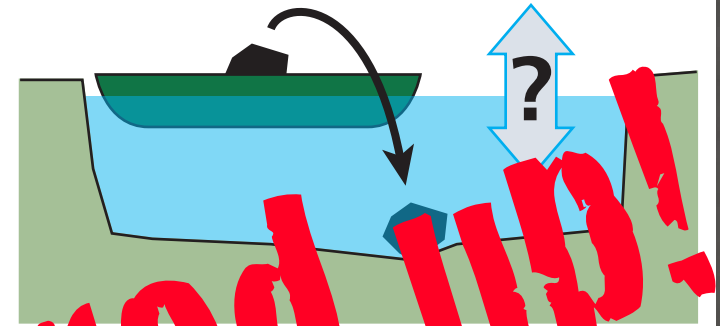


After the boulder sinks to the bottom of the pond, the level of the water in the pond is

1. higher than
2. the same as
3. lower than

it was when the boulder was in the boat.

A boat carrying a large boulder is floating on a small pond. The boulder is thrown overboard and sinks to the bottom of the pond.



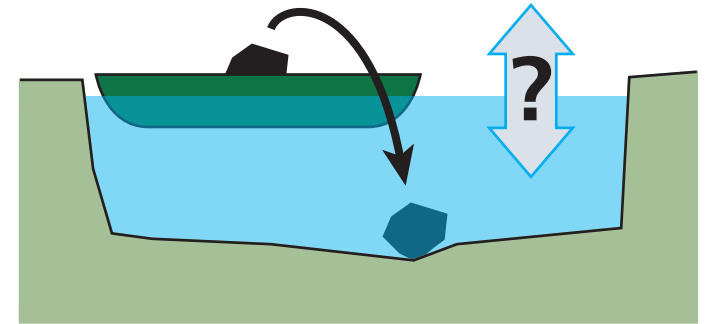
After the boulder sinks to the bottom of the pond, the level of the water in the pond is

1. higher than
2. the same as
3. lower than

it was when the boulder was in the boat.



A boat carrying a large boulder is floating on a small pond. The boulder is thrown overboard and sinks to the bottom of the pond.



After the boulder sinks to the bottom of the pond, the level of the water in the pond is

1. higher than
2. the same as
3. lower than

it was when the boulder was in the boat.

**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...**

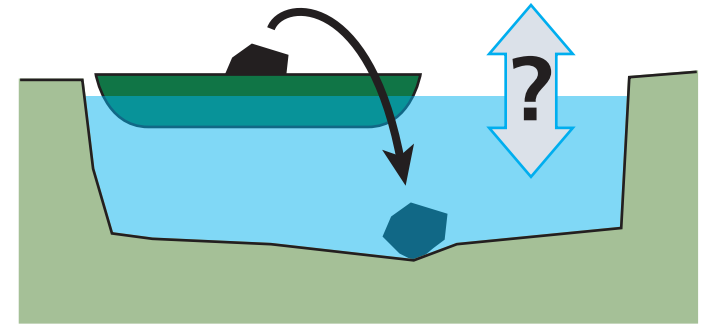
- 1. made a commitment**
- 2. externalized your answer**
- 3. moved from the answer/fact to reasoning**

**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**

A boat carrying a large boulder is floating on a small pond. The boulder is thrown overboard and sinks to the bottom of the pond.



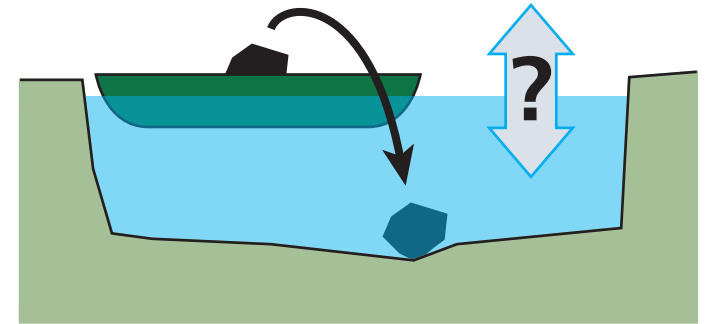
After the boulder sinks to the bottom of the pond, the level of the water in the pond is

1. higher than
2. the same as
3. lower than

it was when the boulder was in the boat.



A boat carrying a large boulder is floating on a small pond. The boulder is thrown overboard and sinks to the bottom of the pond.



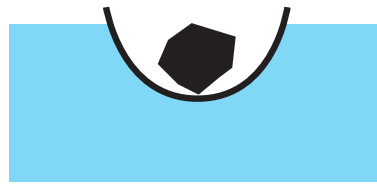
After the boulder sinks to the bottom of the pond, the level of the water in the pond is

1. higher than
2. the same as
3. lower than ✓

it was when the boulder was in the boat.

**remember: amount of displaced water**

remember: amount of displaced water

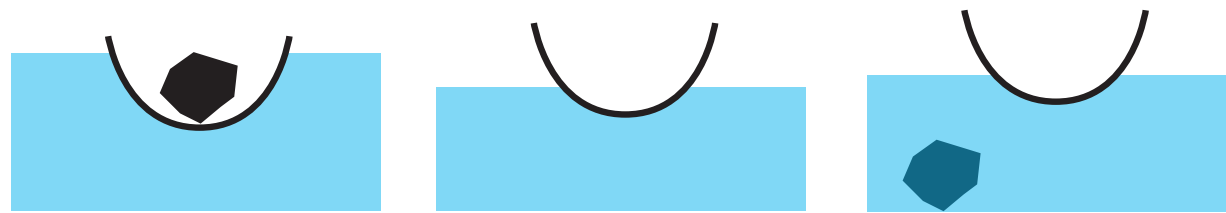




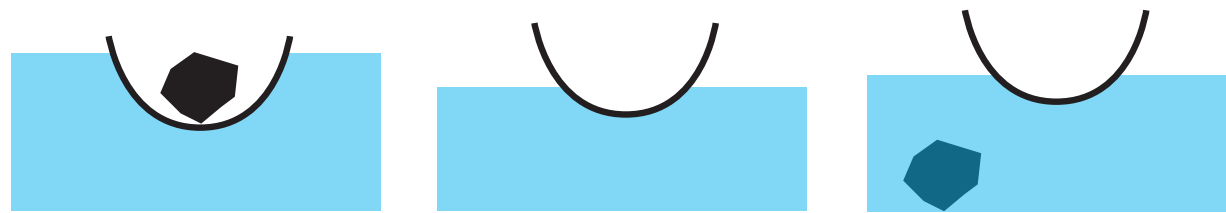
remember: amount of displaced water



remember: amount of displaced water



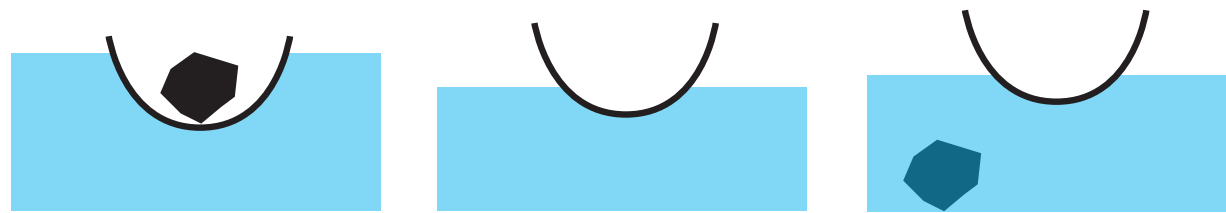
remember: amount of displaced water



displaced  
water

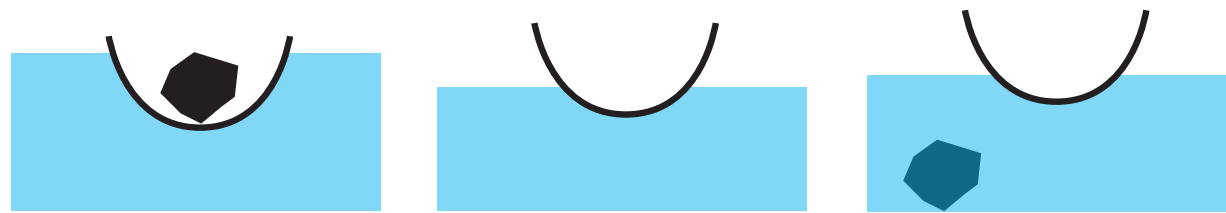


remember: amount of displaced water



displaced  
water  = weight  
of rock

remember: amount of displaced water



displaced  
water



= weight  
of rock



= volume  
of rock

remember: amount of displaced water

**you won't forget this**



displaced  
water



= weight  
of rock



= volume  
of rock



Peer

back to pi

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





**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

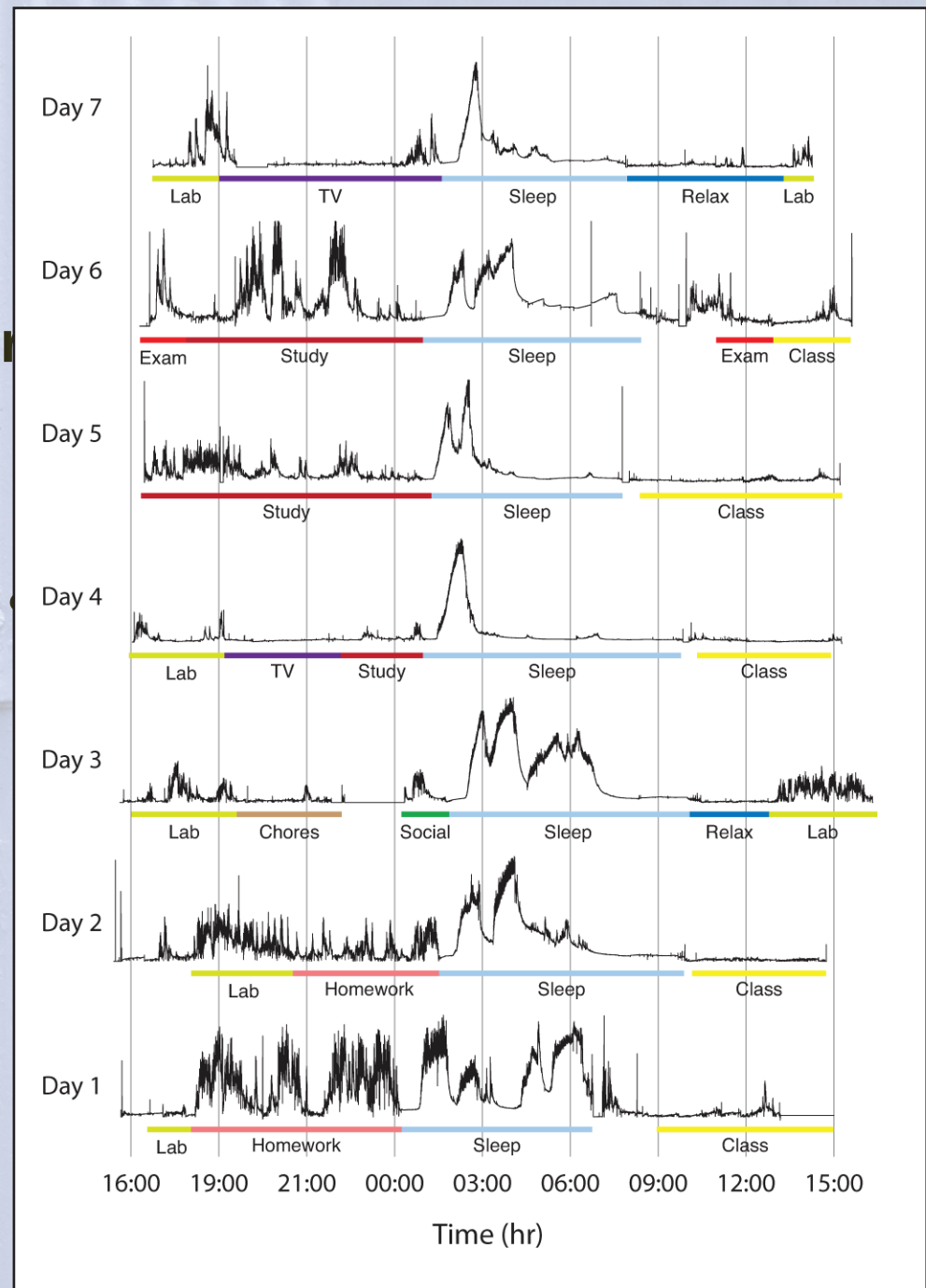
**2** PI

**3** test



in a lecture

1. don't pay utmost



doi: 10.1109/TBME.2009.2038487

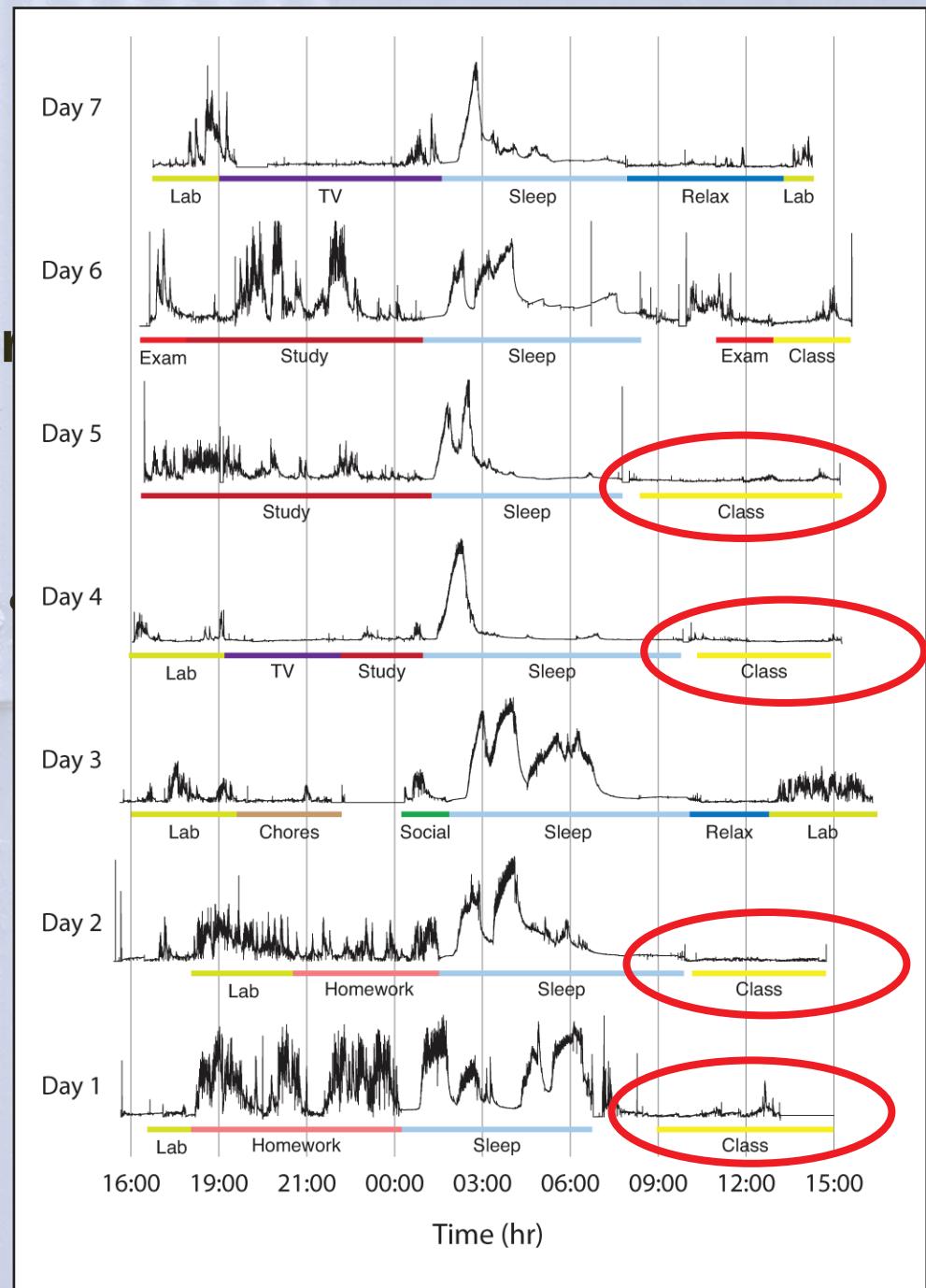
1 education

2 PI

3 test

in a lecture

1. don't pay utmost



doi: 10.1109/TBME.2009.2038487

1 education

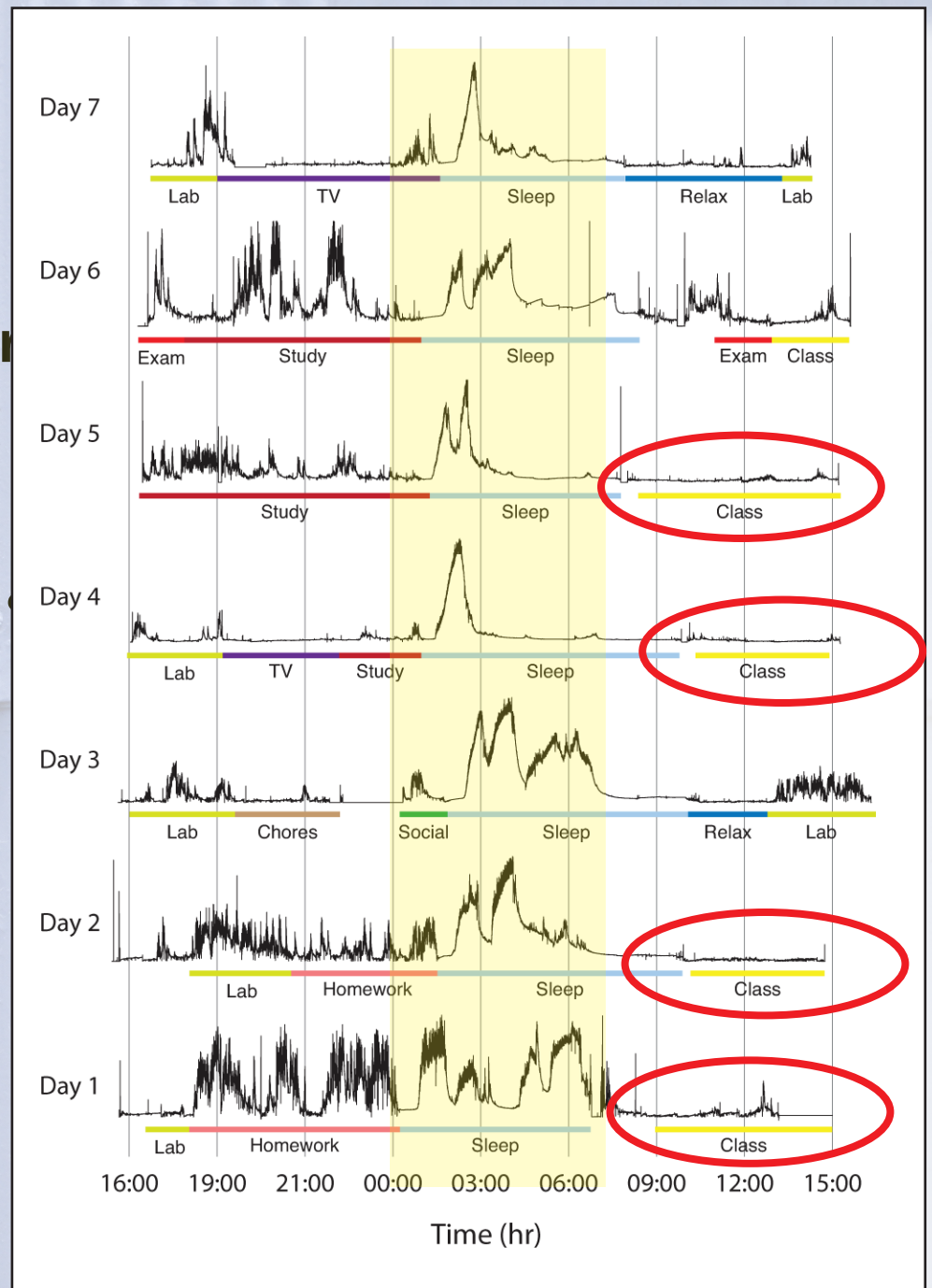
2 PI

3 test



in a lecture

1. don't pay utmost



doi: 10.1109/TBME.2009.2038487

1 education

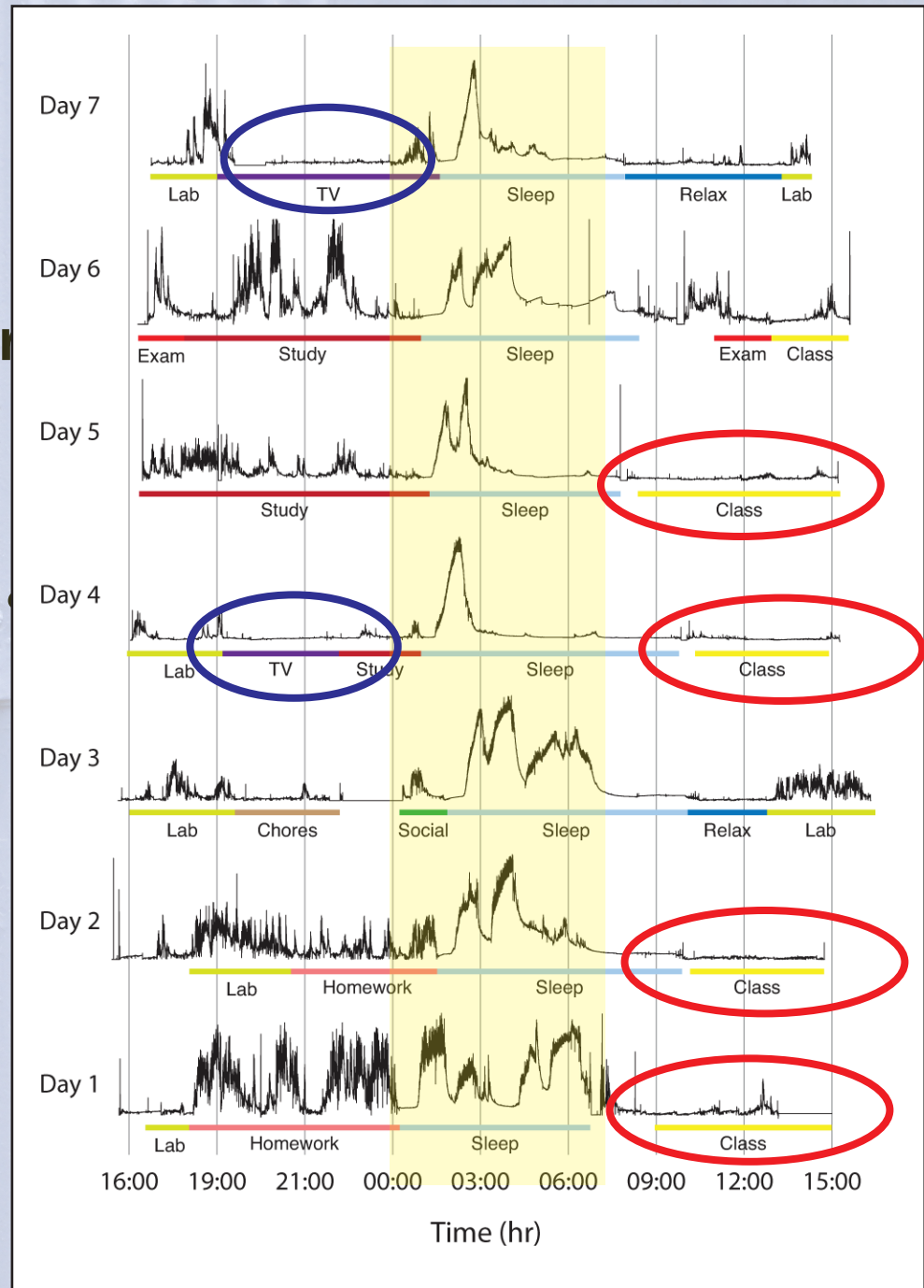
2 PI

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**





<http://www.babble.com>

**1** education

**2** PI

**3** test



A close-up photograph of a calico cat's face, showing its green eyes and orange, white, and black fur. The image is slightly faded to allow text to be overlaid.

## 2 short video lectures on calico cats, same content

doi: [10.3758/s13423-013-0442-z](https://doi.org/10.3758/s13423-013-0442-z)

**1** education

**2** PI

**3** test

**2 short video lectures on calico cats, same content**

**fluent video**



**speaks fluidly w/o notes**

**upright**

**maintains eye contact**

doi: 10.3758/s13423-013-0442-z

**1 education**

**2 PI**

**3 test**



## 2 short video lectures on calico cats, same content

**fluent video**



**speaks fluidly w/o notes  
upright  
maintains eye contact**

**disfluent video**

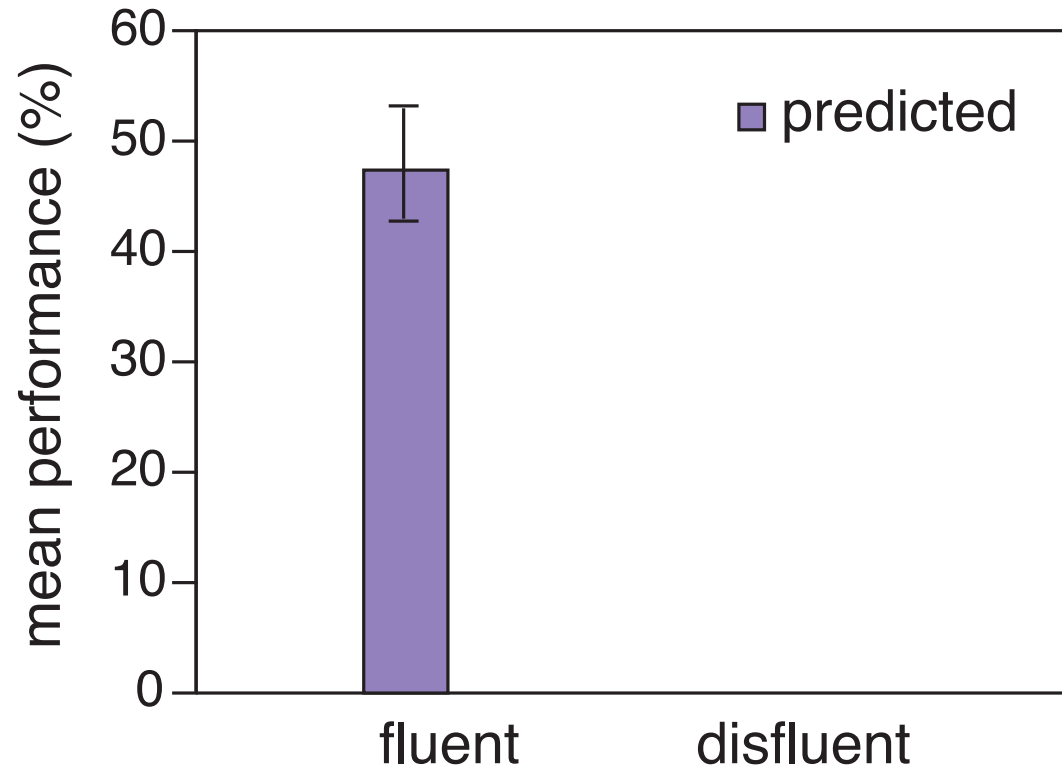


**speaks haltingly from notes  
slumped  
looks away**

doi: 10.3758/s13423-013-0442-z

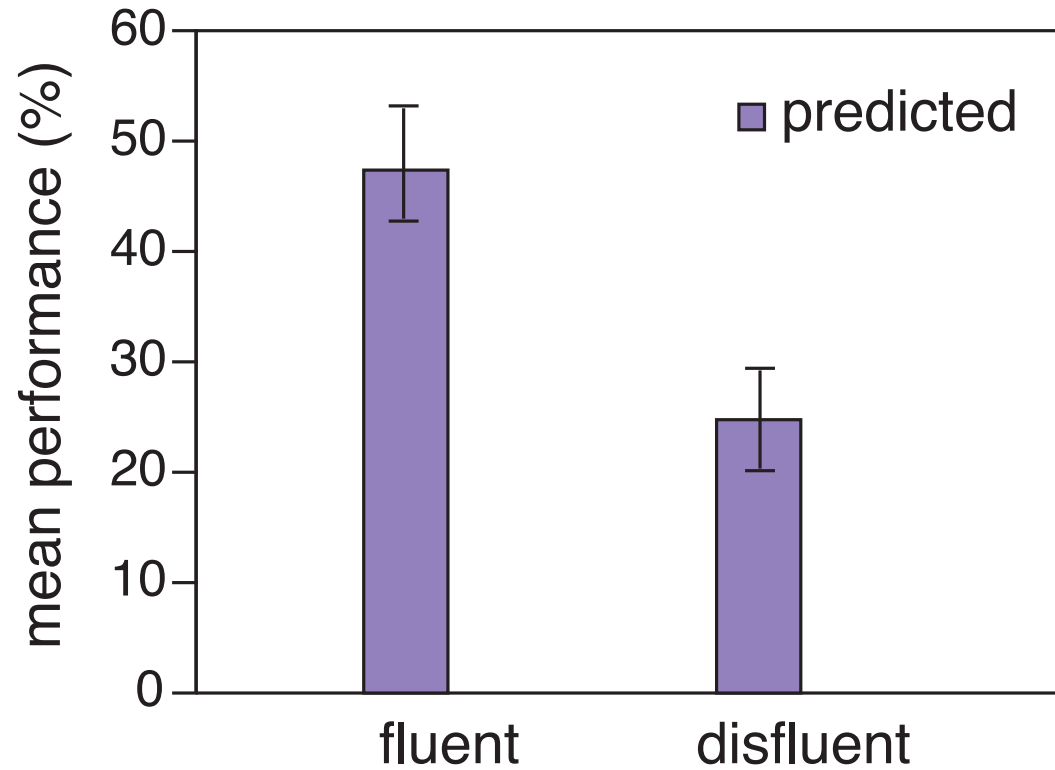


## judgement of learning



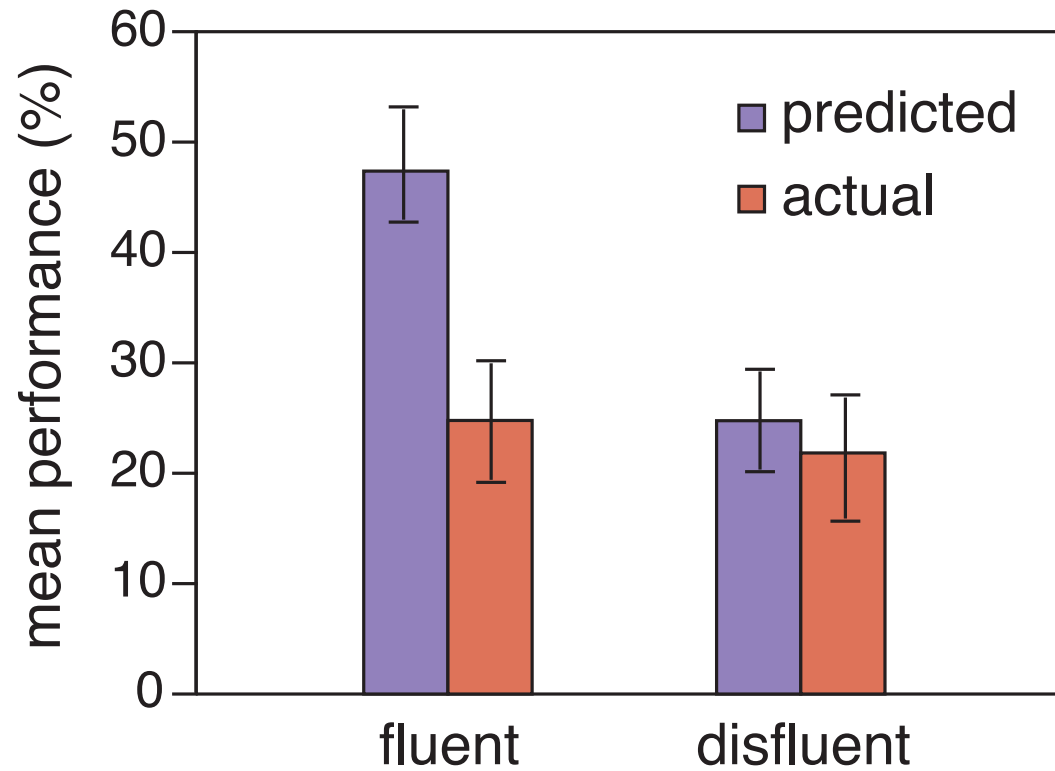
doi: 10.3758/s13423-013-0442-z

## judgement of learning



doi: 10.3758/s13423-013-0442-z

## judgement of learning



doi: 10.3758/s13423-013-0442-z



**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 of the slide is a painting of a face with three eyes, rendered in a style reminiscent of a classical portrait. The face is pale and has a serene expression. The eyes are arranged vertically, with the top and bottom eyes looking forward and the middle eye looking slightly to the right. The painting is overlaid on a background of vertical blinds, which are partially open, allowing light to filter through. The blinds are a light yellow color, and the frame around them is a reddish-brown color. The overall mood is mysterious and contemplative.

**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**

**Funding:**

**National Science Foundation**

**for a copy of this presentation:**

**mazur.harvard.edu**

**Follow me!**



**eric\_mazur**

Google™

Google Search

I'm Feeling Lucky



Google™

mazur

Google Search

I'm Feeling Lucky

Google™

mazur

Google Search

I'm Feeling Lucky

# Google™

Google Search

I'm Feeling Lucky



**Funding:**

**National Science Foundation**

**for a copy of this presentation:**

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

**Follow me!**



**[eric\\_mazur](https://twitter.com/eric_mazur)**