Peer Instruction

Peer Instruction Workshop
Hochschule Karlsruhe
Karlsruhe, Germany, 31 May 2013

Peer Instruction

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Karlsruhe, Germany, 31 May 2013

- no ON/OFF button
- only last “click” counts
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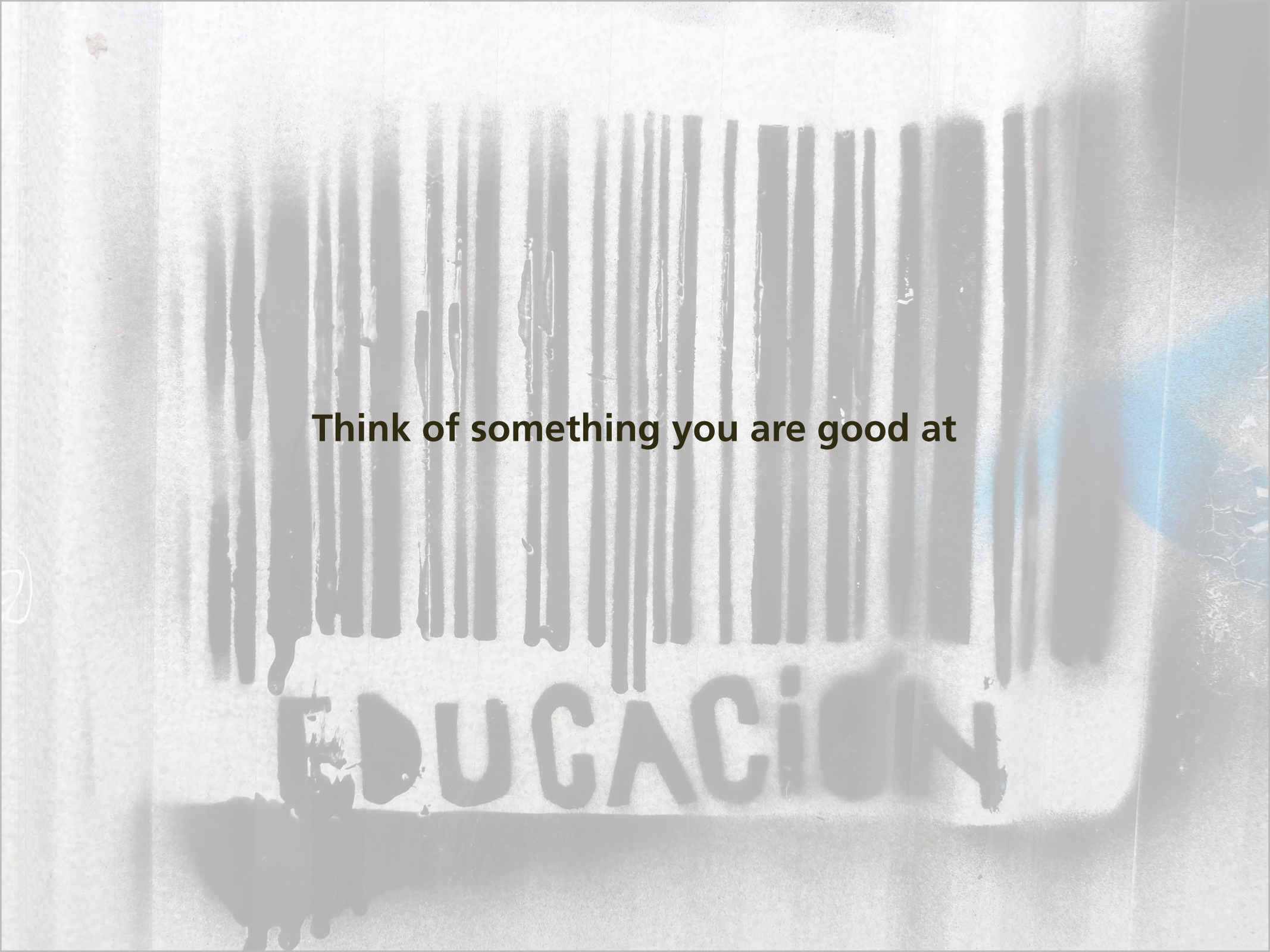
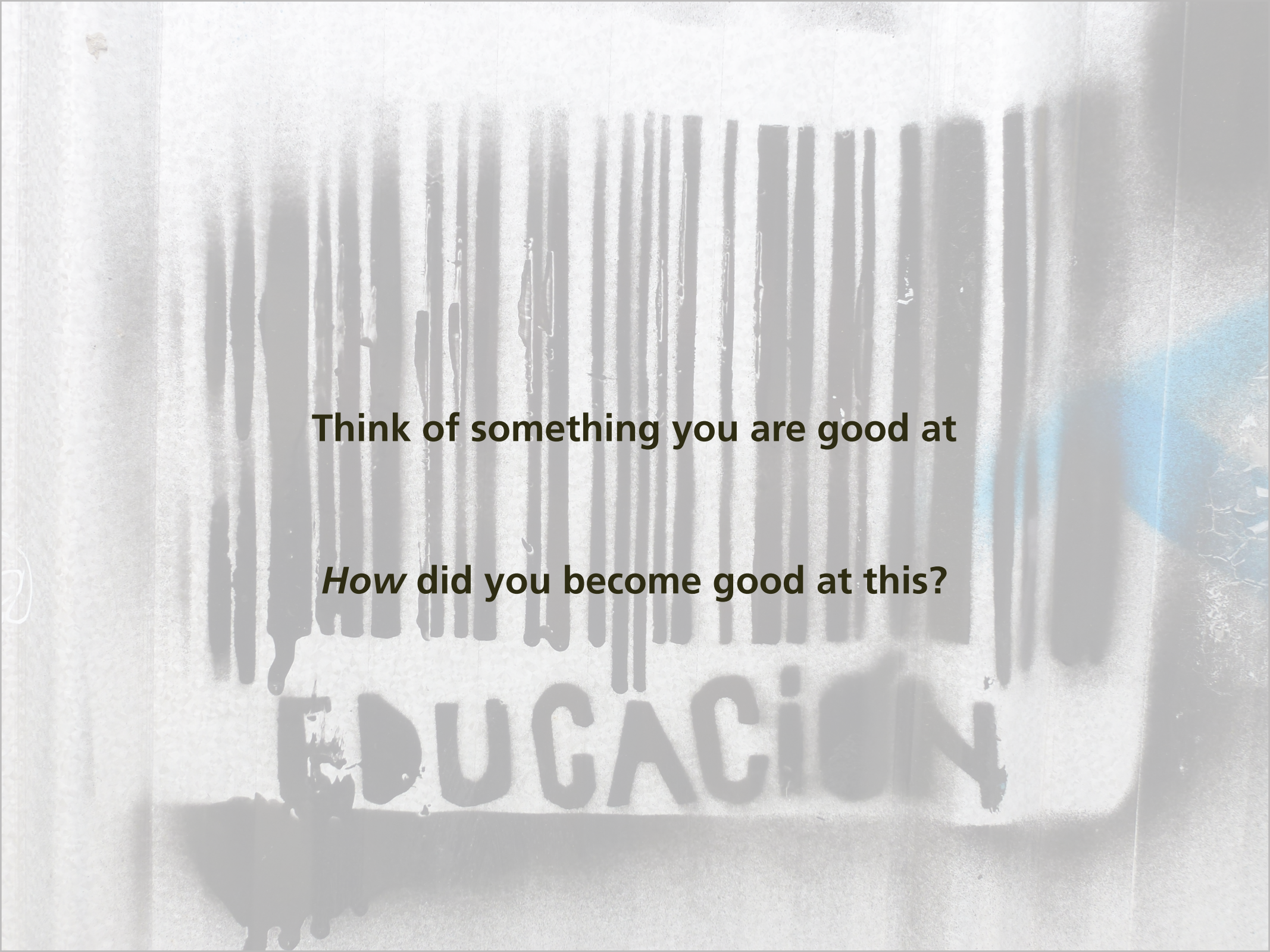

Think of something you are good at
EDUCACION



Think of something you are good at

How did you become good at this?

Became good at it by:

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

1 education

1 education

2 PI

1 education

2 PI

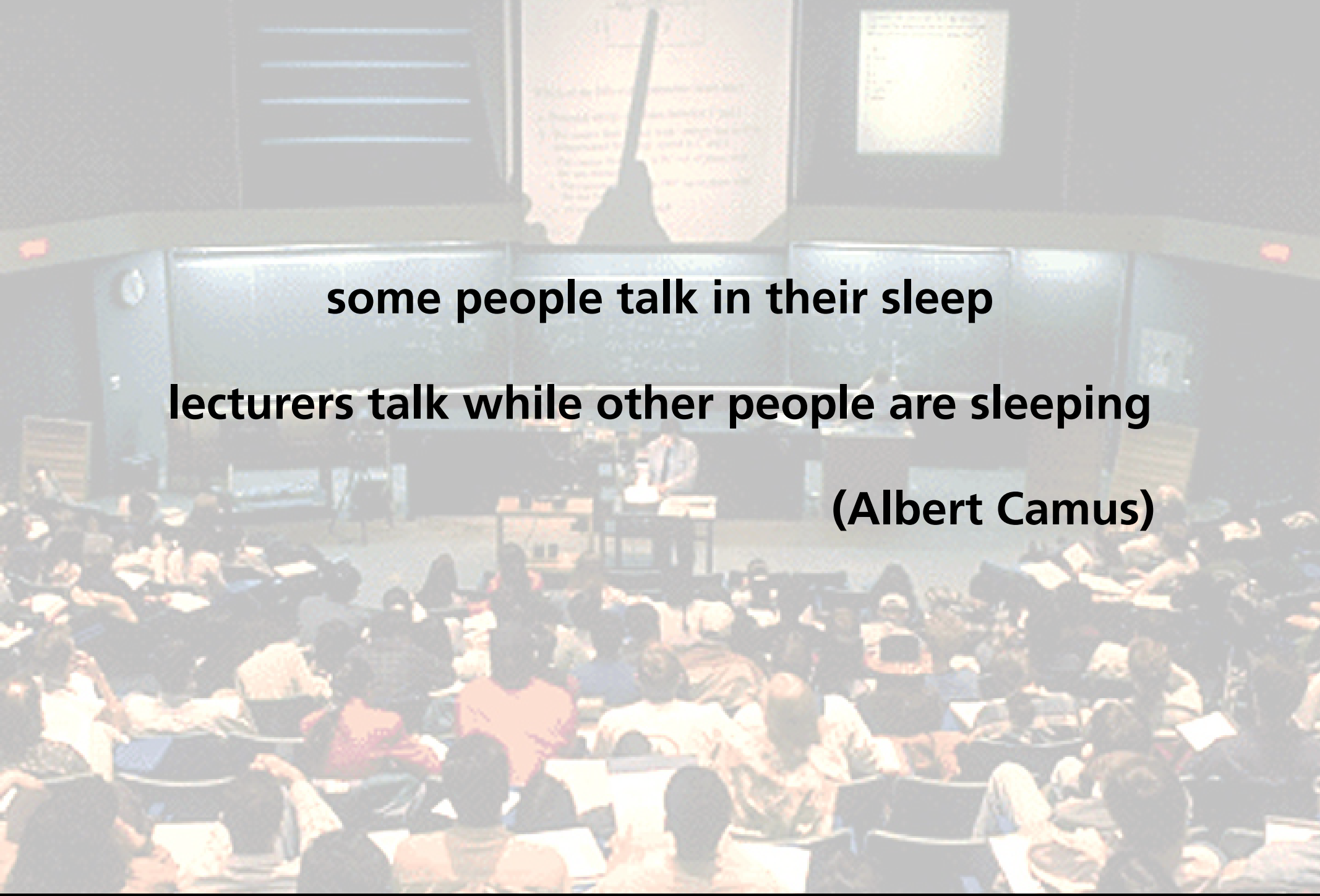
3 test

1 education 2 PI 3 test

What happens
in a lecture?

1 education

1 education

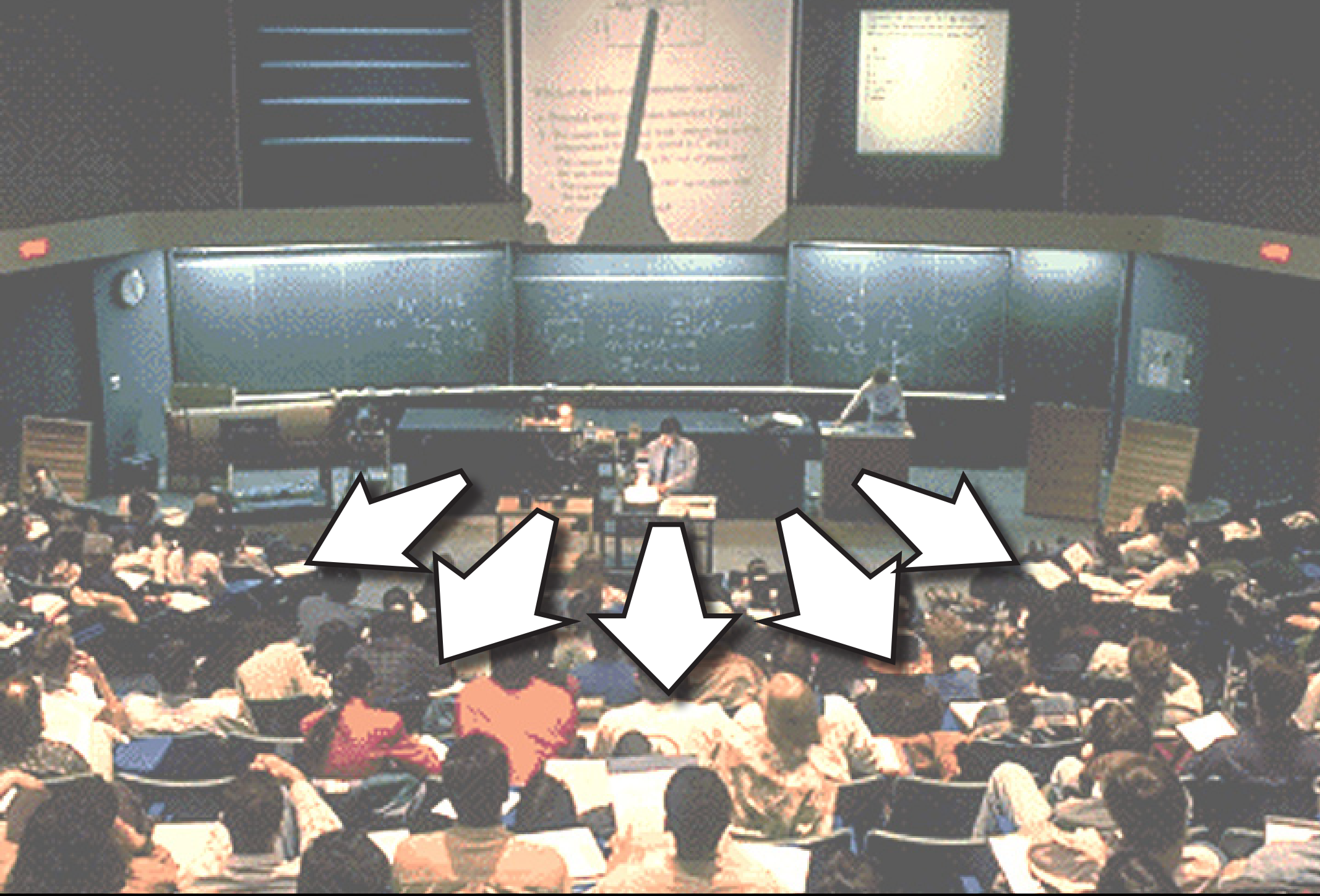


some people talk in their sleep

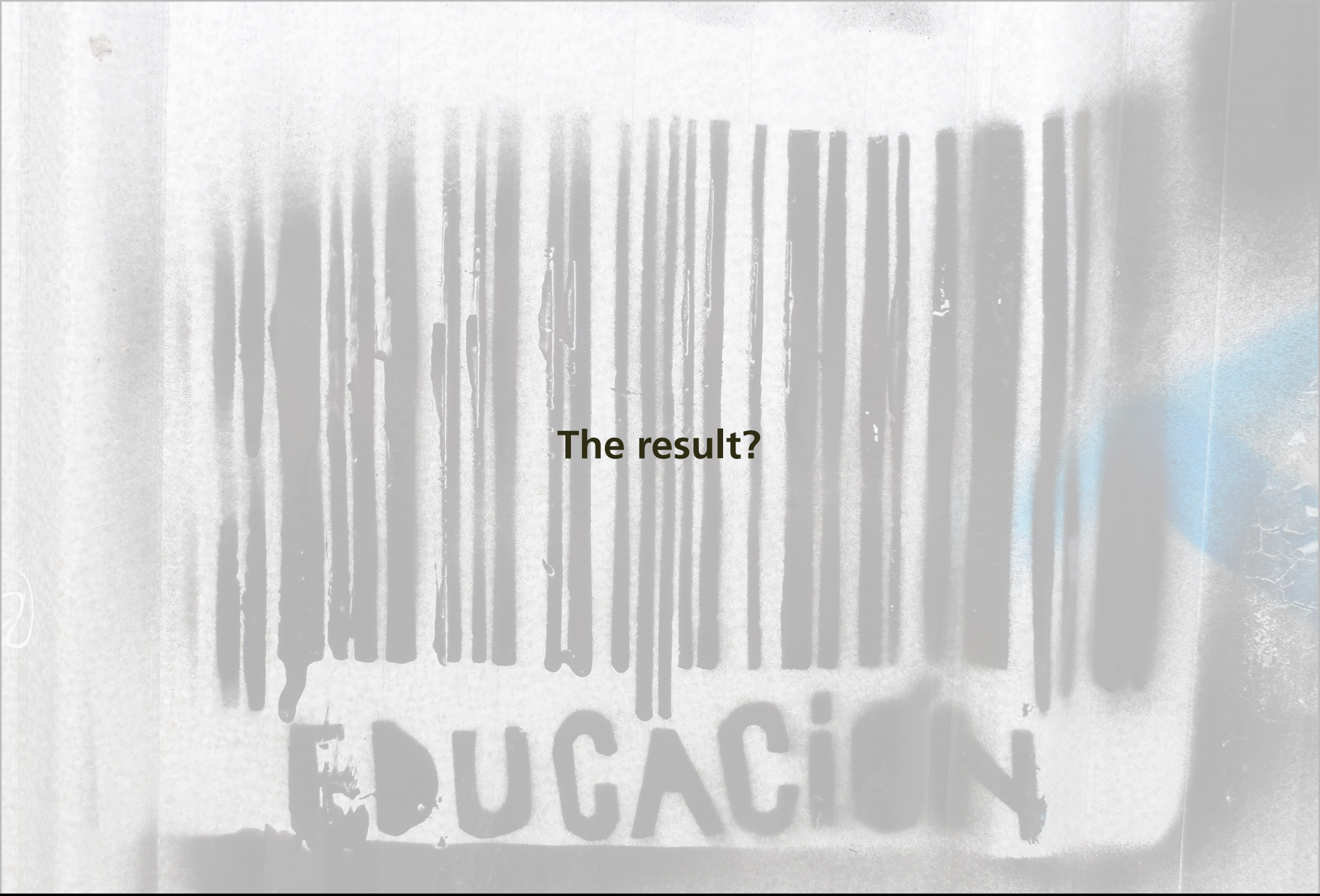
lecturers talk while other people are sleeping

(Albert Camus)

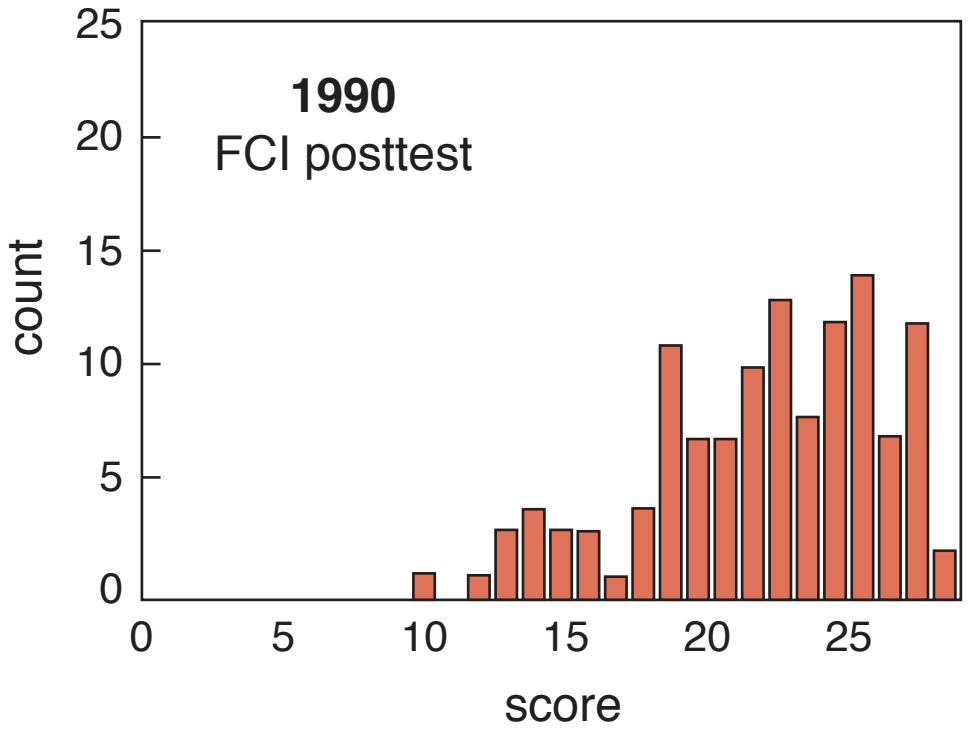
1 education



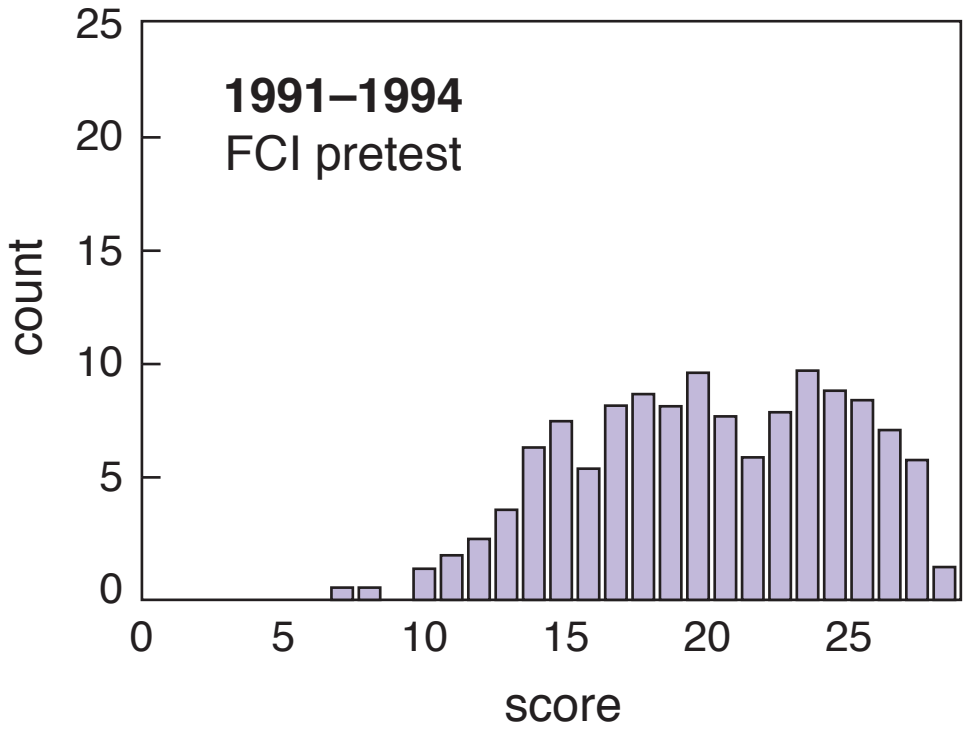
1 education


The result?
EDUCACION

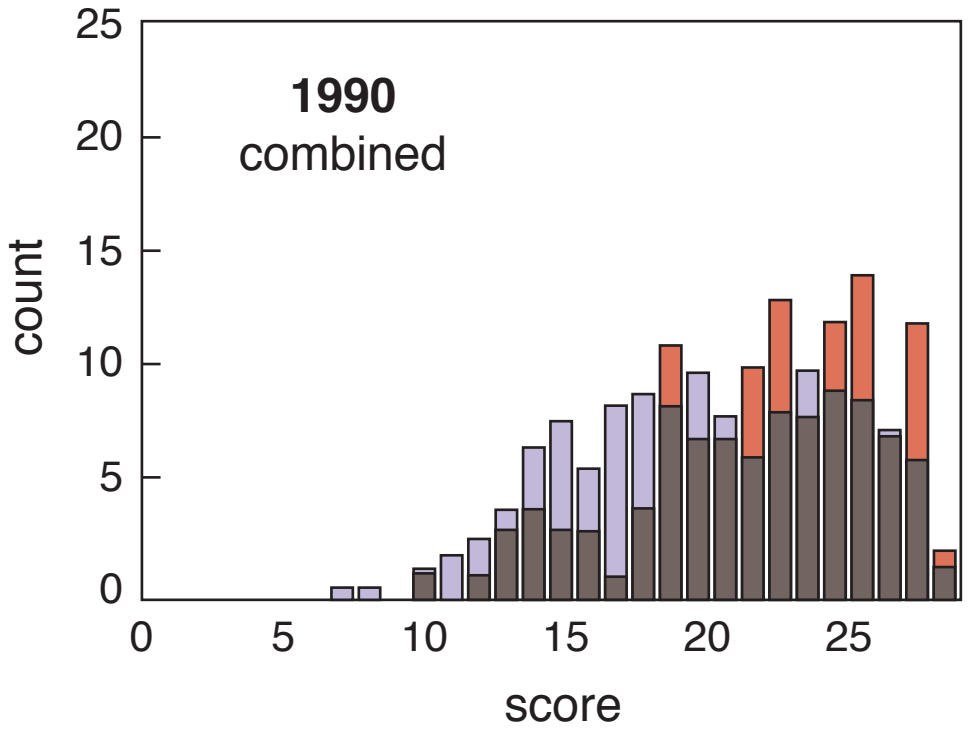
education is not just information transfer

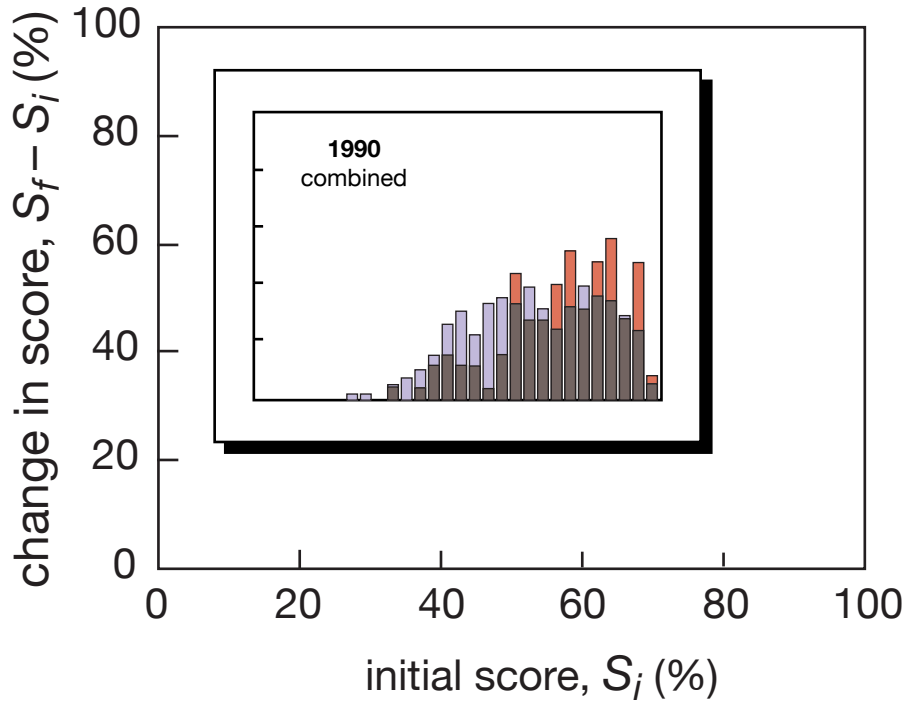


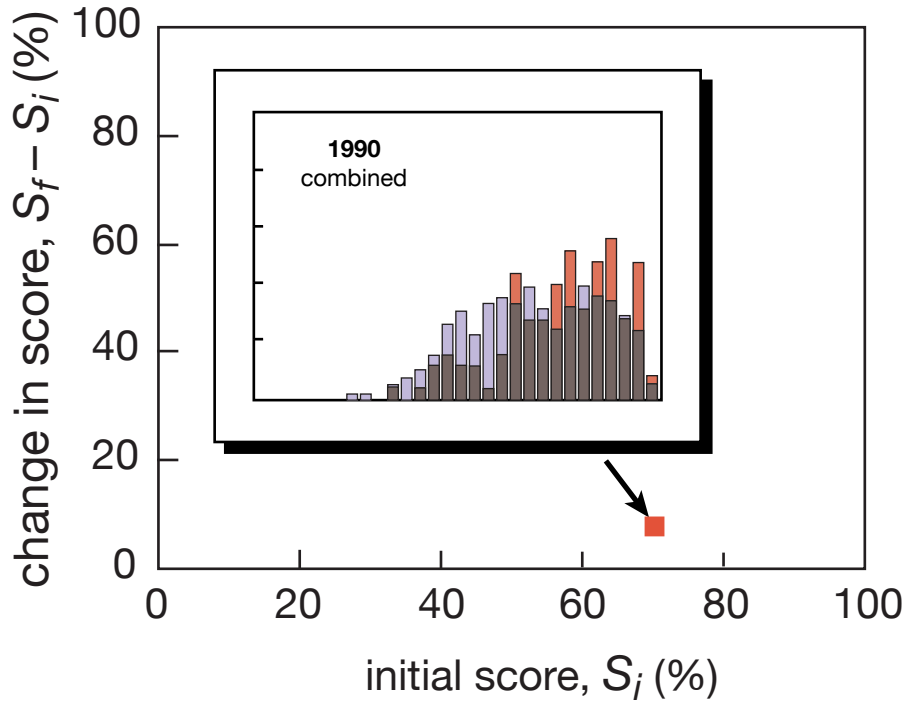
education is not just information transfer

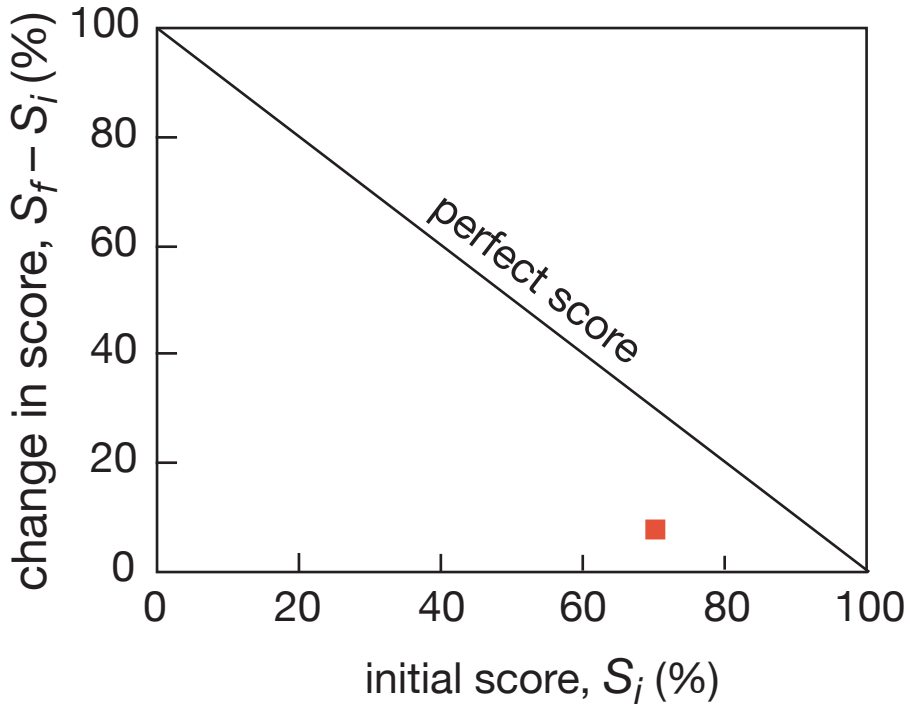


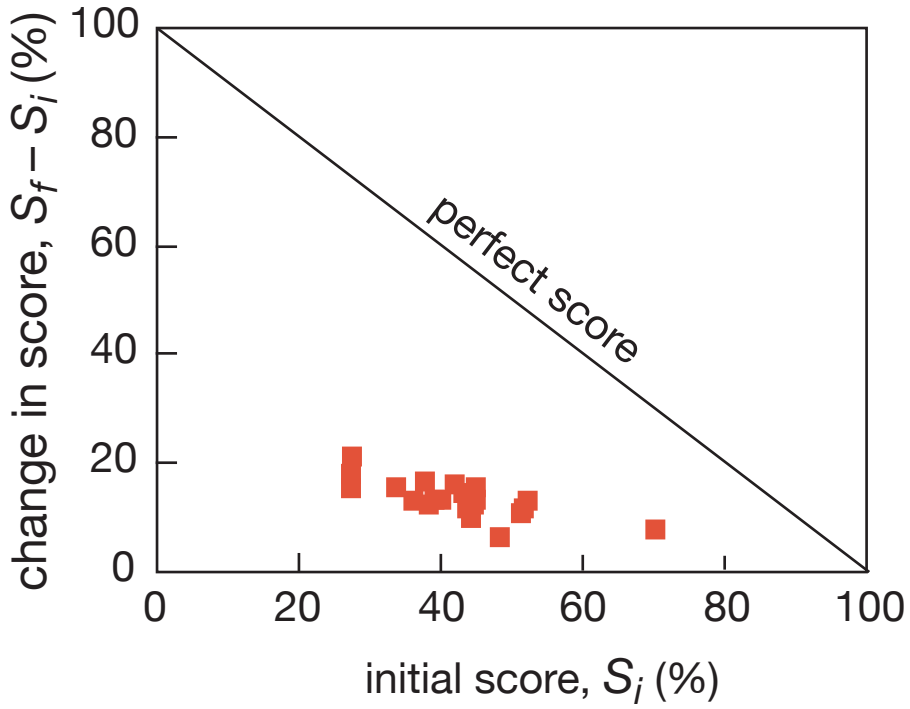
education is not just information transfer




1990
combined
change in score, $S_f - S_i$ (%)
initial score, S_i (%)
0
20
40
60
80
100

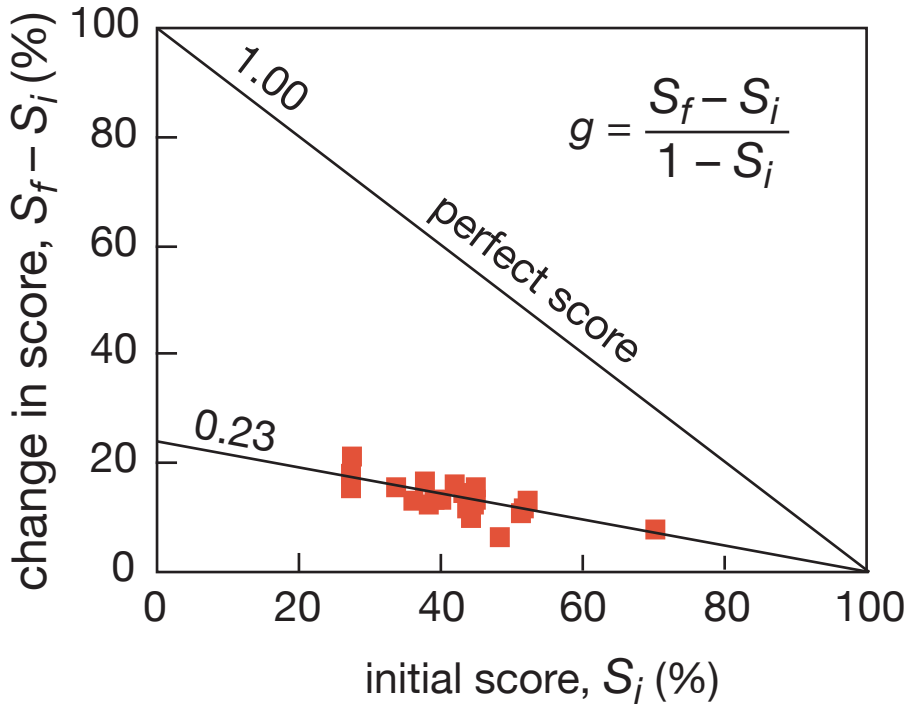

1990
combined
change in score, $S_f - S_i$ (%)
initial score, S_i (%)
0
20
40
60
80
100


change in score, $S_f - S_i$ (%)
100
80
60
40
20
0
0
20
40
60
80
100
perfect score
initial score, S_i (%)

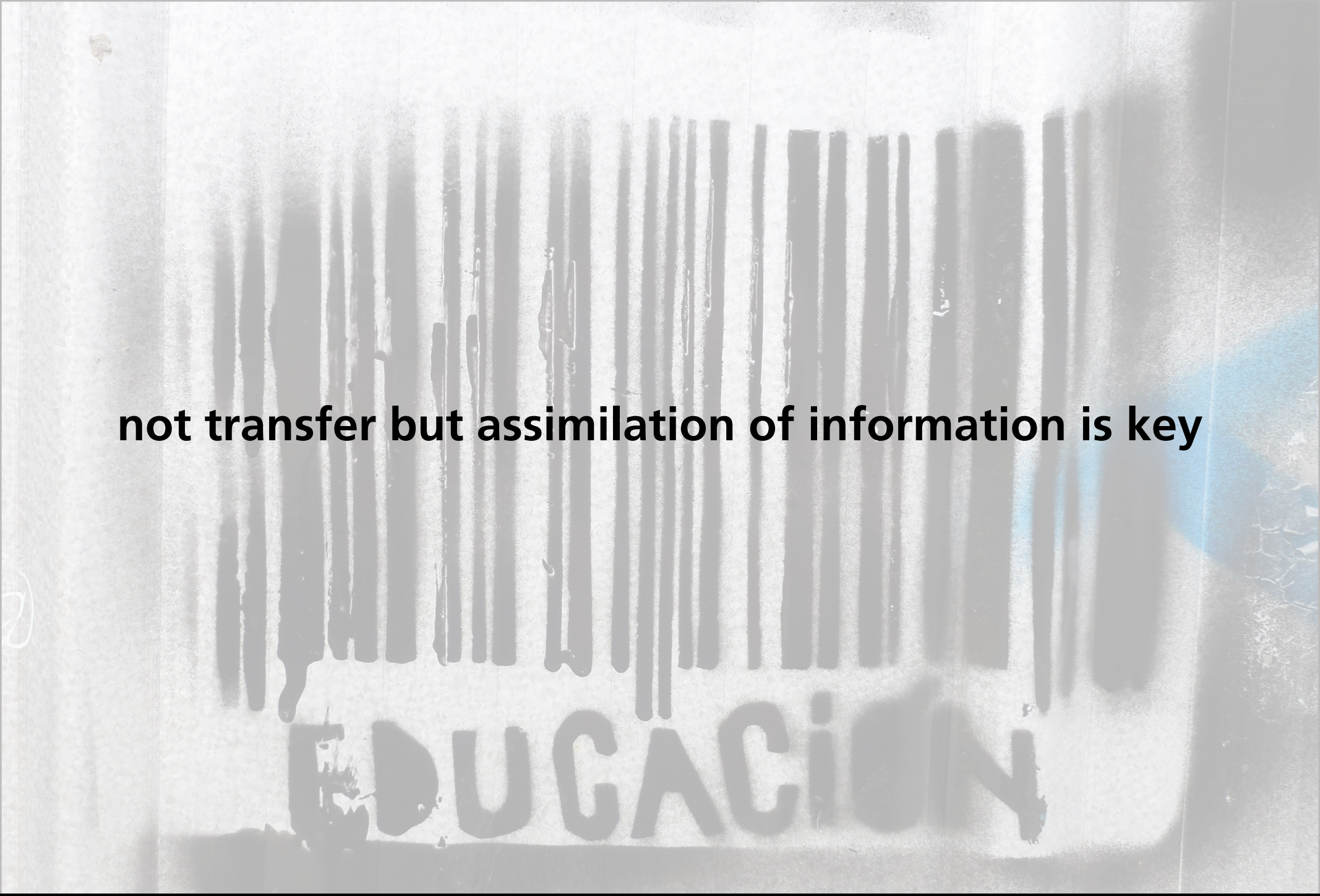


R.R. Hake, *Am. J. Phys.* 66, 64 (1998)

only one quarter of maximum gain realized



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


not transfer but assimilation of information is key
EDUCACION

1 education

2 PI

1. transfer of information

1. transfer of information

2. assimilation of that information

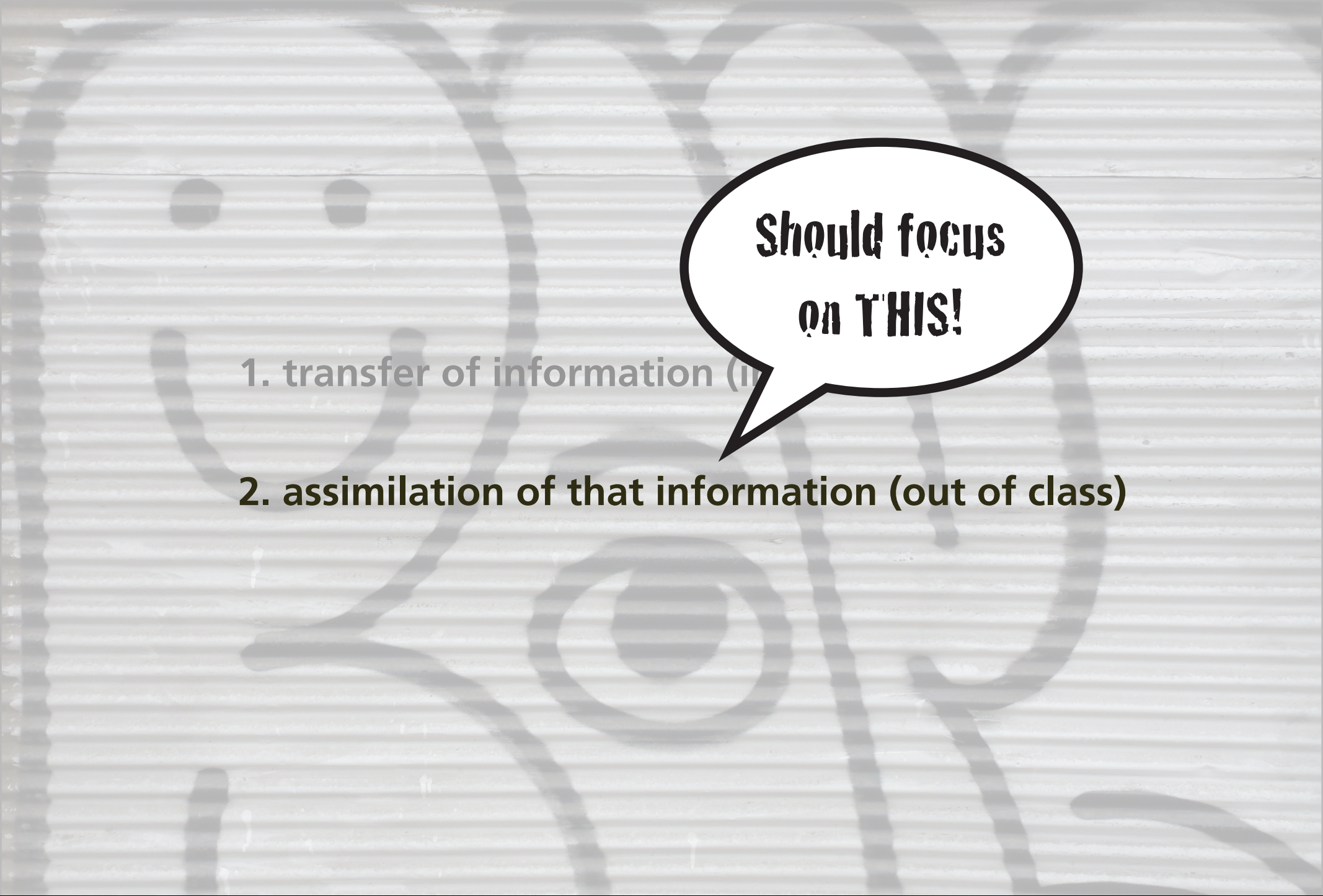
1 education 2 PI

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)



1 education 2 PI

1. transfer of information (in class)

2. assimilation of that information (out of class)

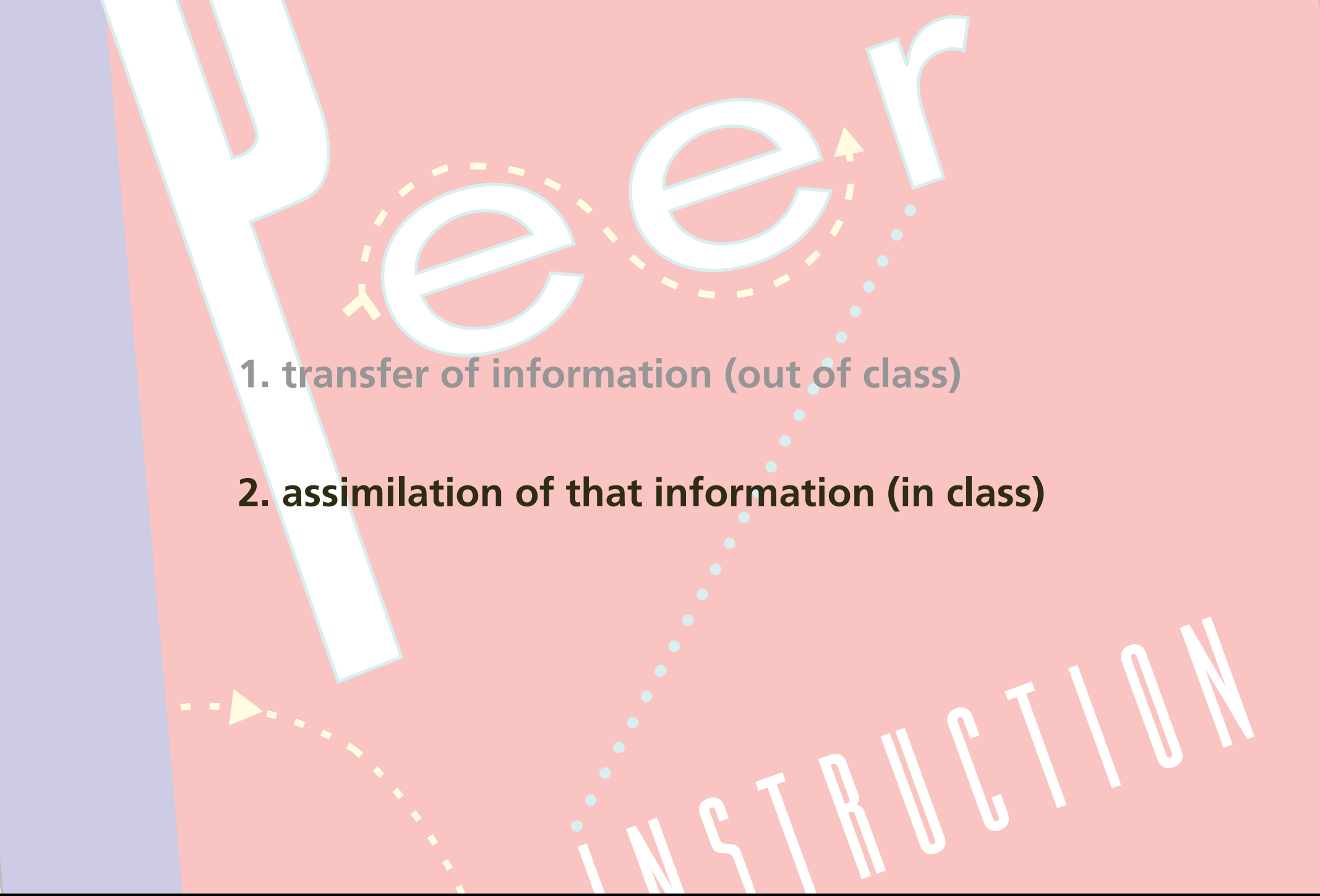
1 education

2 PI

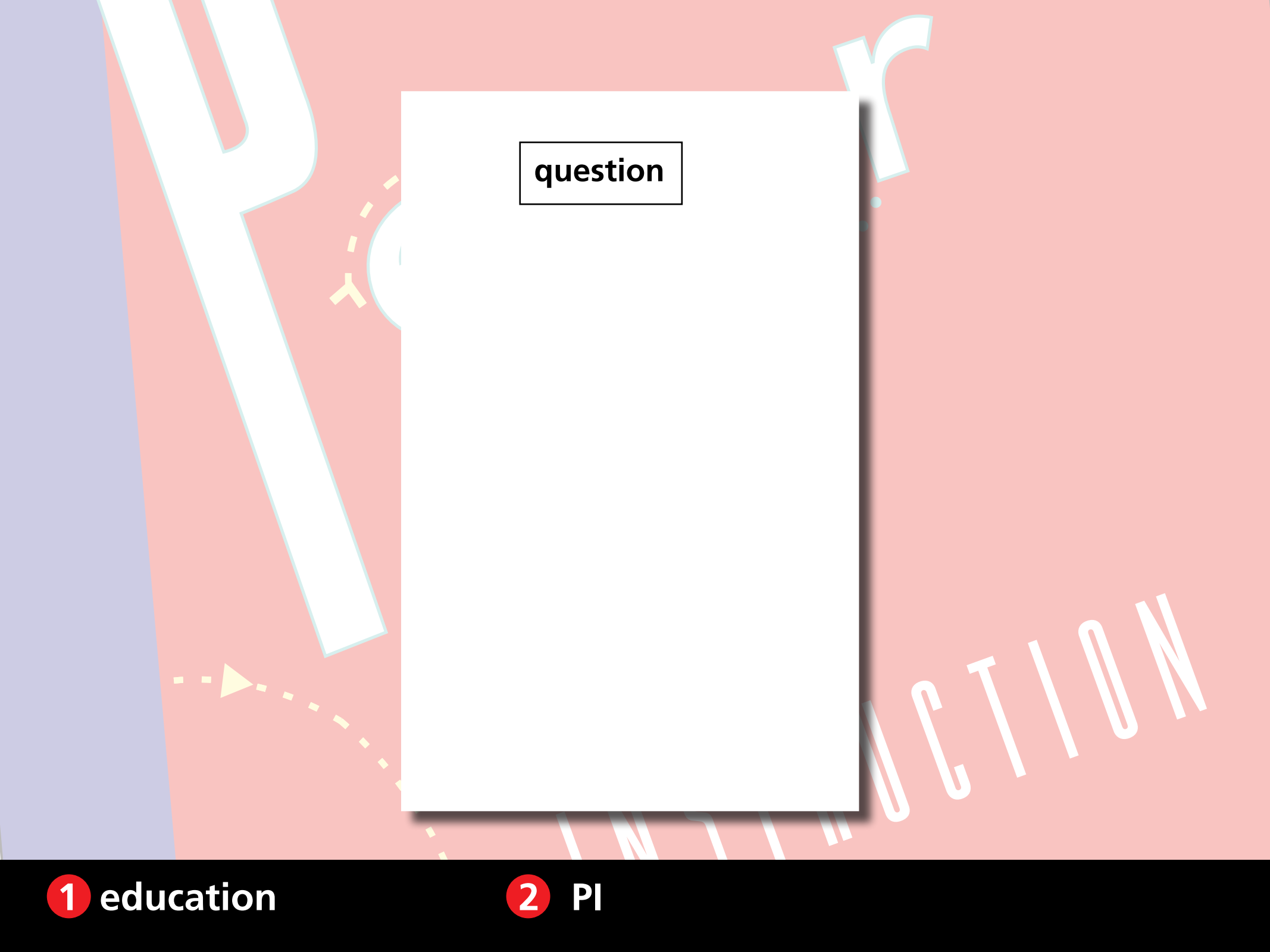
1. transfer of information (out of class)

2. assimilation of that information (in class)

1 education 2 PI

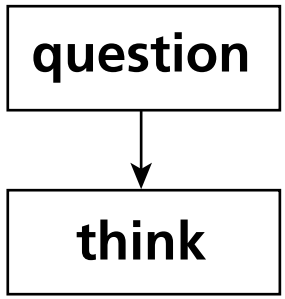


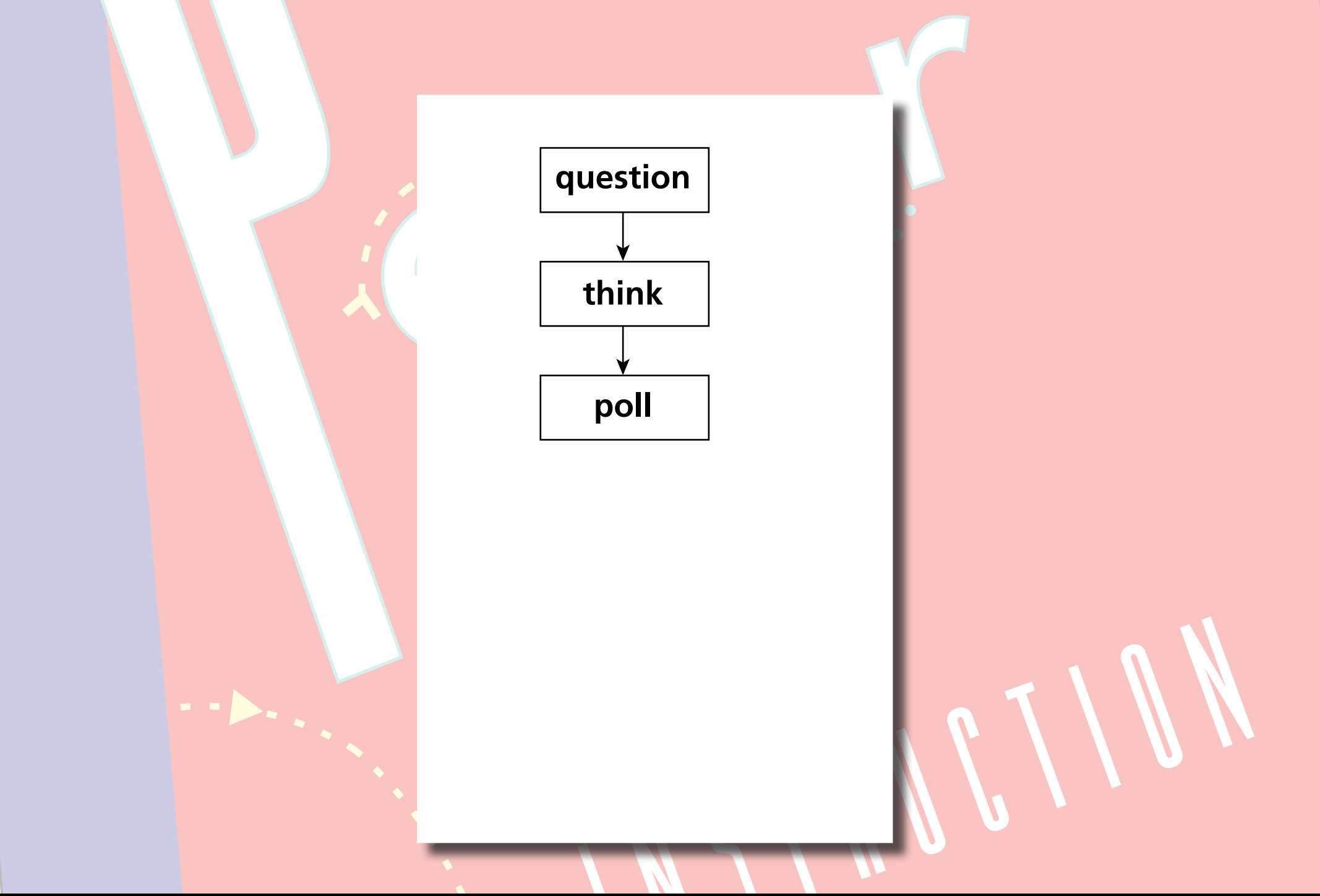
1 education 2 PI

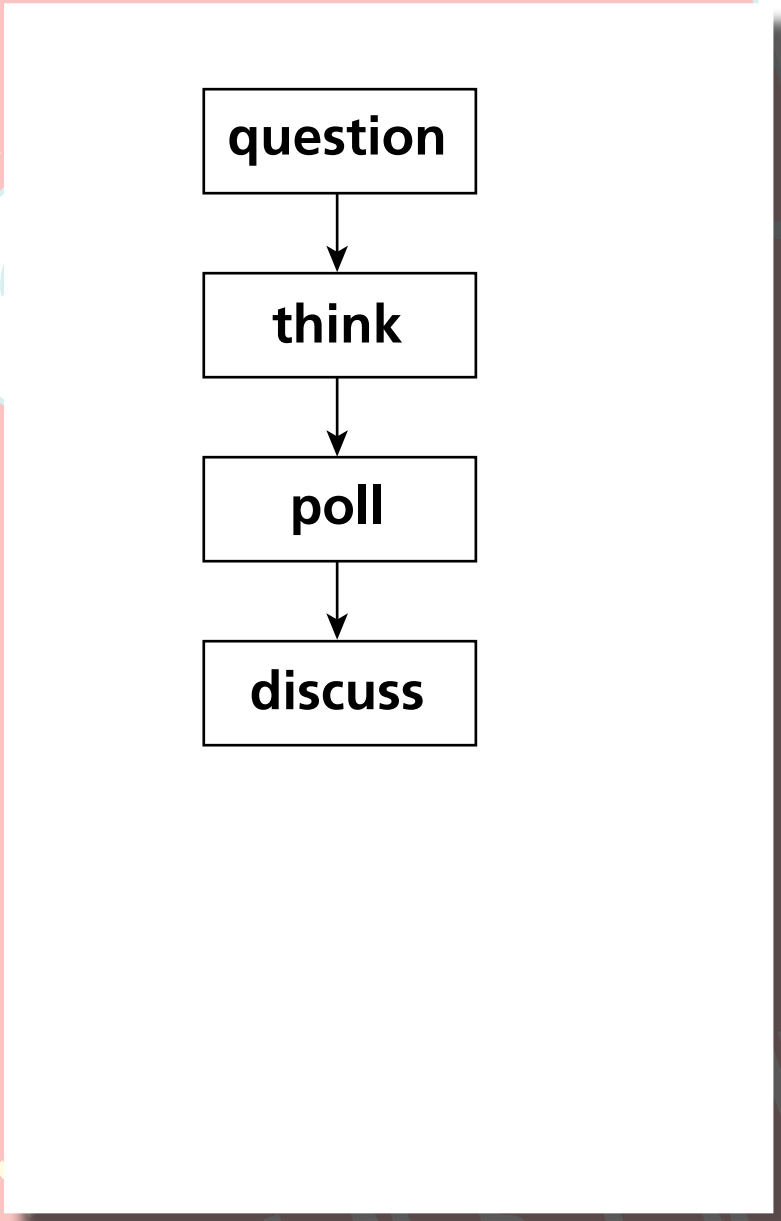


1 education

2 PI

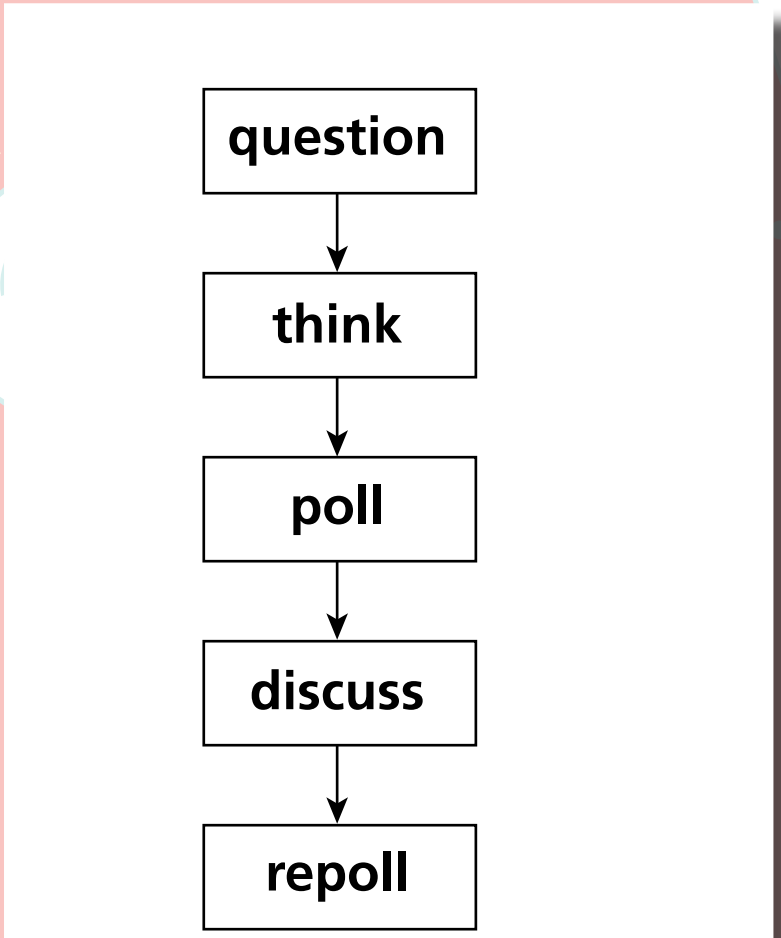

question
think

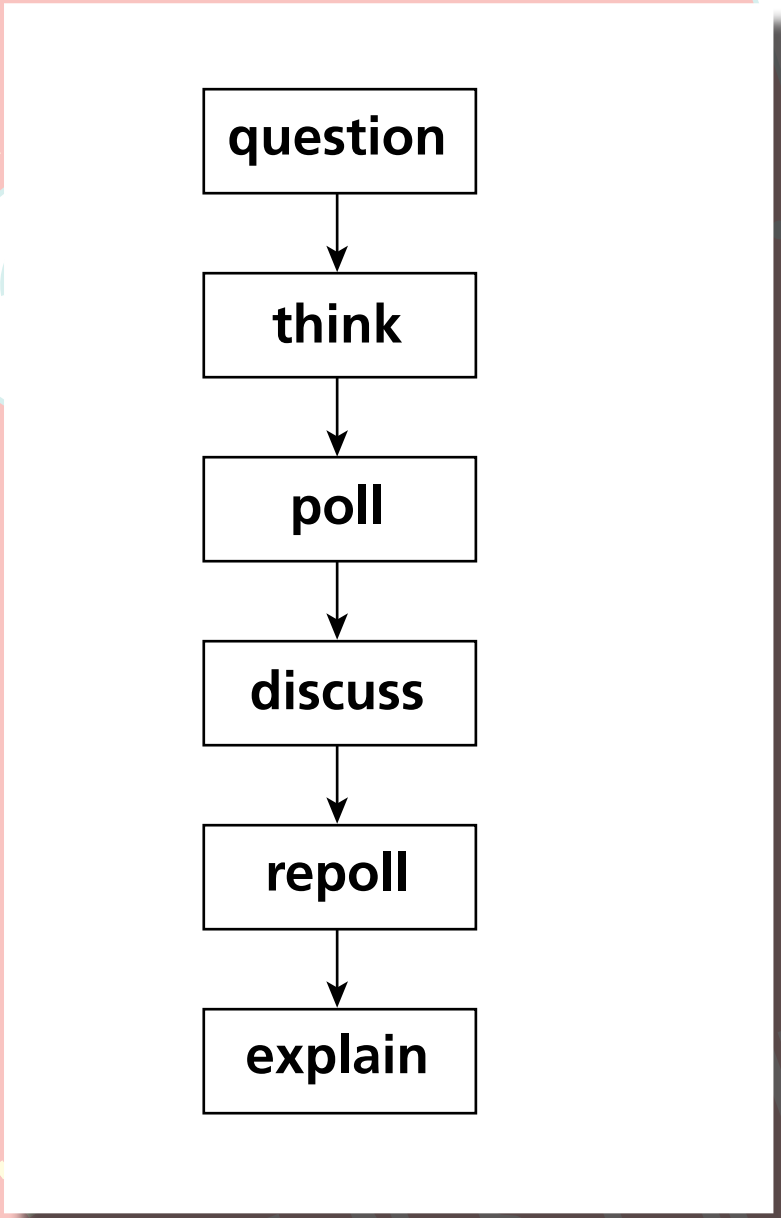

question
think
poll

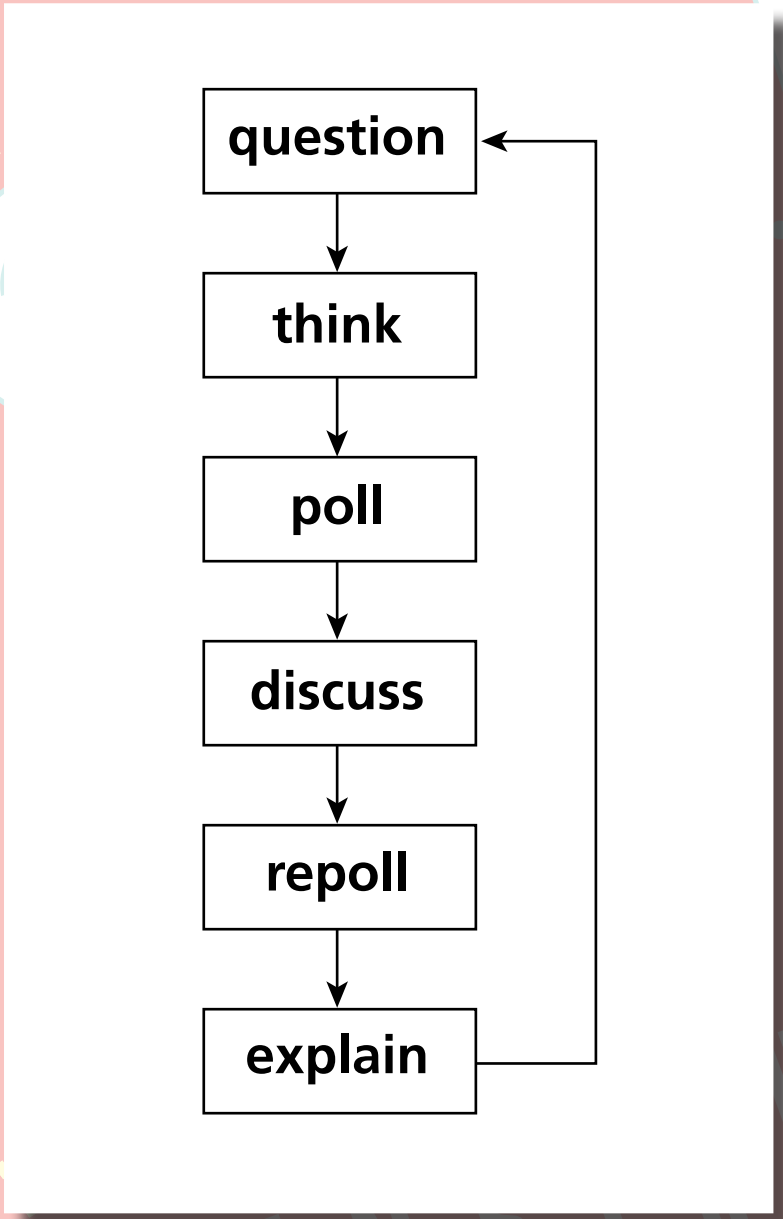


1 education

2 PI


question
think
poll
discuss
repoll


question
think
poll
discuss
repoll
explain


question
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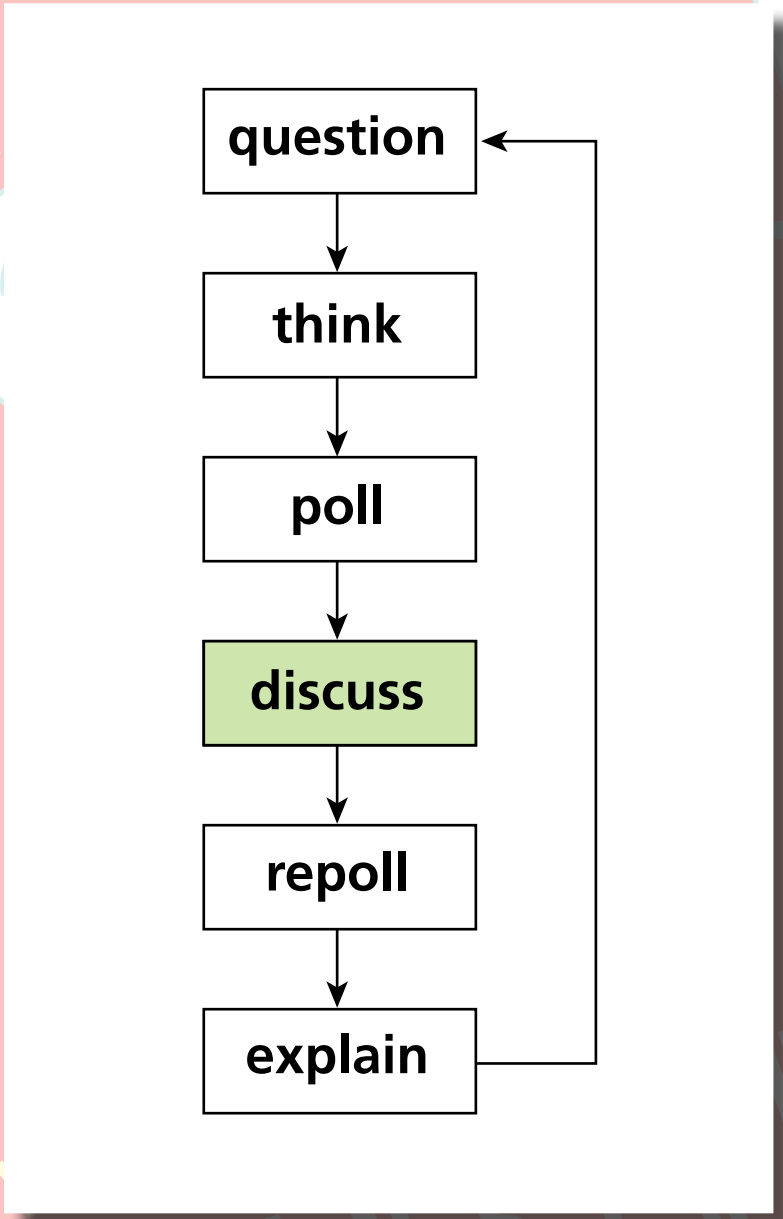
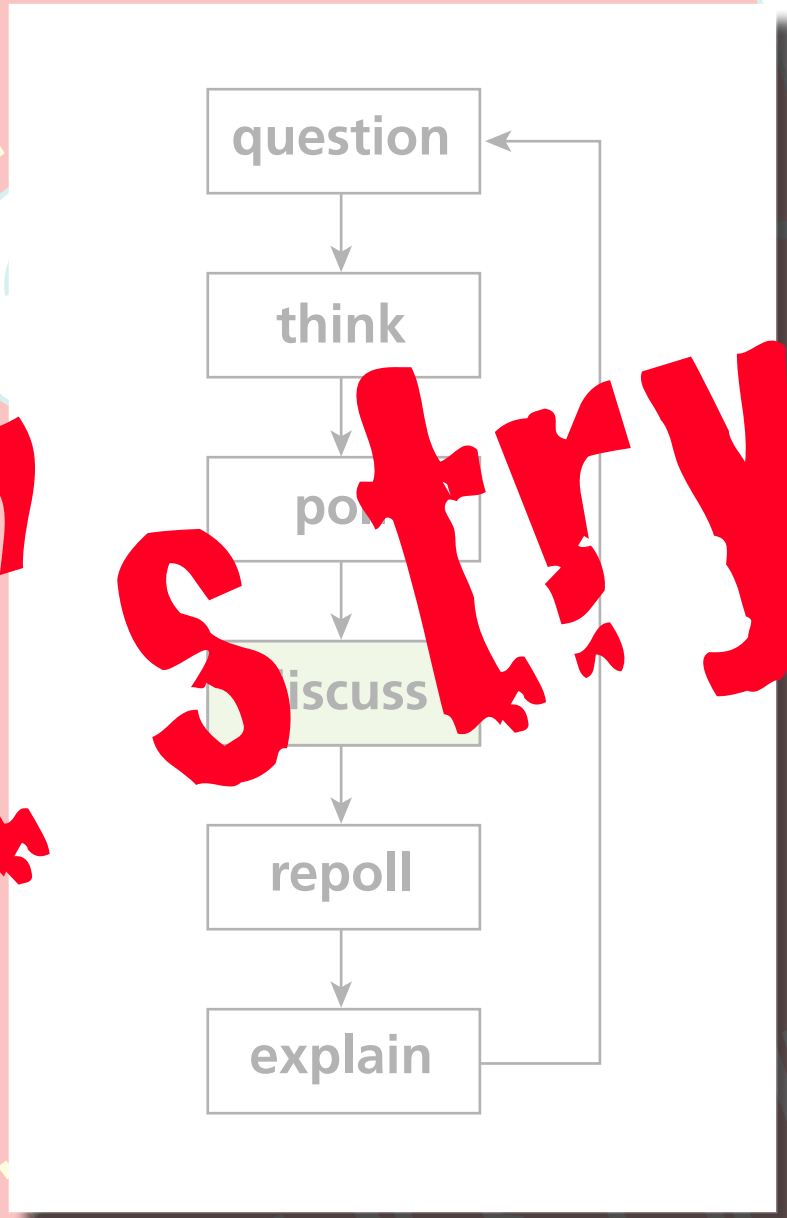


1 education

2 PI

1 education

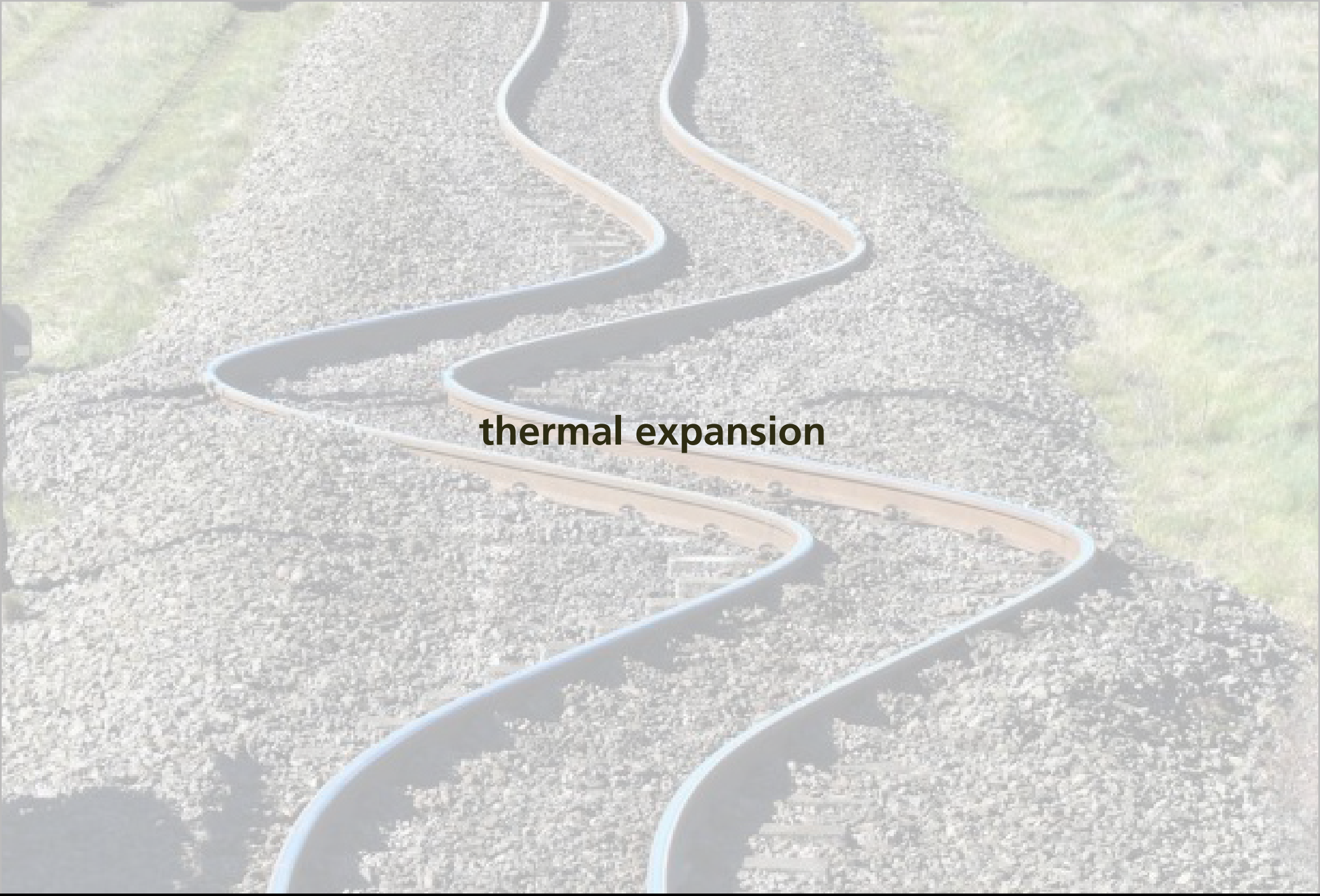
2 PI



Let's try it!

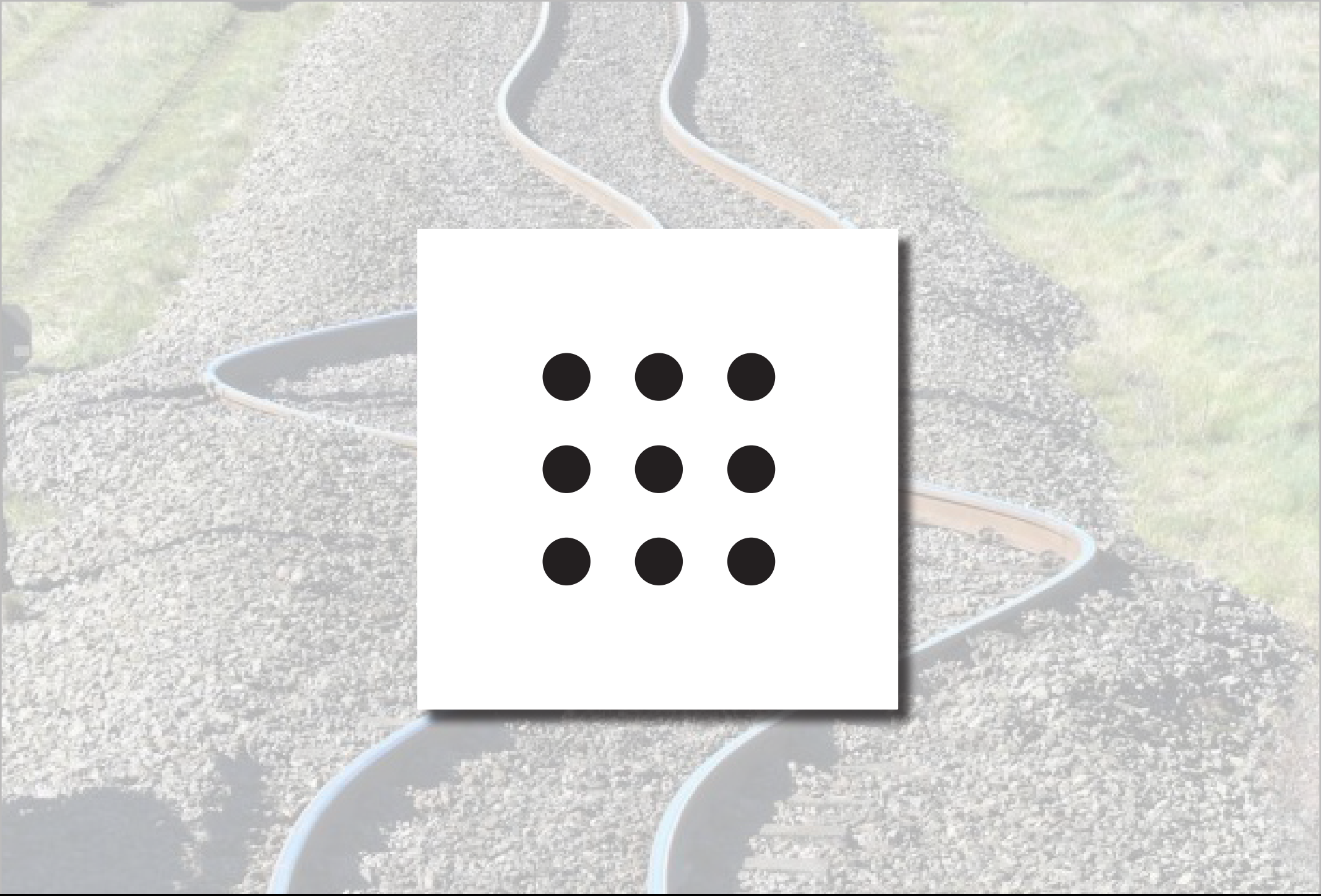
1 education

2 PI



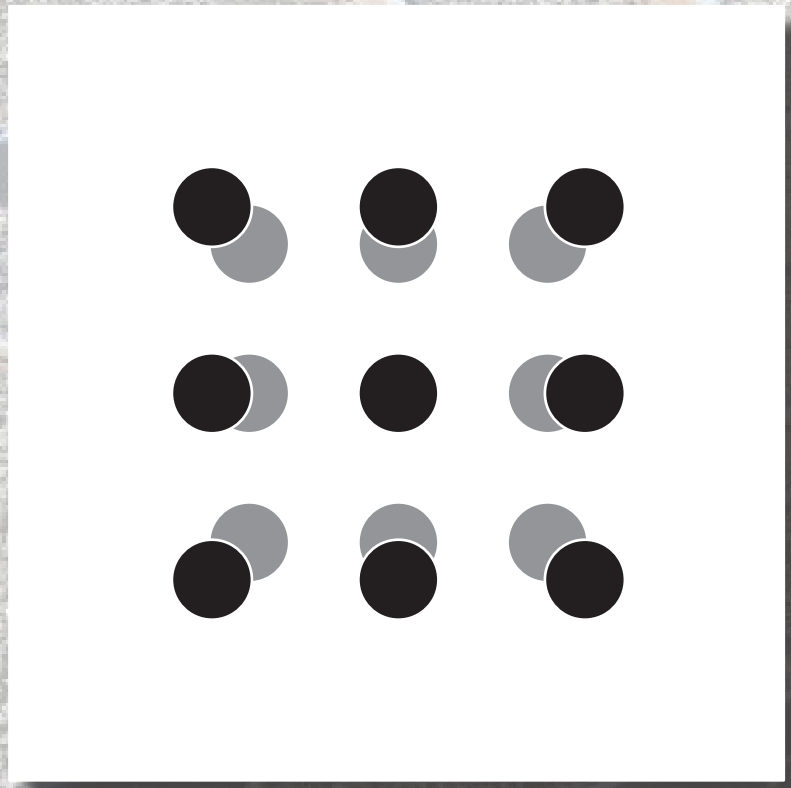
1 education

2 PI



1 education

2 PI



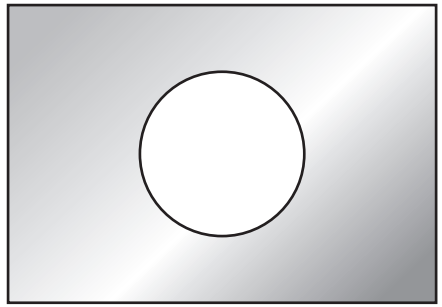
1 education

2 PI

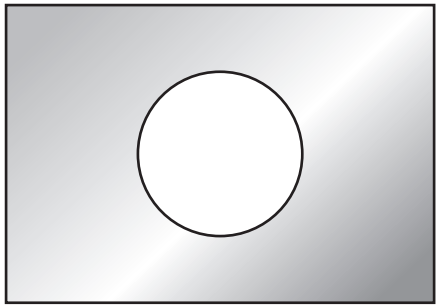
1 education

2 PI

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



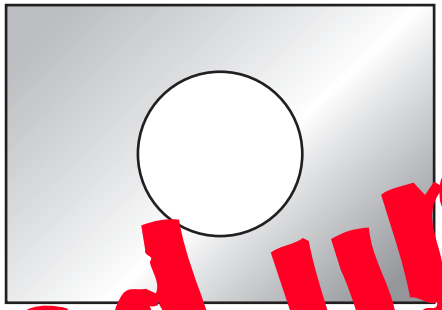
Consider a rectangular metal plate with a circular hole in it.



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.

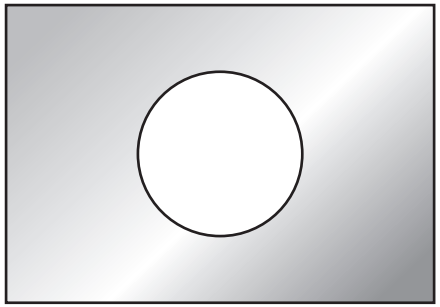


When the plate is uniformly heated, the diameter of the hole

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…

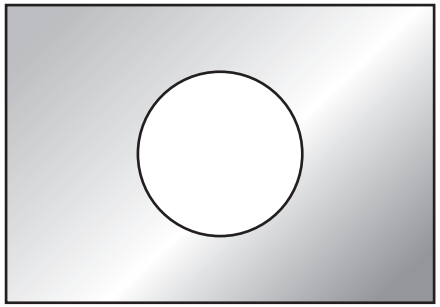
1. made a commitment
2. externalized your answer
3. moved from the answer/fact to reasoning

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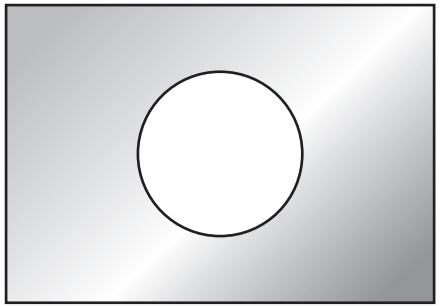
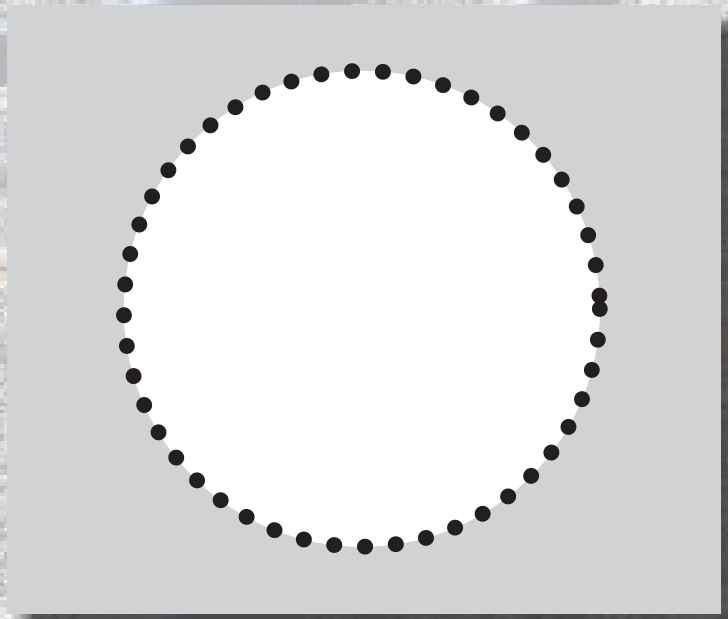
Consider a rectangular metal plate with a circular hole in it.

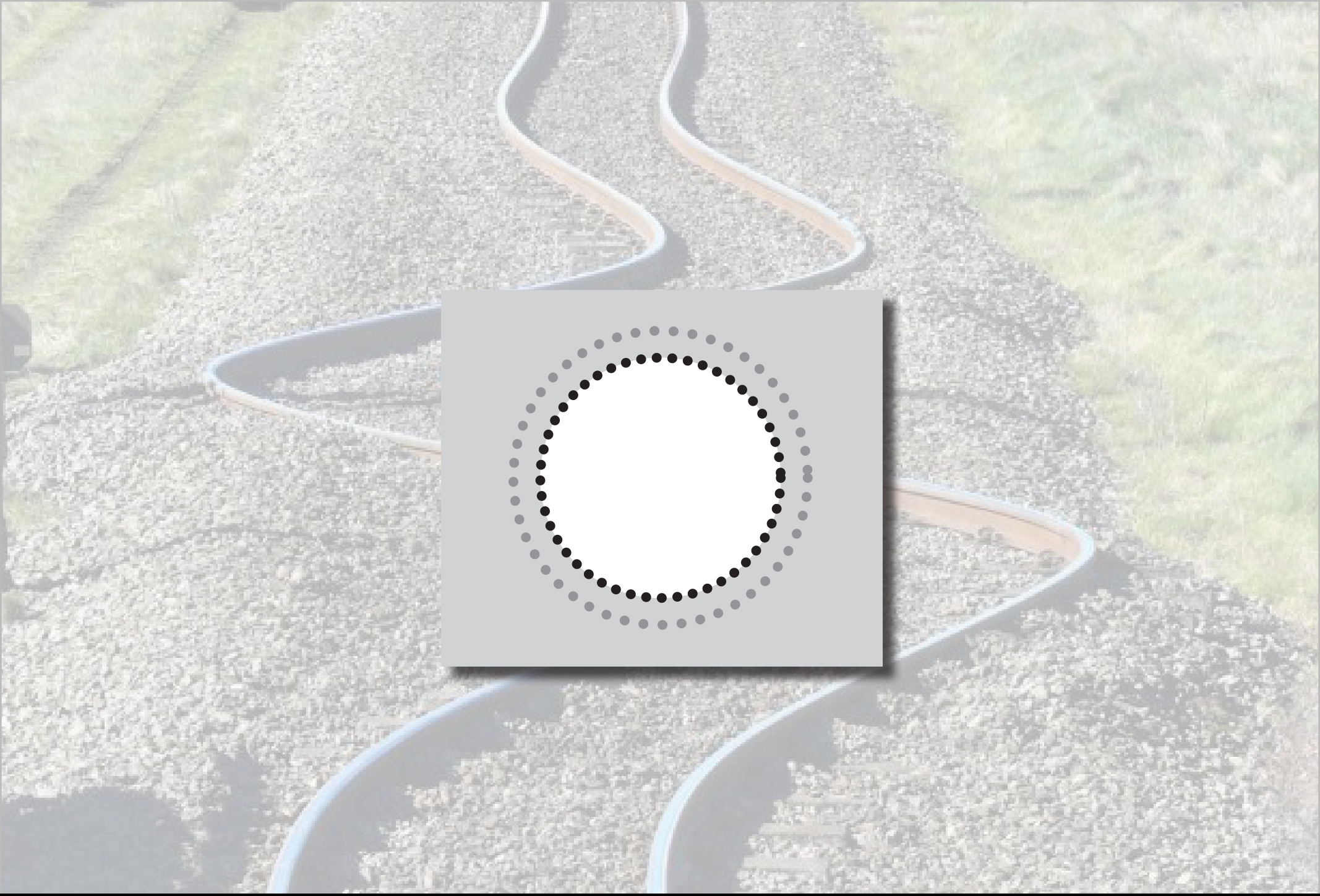


When the plate is uniformly heated, the diameter of the hole

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

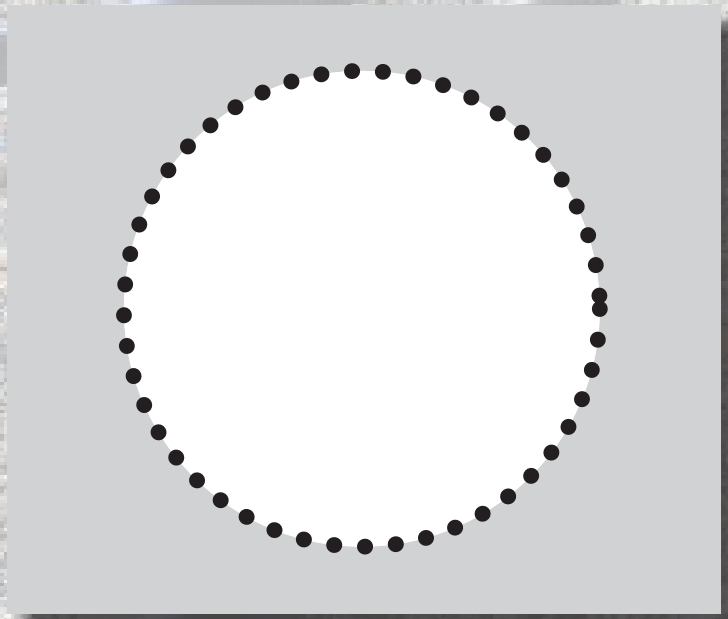
consider atoms at rim of hole



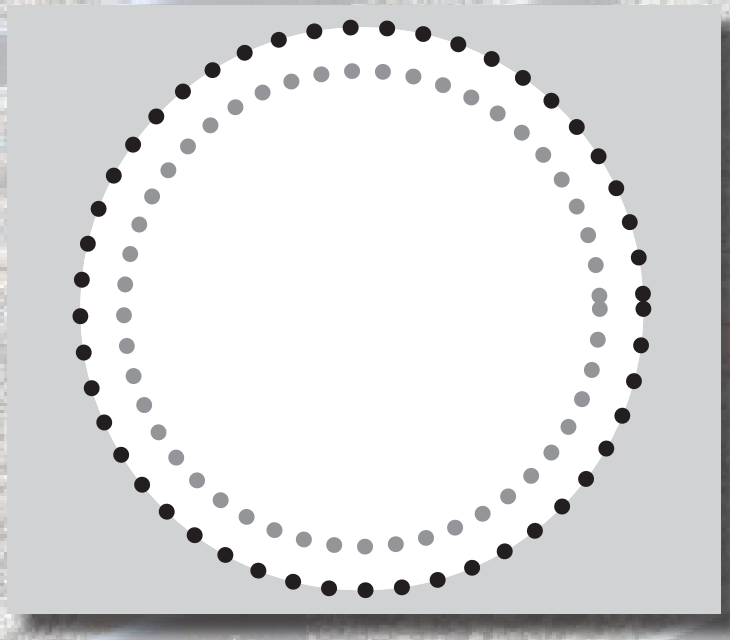


1 education 2 PI 3 test

consider atoms at rim of hole



consider atoms at rim of hole



consider atoms at rim of hole

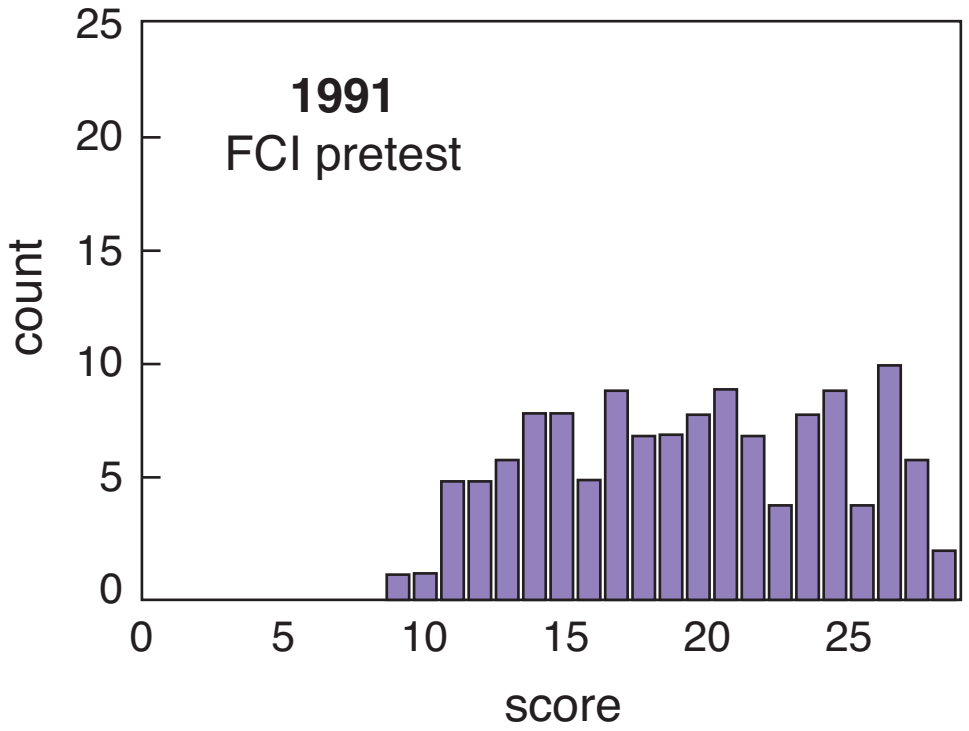
you won't forget this

1 education 2 PI 3 test

1 education 2 PI 3 test

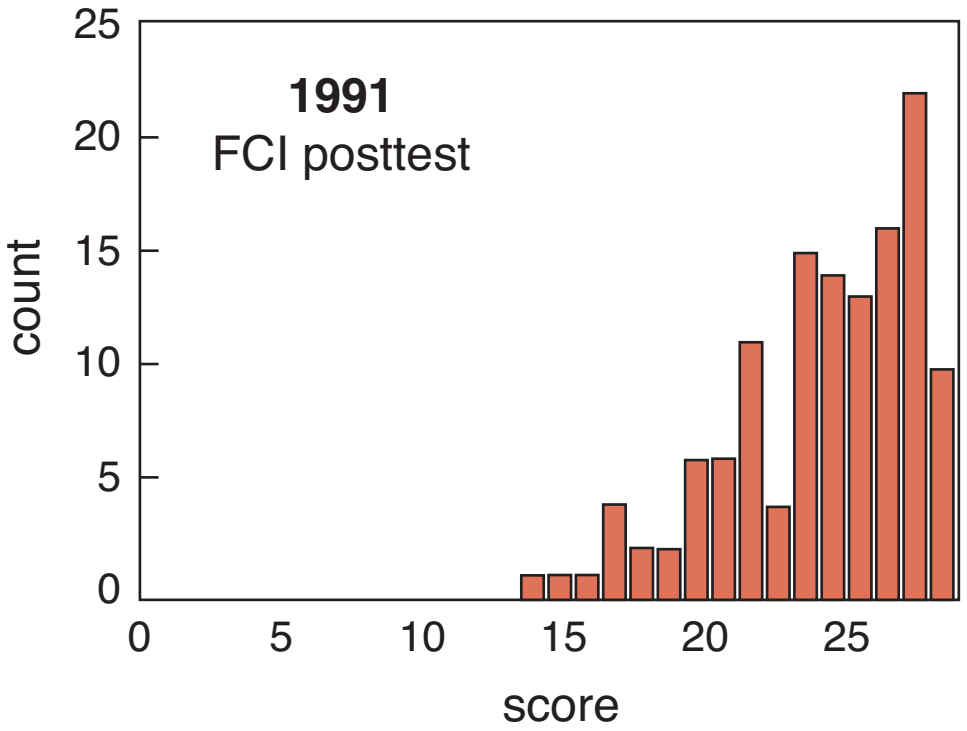
1 education 2 PI 3 test

first year of implementing PI



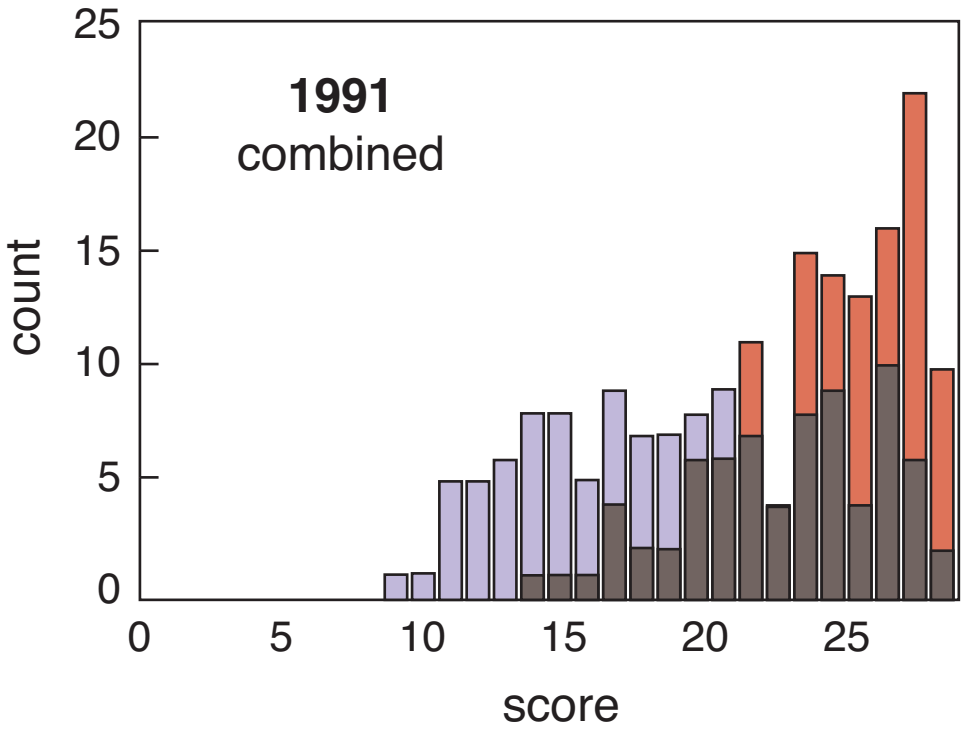
1 education 2 PI 3 test

first year of implementing PI



1 education 2 PI 3 test

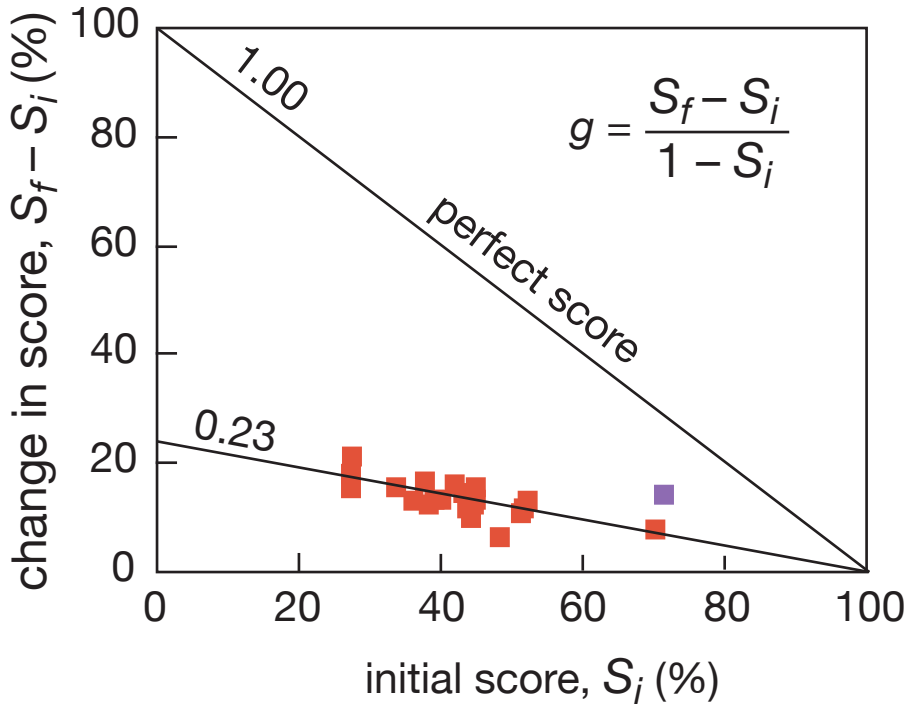
first year of implementing PI



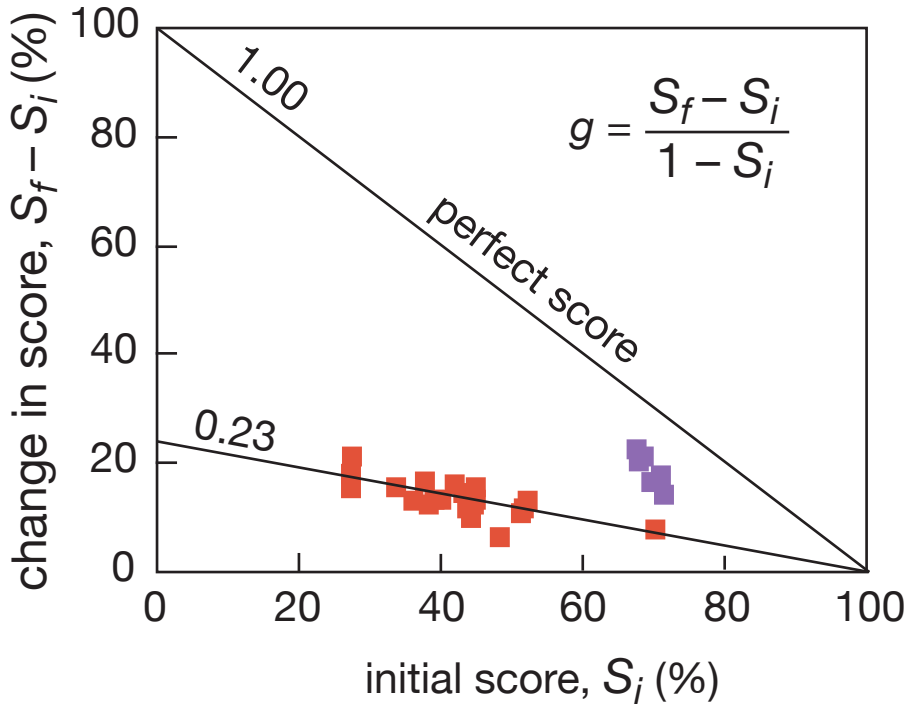
1 education

2 PI

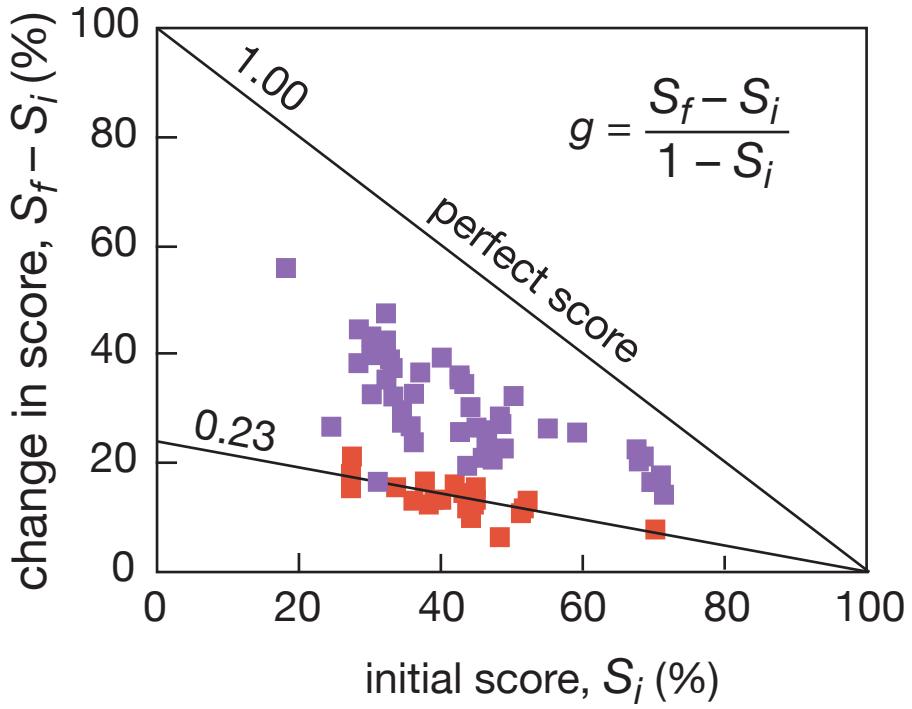
3 test



1 education 2 PI 3 test

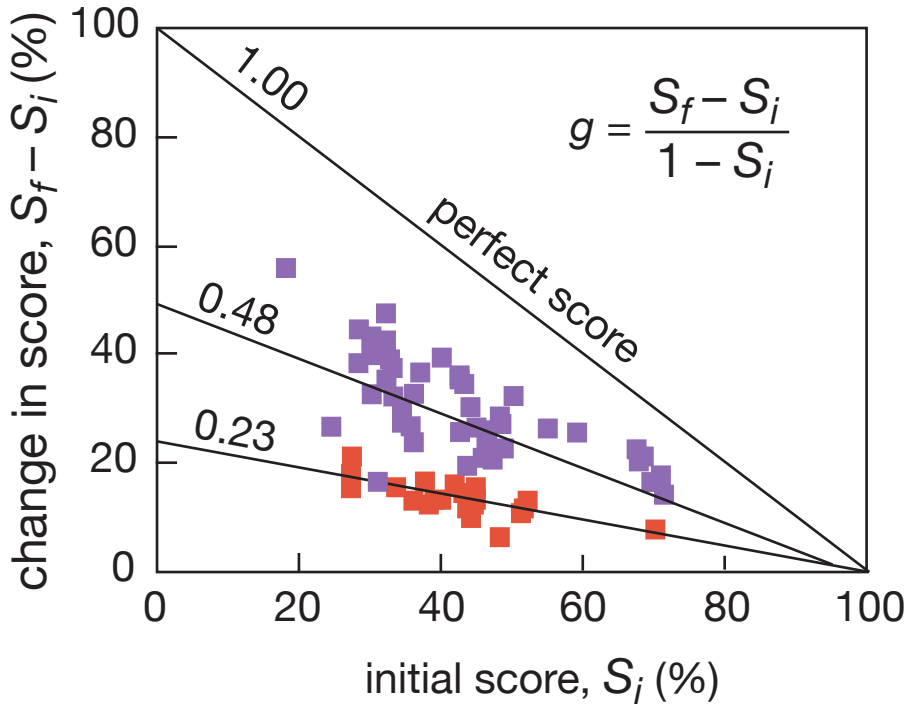


1 education 2 PI 3 test



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

1 education 2 PI 3 test



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1 education 2 PI 3 test

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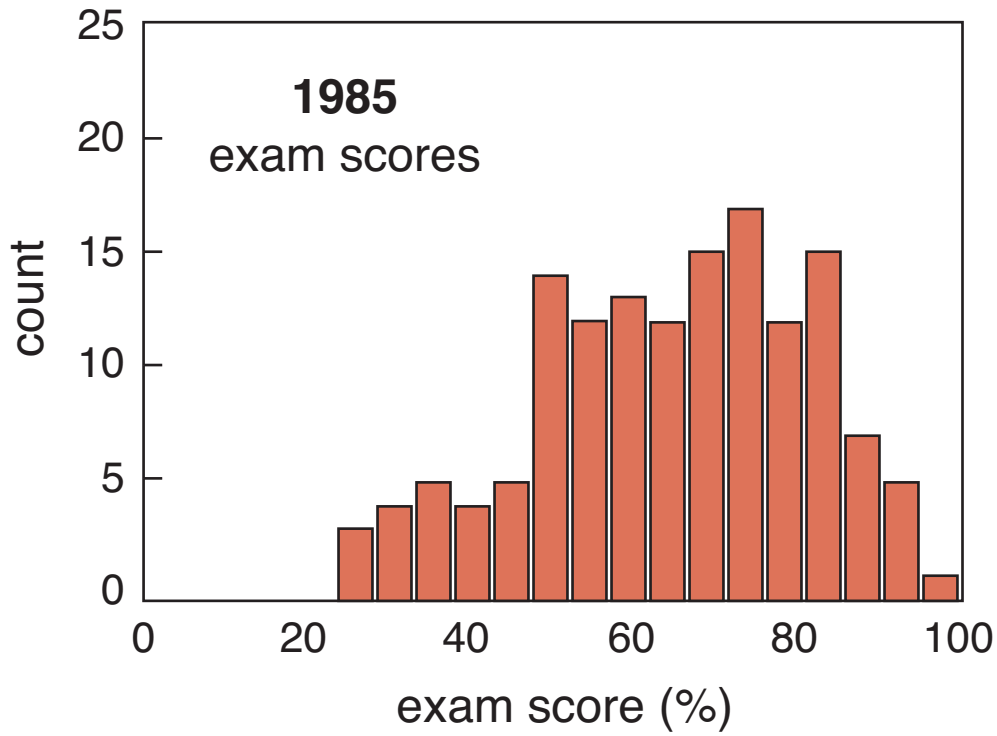
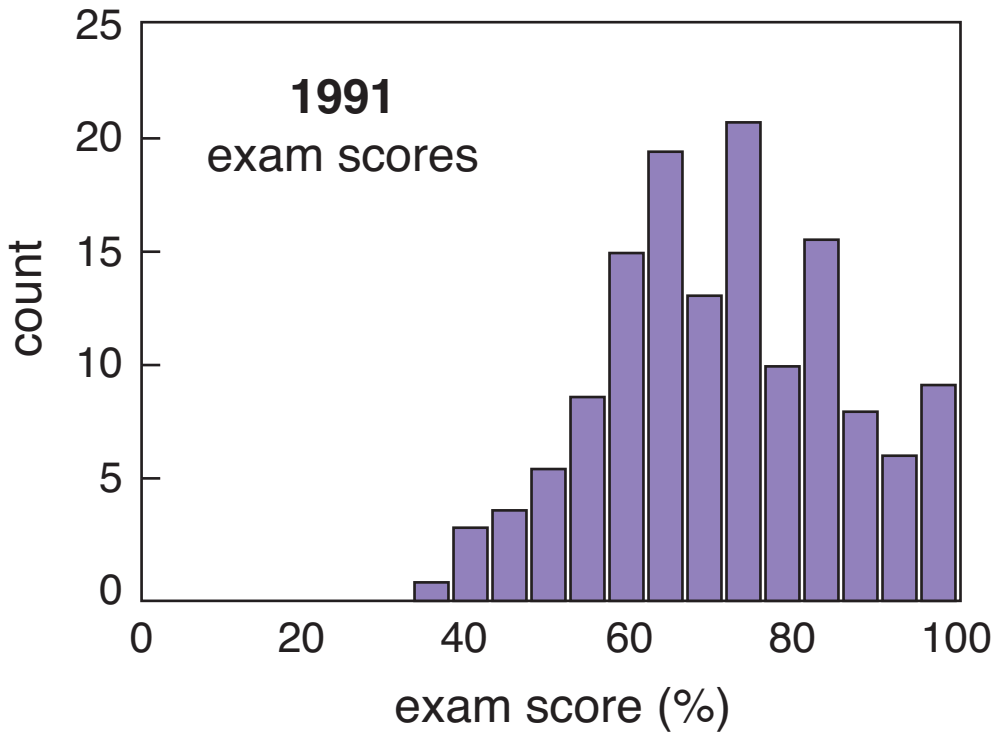


1 education 2 PI 3 test



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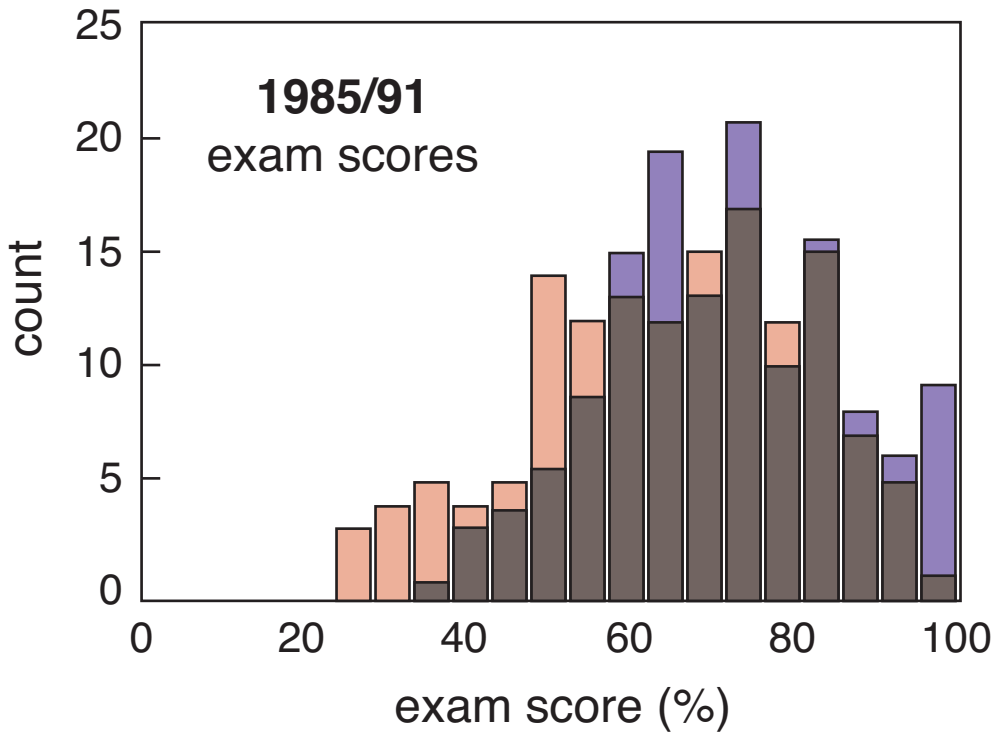

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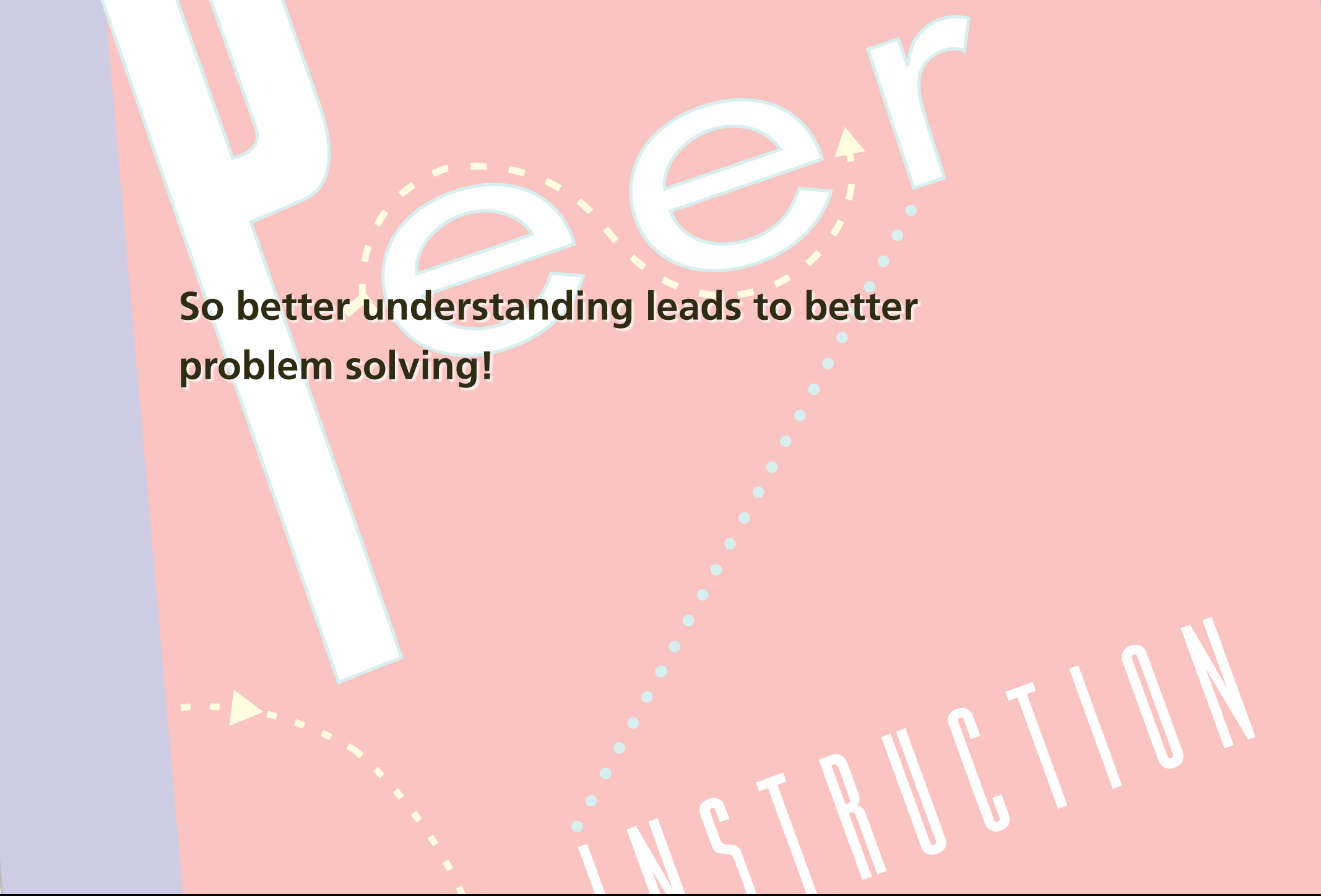


So better understanding leads to better problem solving!

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

in a lecture, students…

1 education

2 PI

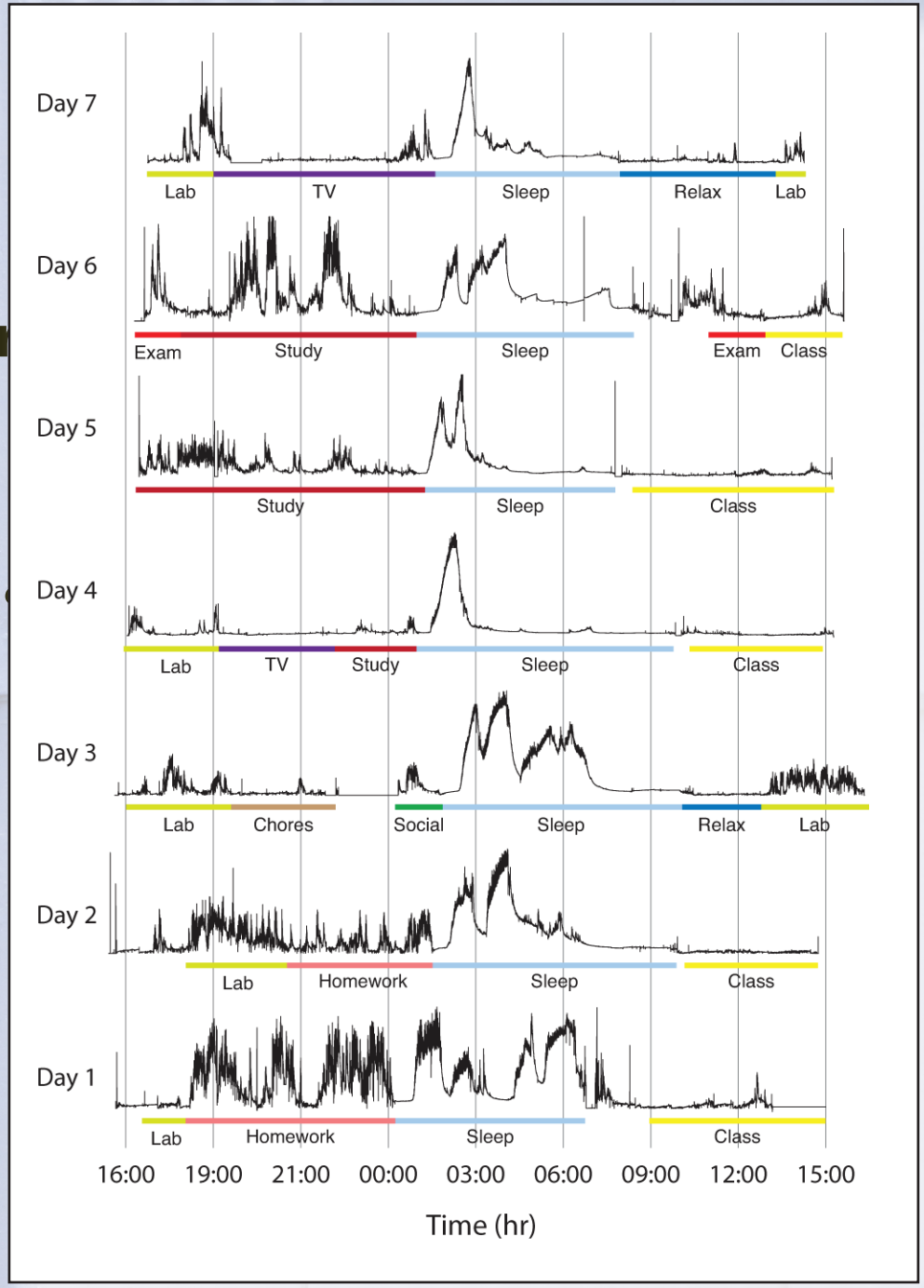
3 test

in a lecture, students…

1. don’t pay utmost attention

in a lectur

1. don’t pay utmost

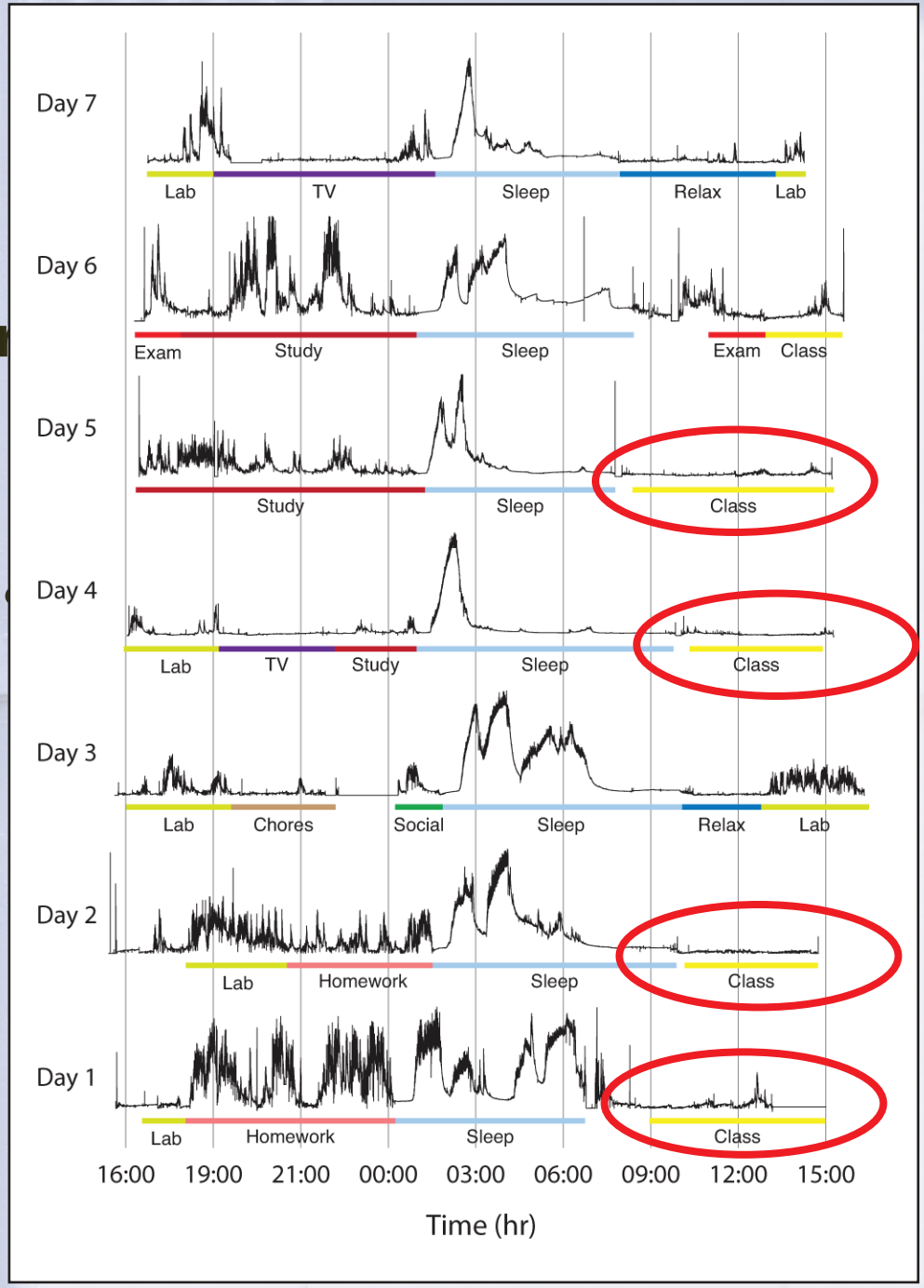


doi: 10.1109/TBME.2009.2038487

1 education 2 PI 3 test

in a lectur

1. don’t pay utmost



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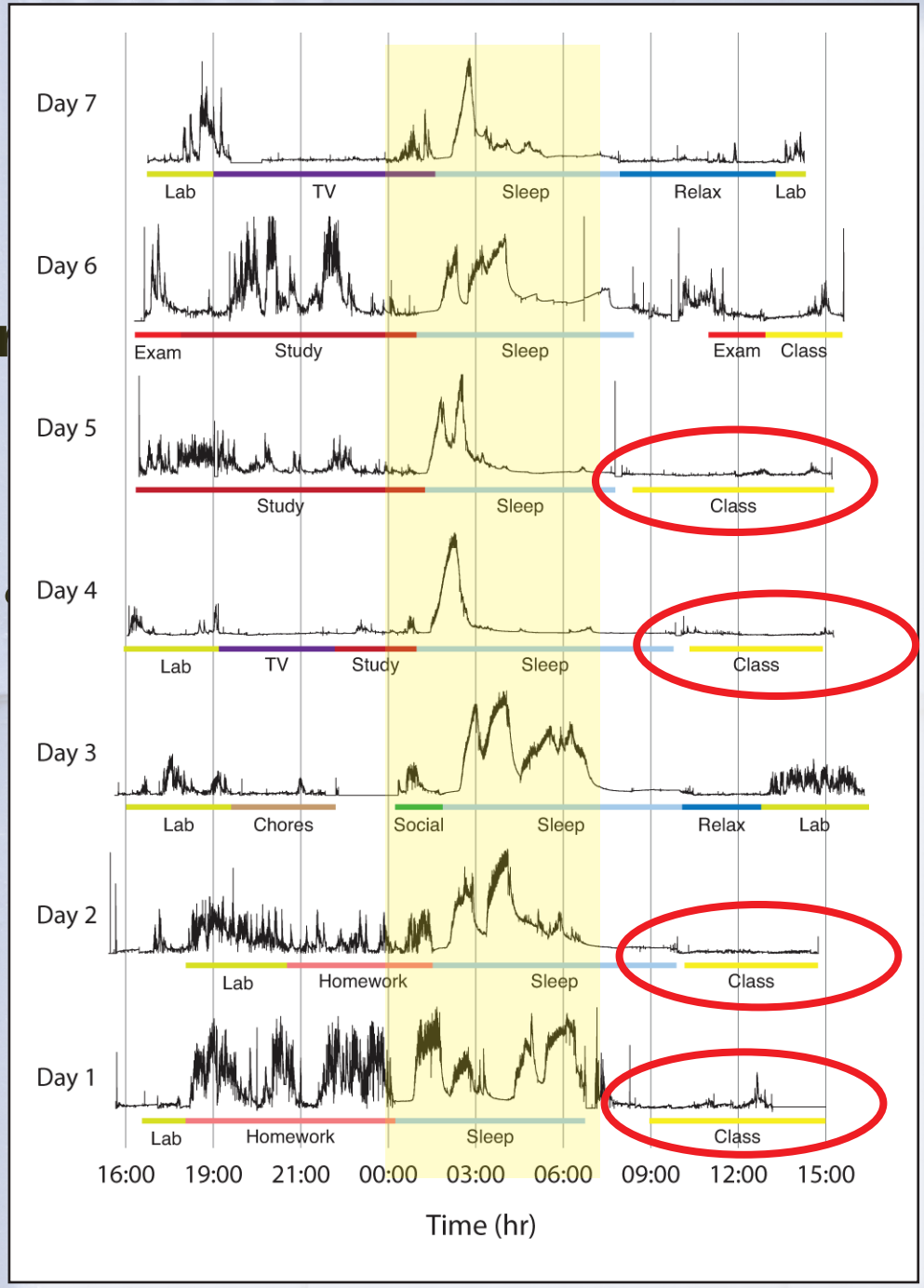

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in a lectur

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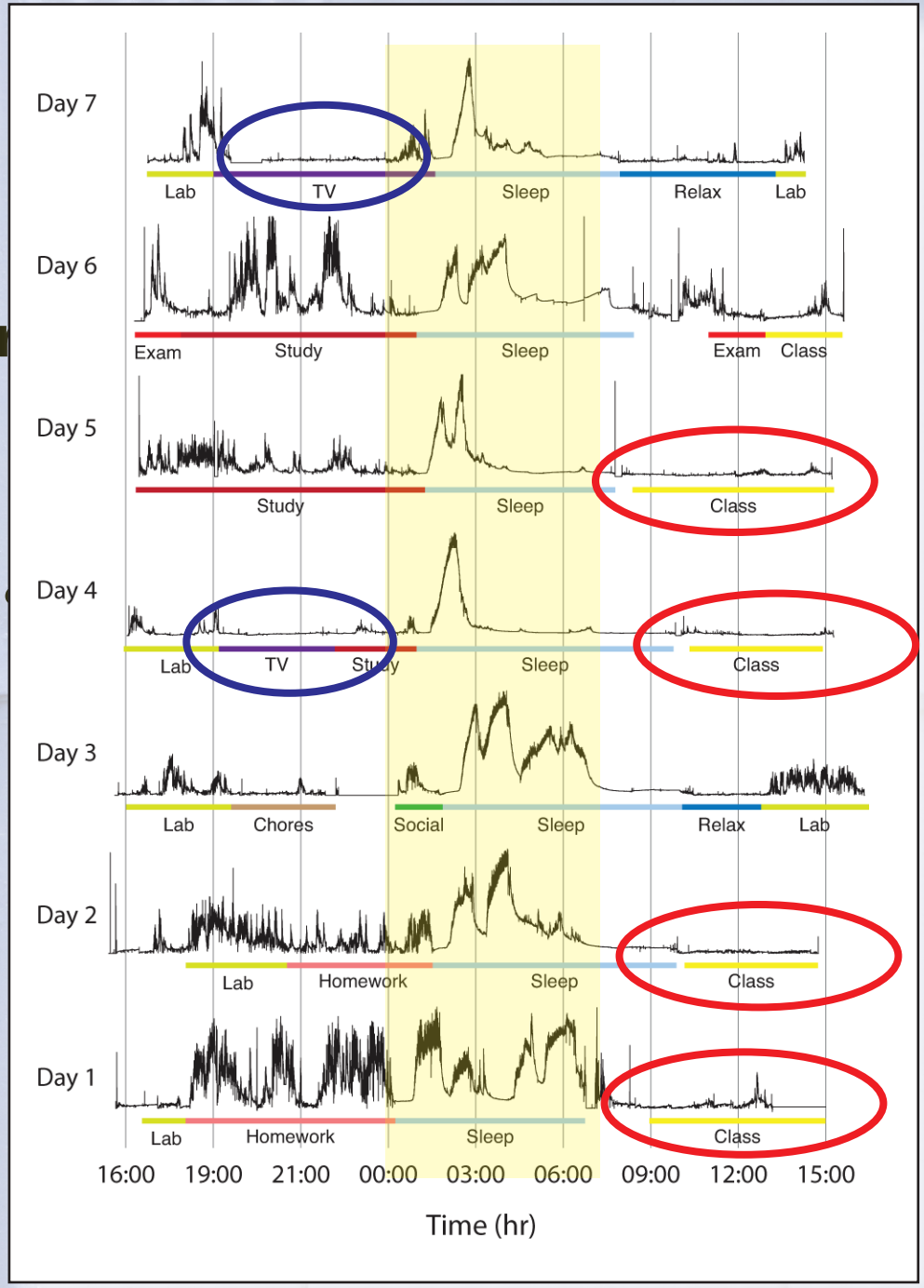


doi: 10.1109/TBME.2009.2038487

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

1 education 2 PI 3 test

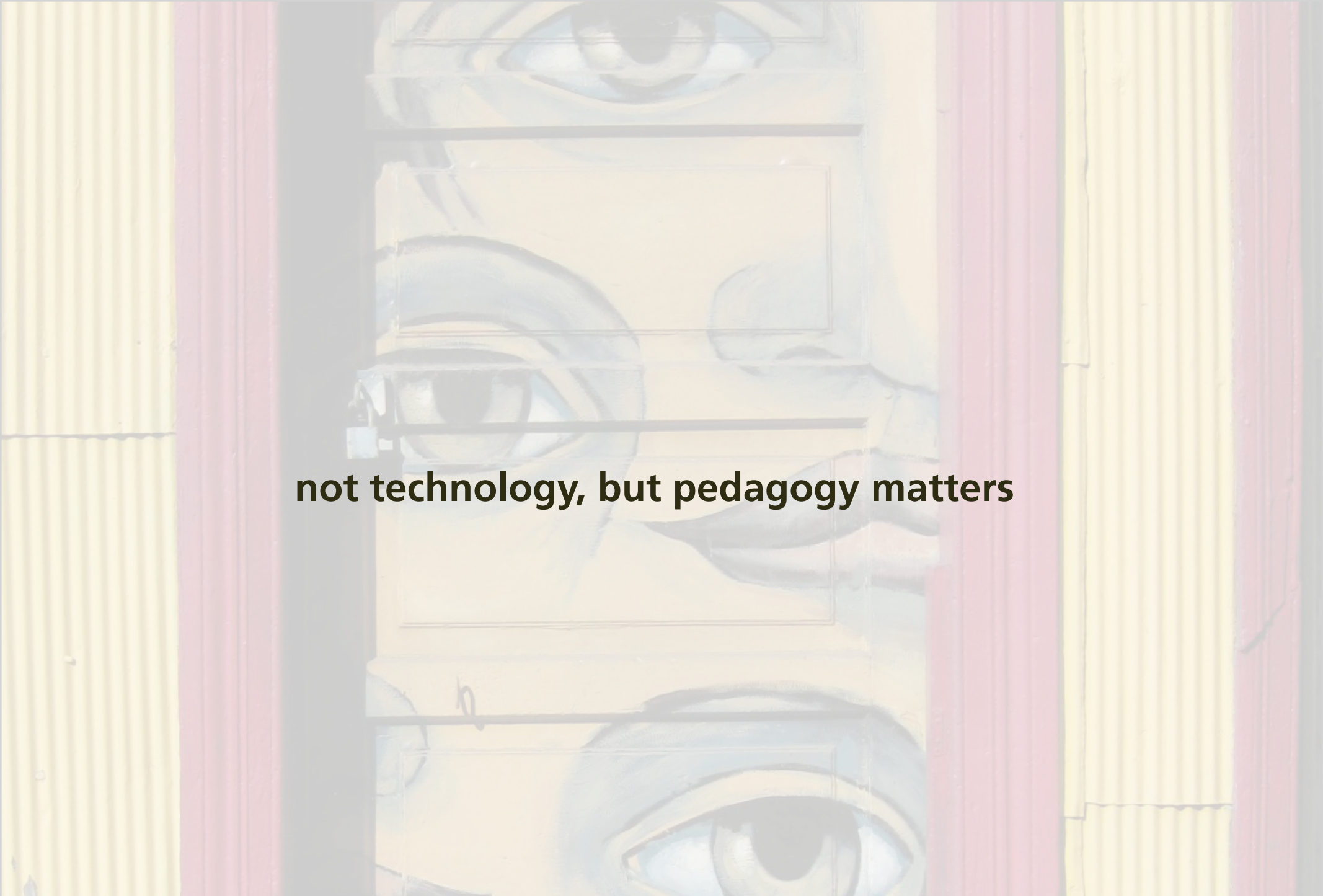
Education is not just about:

- 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

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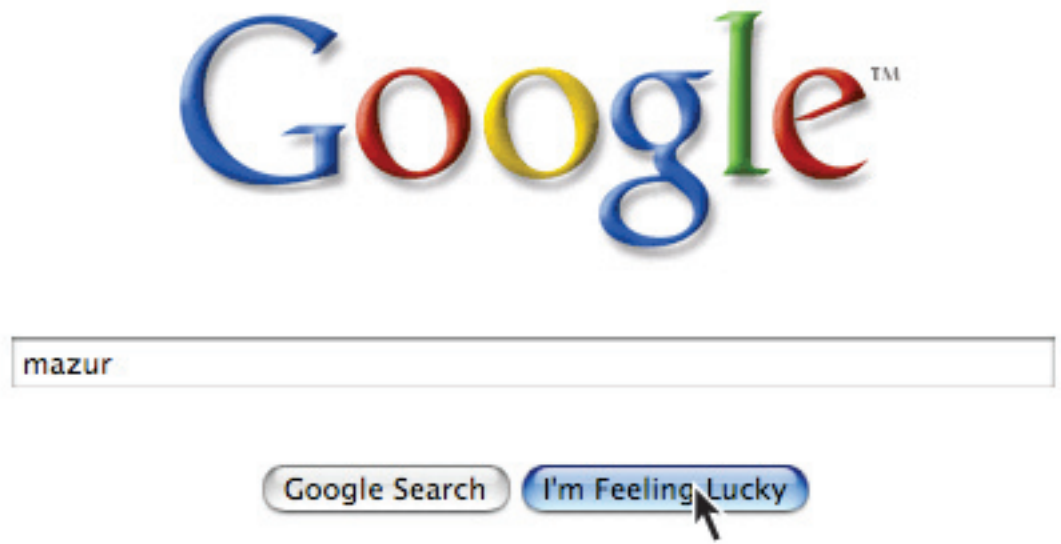
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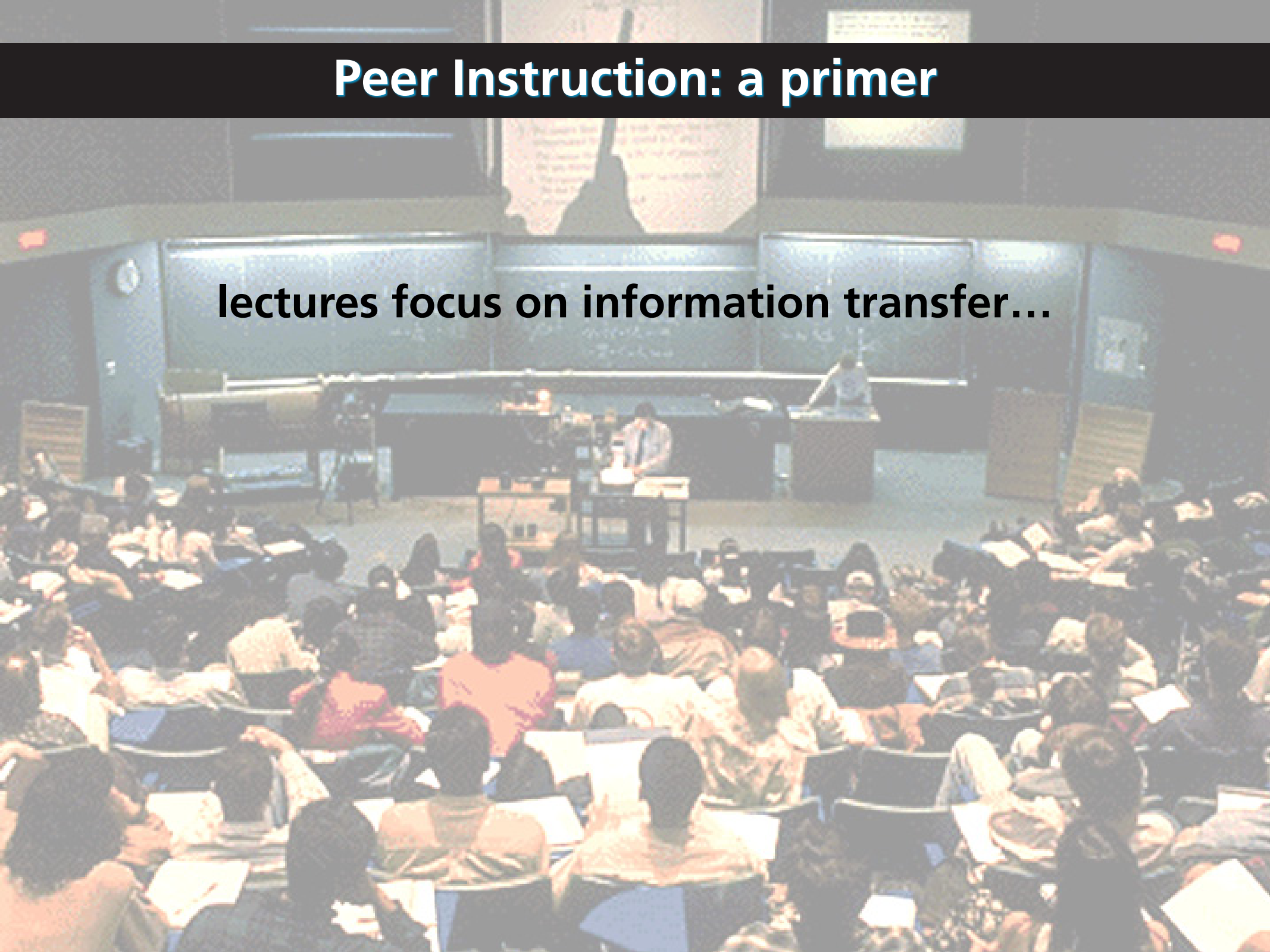
Peer Instruction Workshop

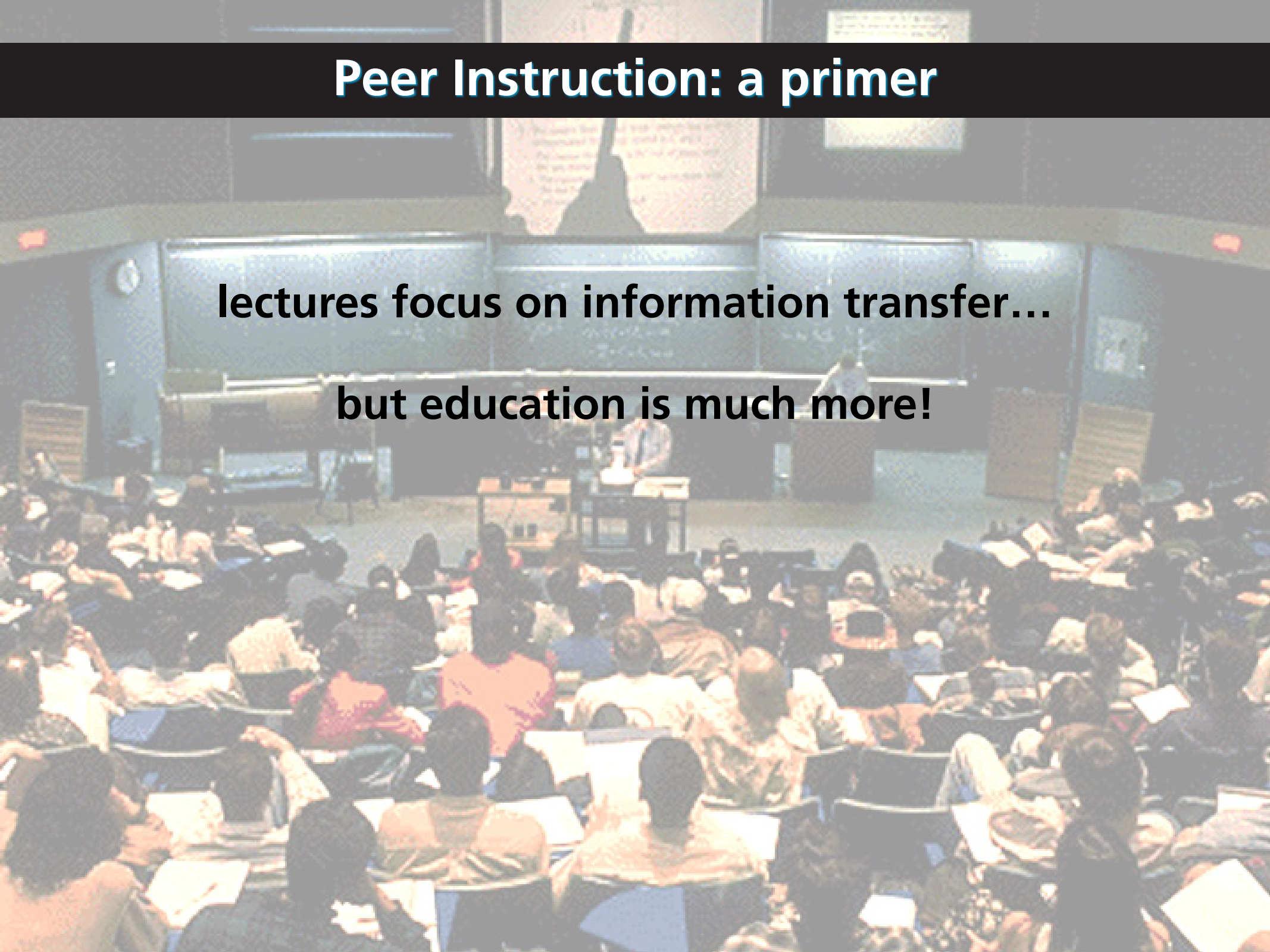
Peer Instruction Workshop
Hochschule Karlsruhe
Karlsruhe, Germany, 31 May 2013

Peer Instruction: a primer



lectures focus on information transfer…

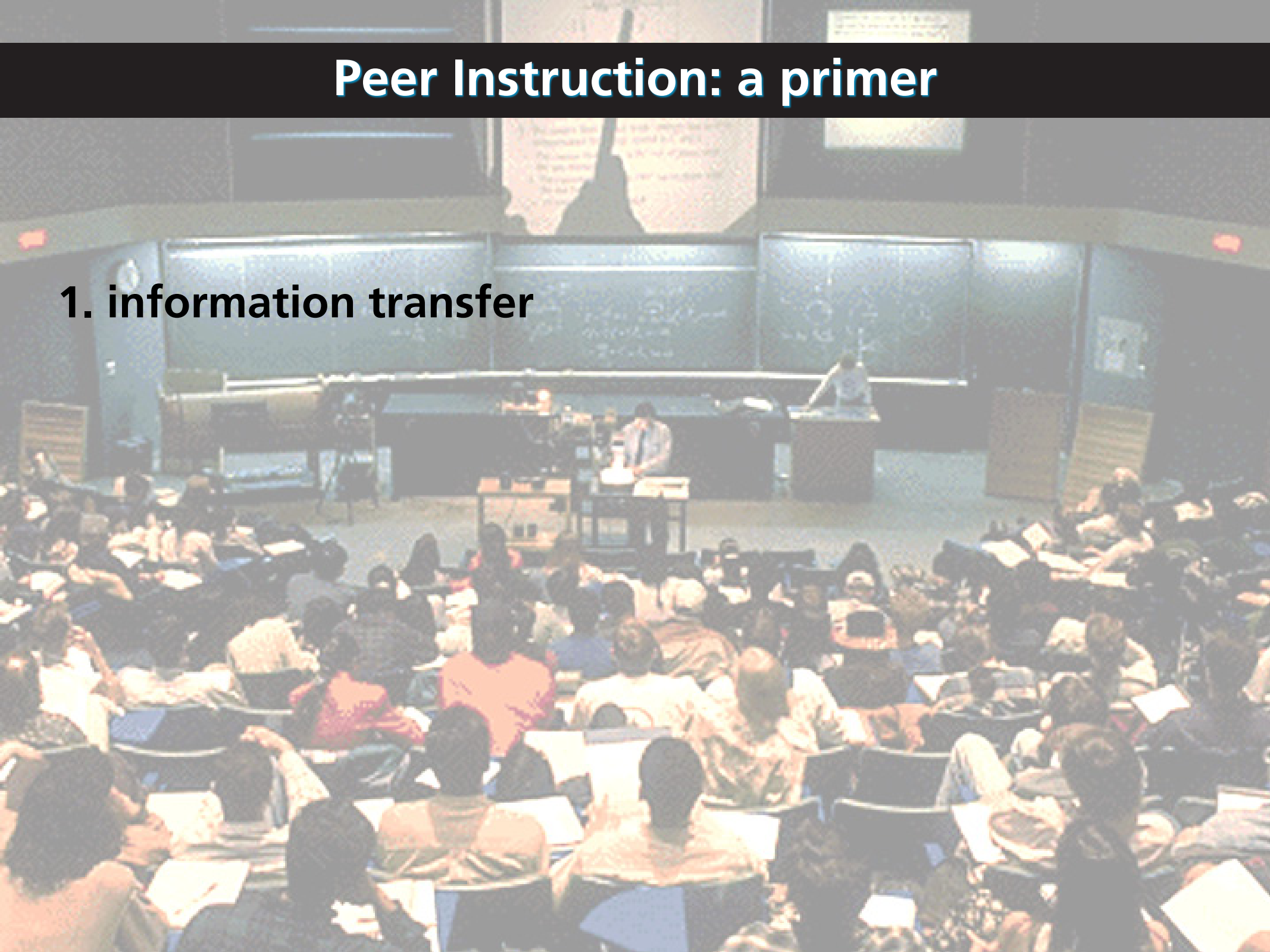
Peer Instruction: a primer



lectures focus on information transfer…

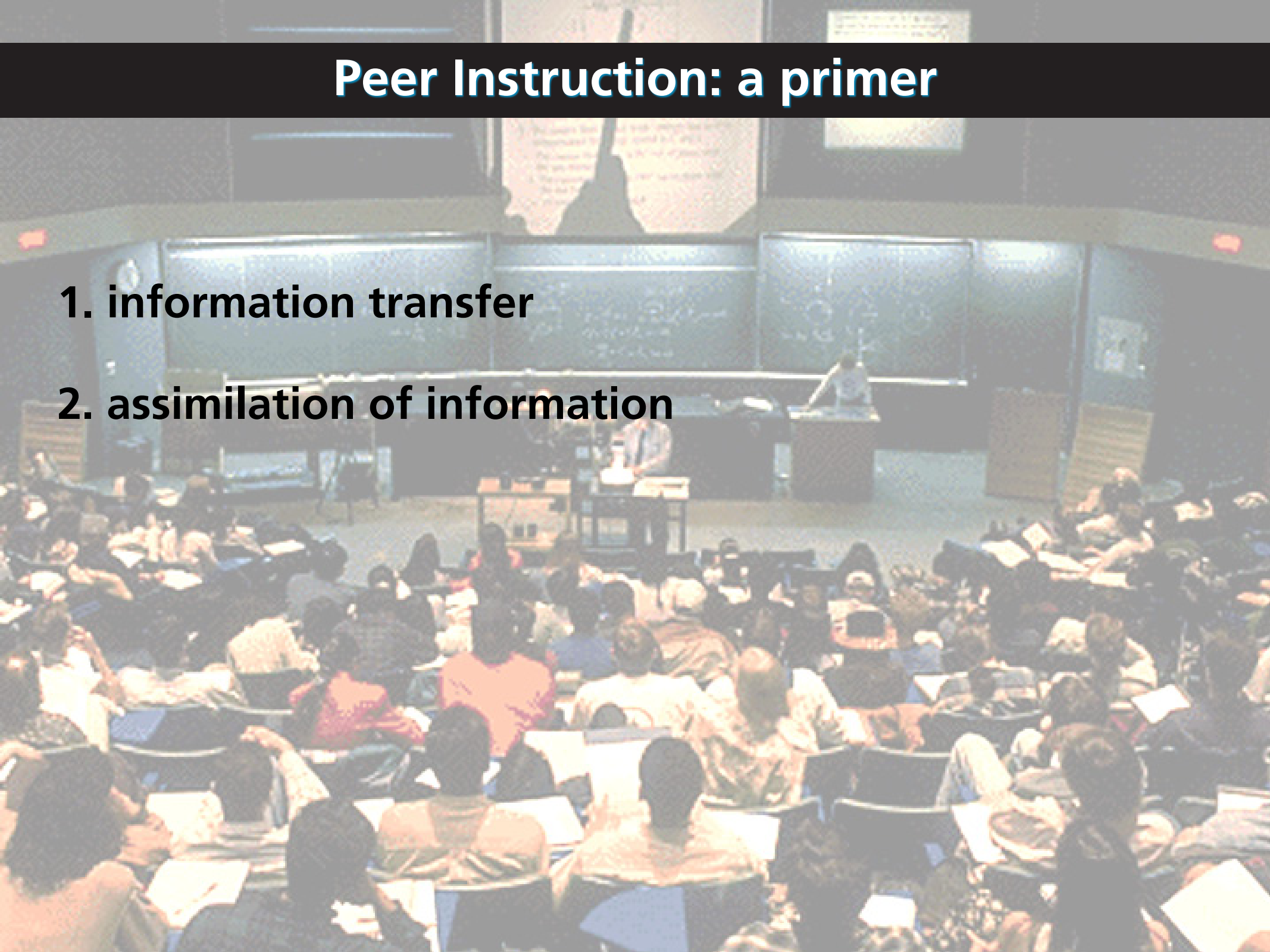
but education is much more!

Peer Instruction: a primer



1. information transfer

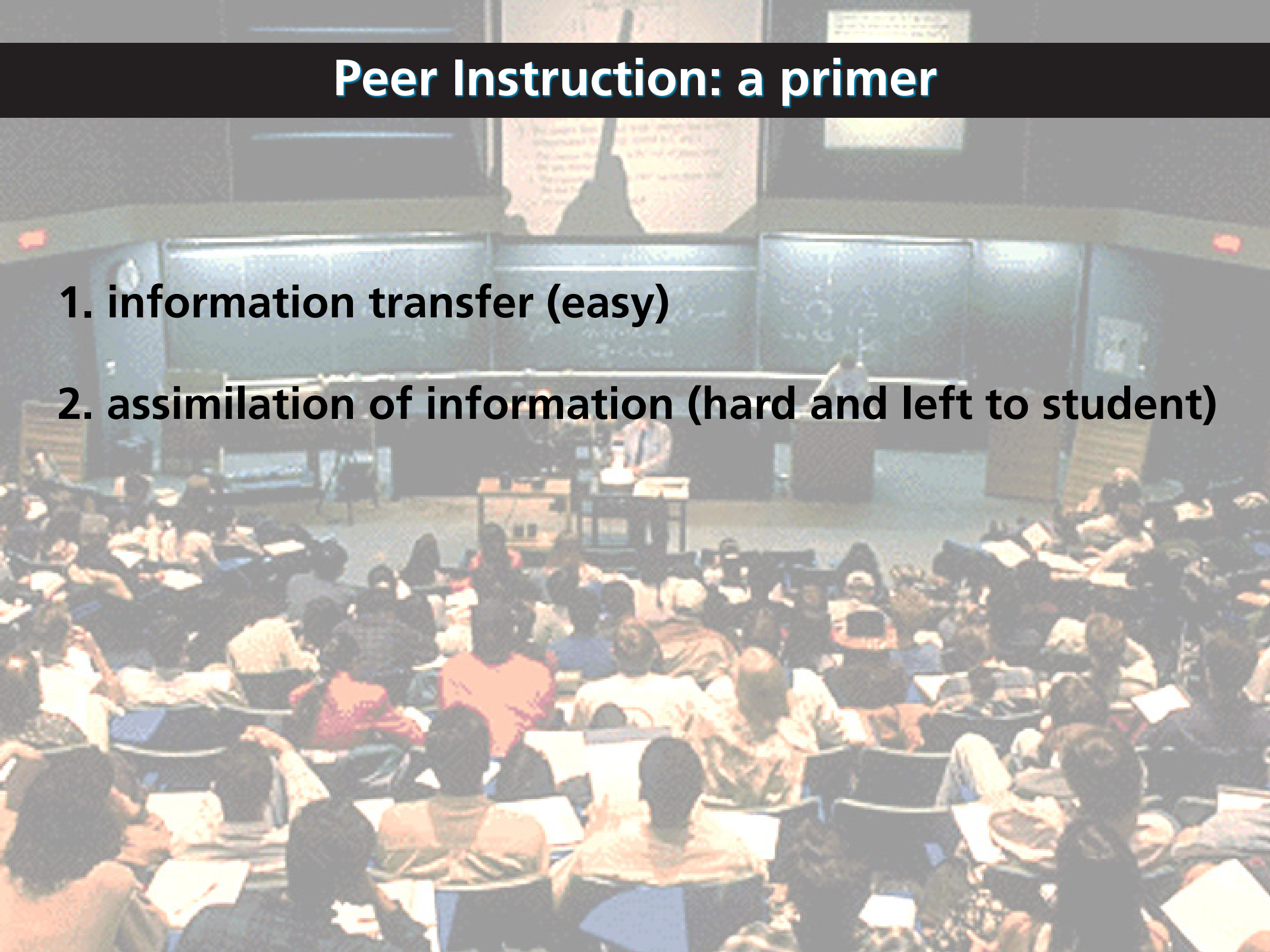
Peer Instruction: a primer



1. information transfer

2. assimilation of information

Peer Instruction: a primer



1. information transfer (easy)

2. assimilation of information (hard and left to student)

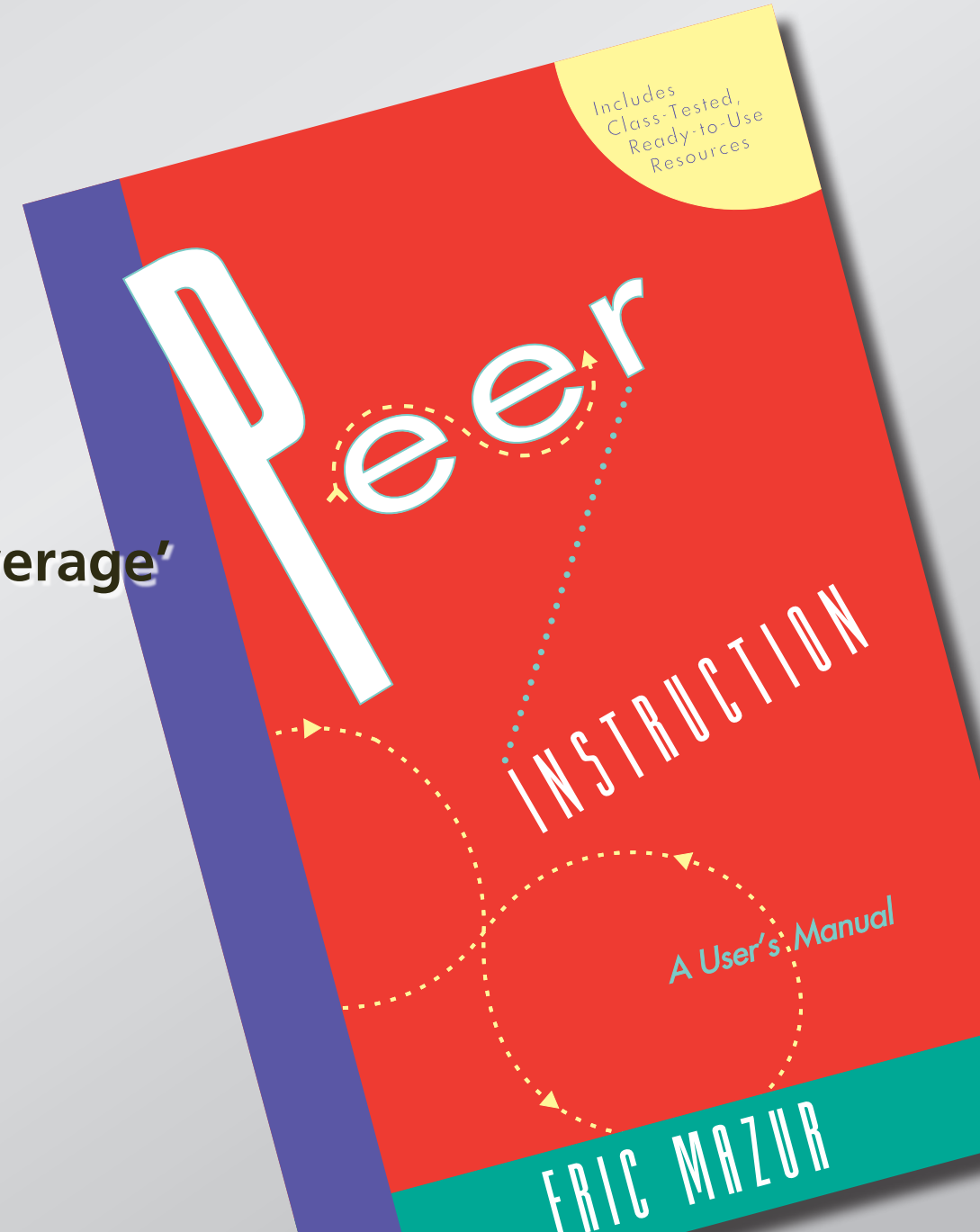
Peer Instruction: a primer

Solution: move information transfer out of classroom!

Peer Instruction: a primer

Main features:

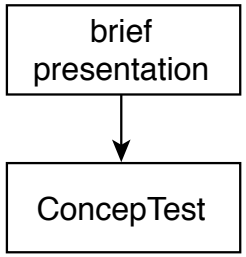
- **pre-class reading**
- **in-class: depth, not 'coverage'**
- **ConcepTests**



Peer Instruction: a primer

brief
presentation

Peer Instruction: a primer



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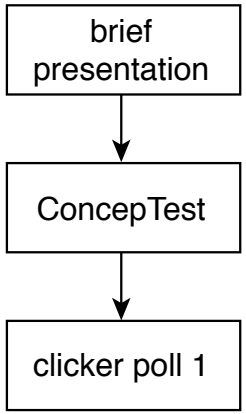

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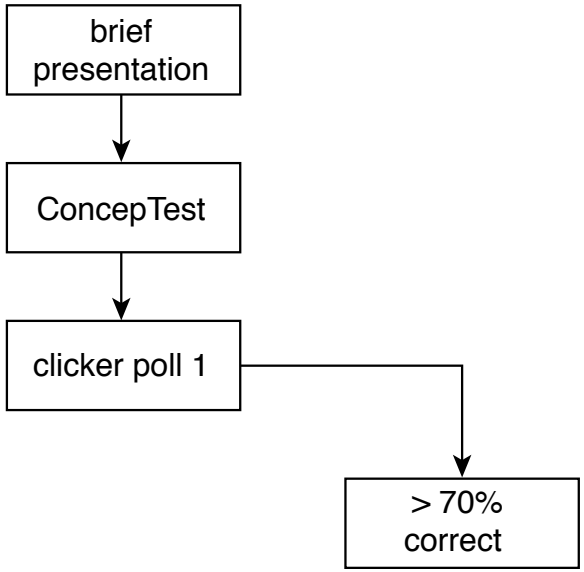

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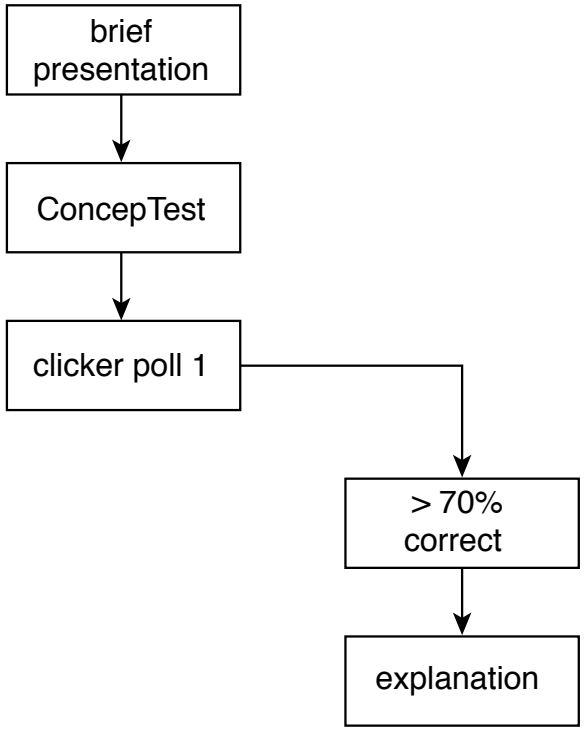

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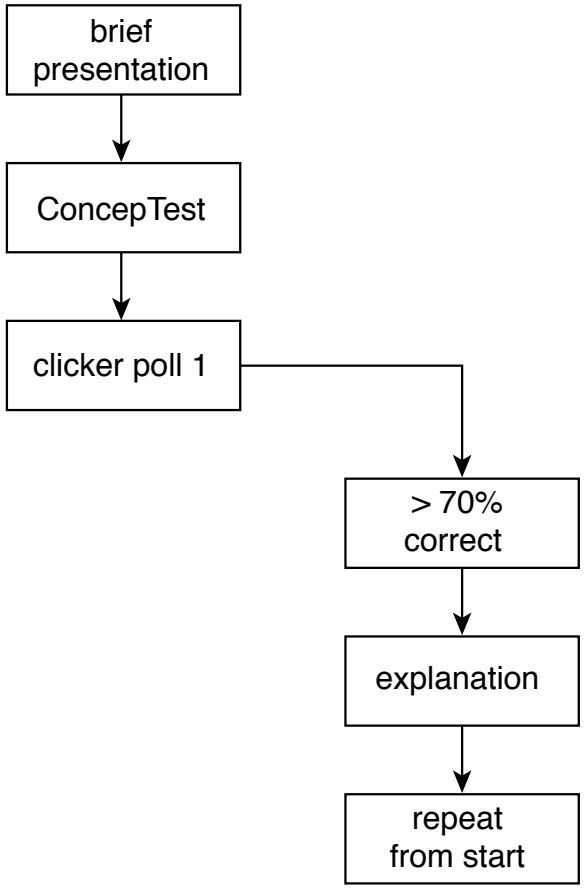

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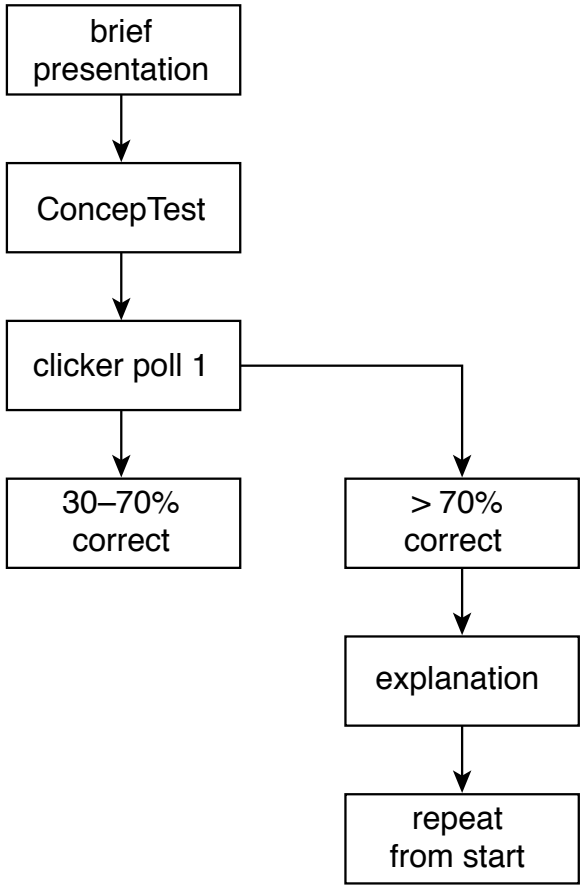

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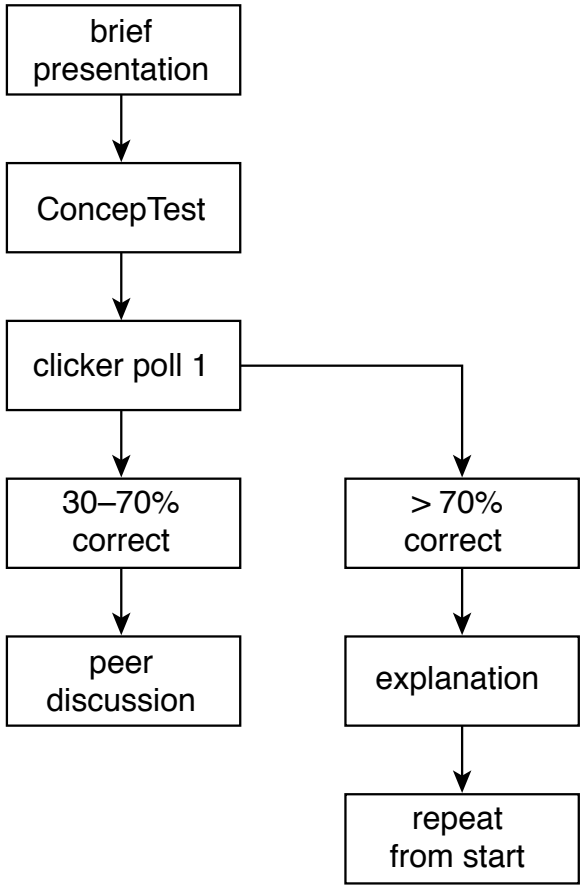

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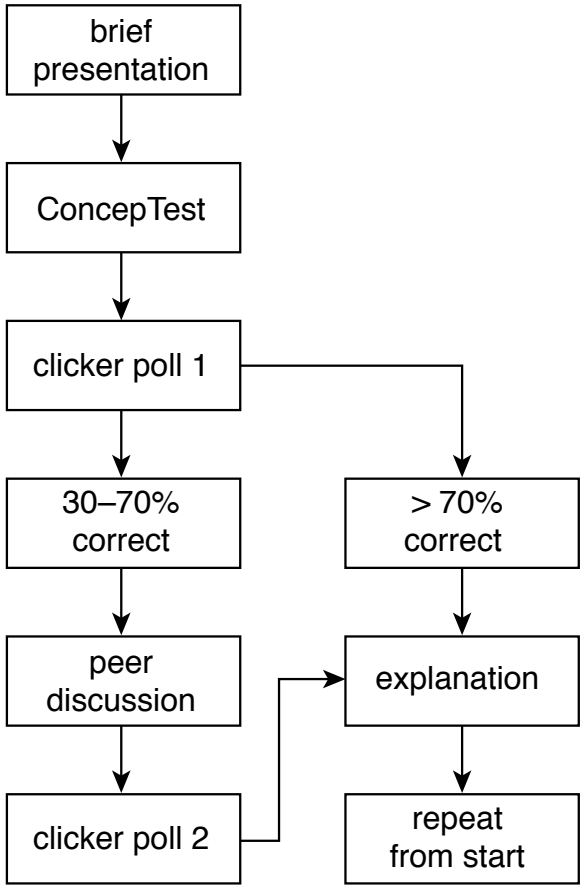

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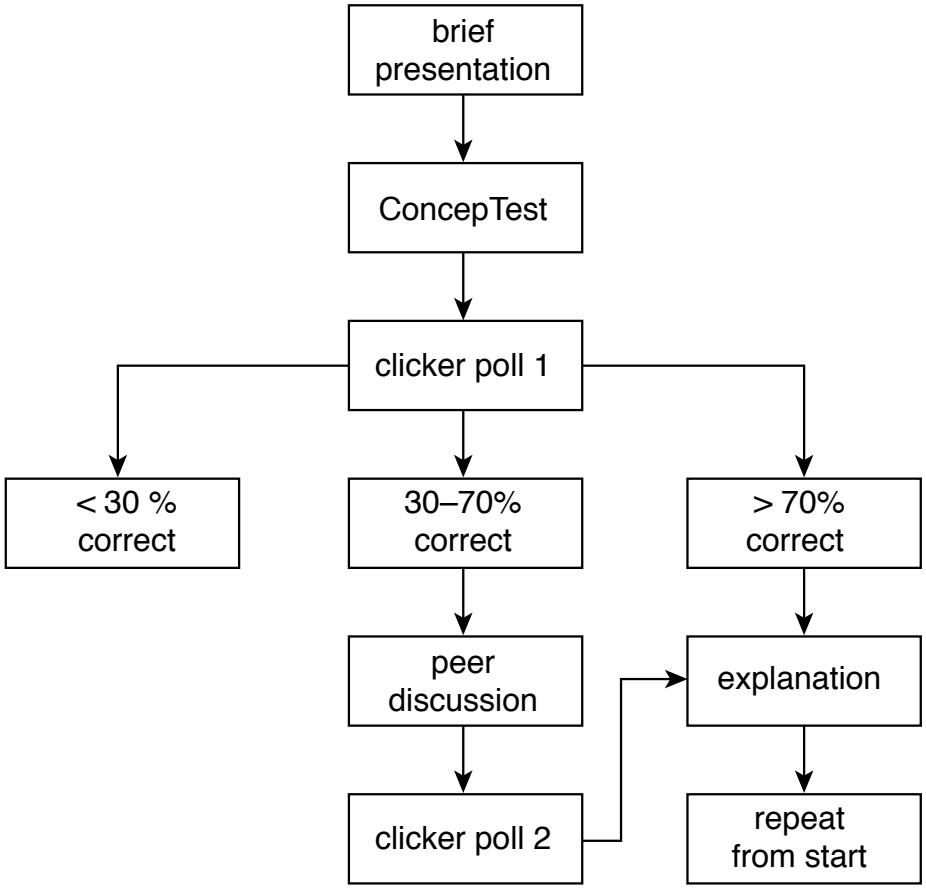

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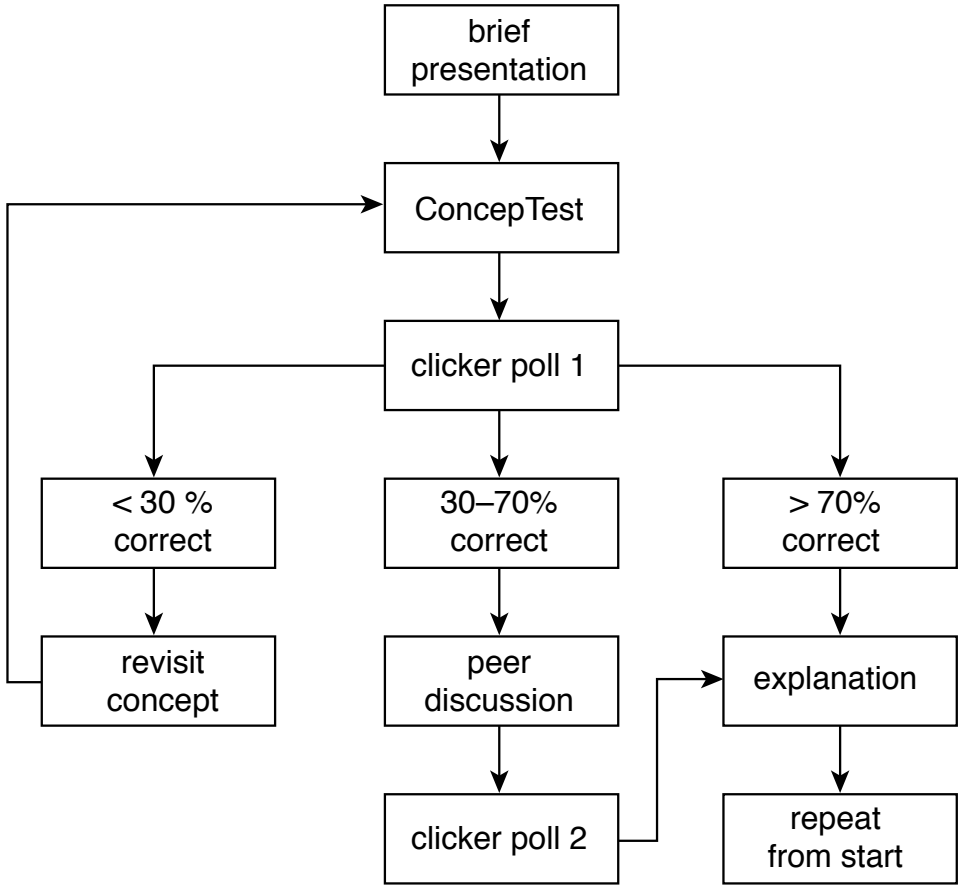

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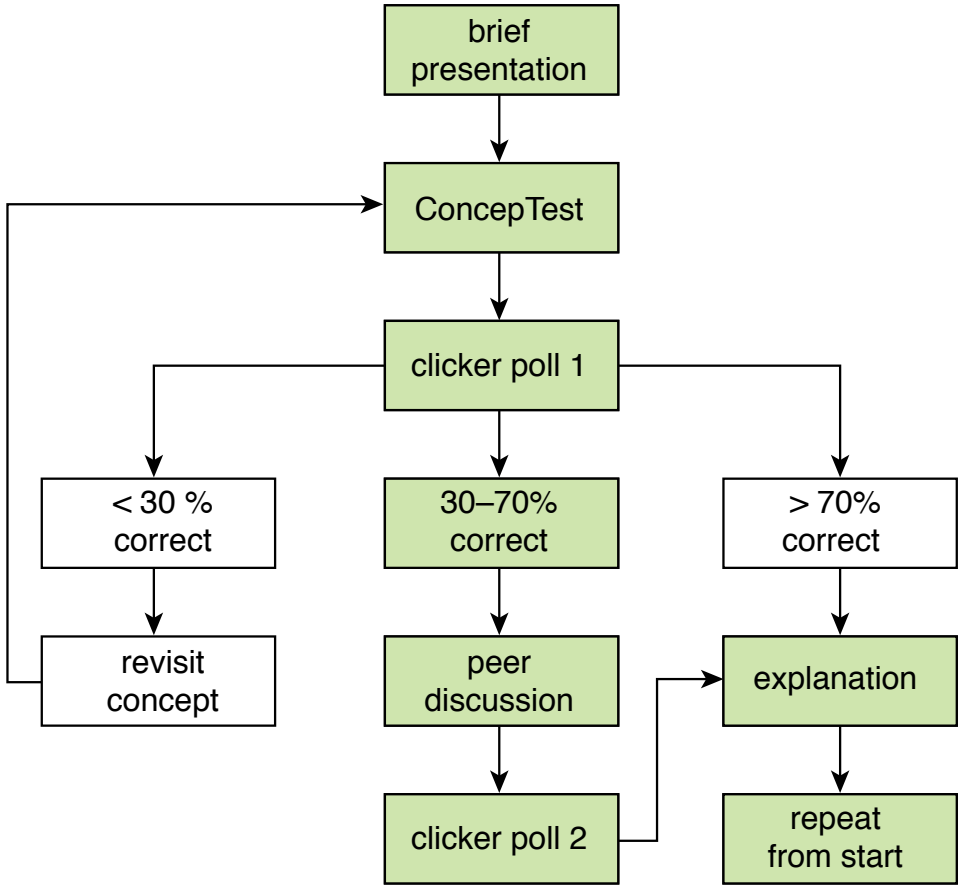


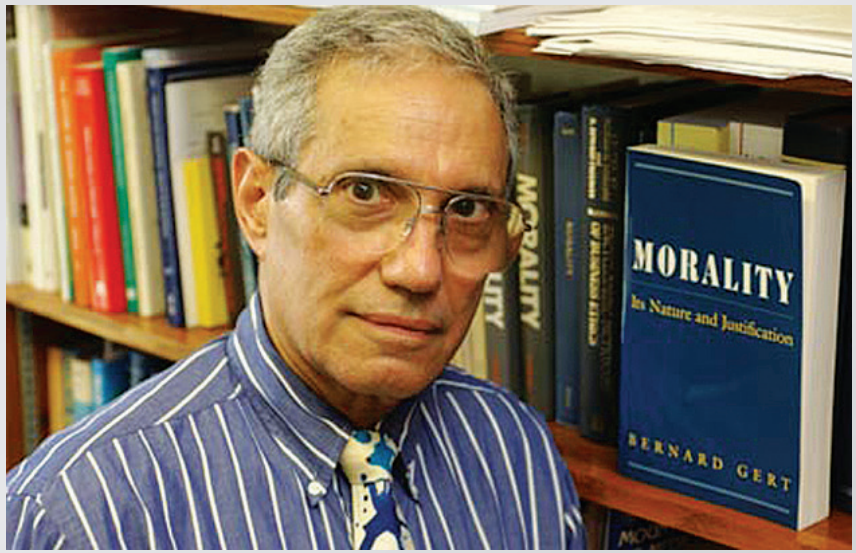
Frequently Asked Questions

“Can this method be used in my class,

where questions don’t necessarily have right answers?”

Let's try it!

Bernard Gert (1934 – 2011)

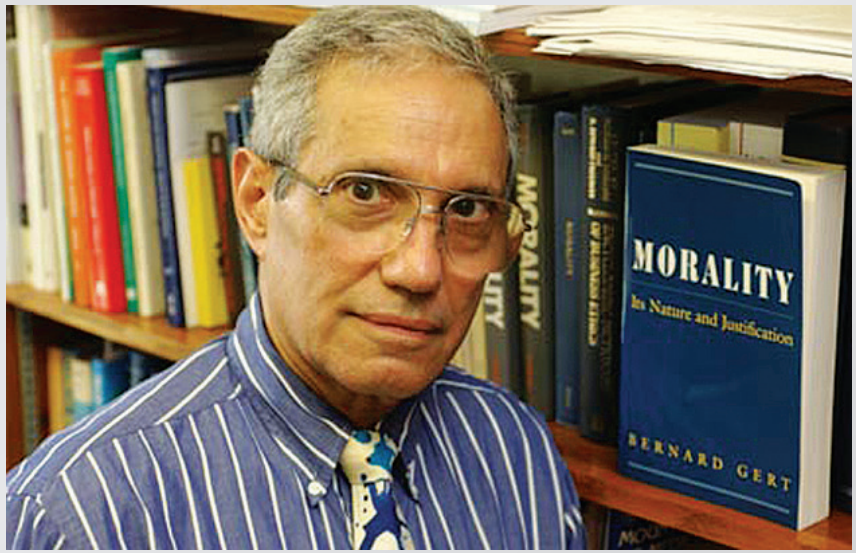


Moral philospher

Professor at Dartmouth

Let's try it!

Bernard Gert (1934 – 2011)



Moral philospher
Professor at Dartmouth

"Morality is an informal public system applying to all rational persons, governing behavior that affects others, and includes what are commonly known as the moral rules, ideals, and virtues and has the lessening of evil or harm as its goal."

Let's try it!

Bernard Gert's moral system created by 10 rules:

1. Do not kill
2. Do not cause pain
3. Do not disable
4. Do not deprive of freedom
5. Do not deprive of pleasure
6. Do not deceive
7. Keep your promises
8. Do not cheat
9. Obey the law
10. Do your duty (as required by job, circumstances).

Let's try it!

Heinz's wife was near death, and her only hope was a drug that had been discovered by a pharmacist who was selling it for an exorbitant price. The drug cost $20,000 to make, and the pharmacist was selling it for $200,000. Heinz could only raise $50,000 and insurance wouldn't make up the difference. He offered what he had to the pharmacist, and when his offer was rejected, Heinz said he would pay the rest later. Still the pharmacist refused. In desperation, Heinz broke into the store and stole the drug.

Let's try it!

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Should Heinz have broken into the store to steal the drug for his wife?

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Should Heinz have broken into the store to steal the drug for his wife?

1. Yes
2. No

Let's try it!

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Should Heinz have broken into the store to steal the drug for his wife?

1. Yes
2. No

you got all engaged!

Frequently Asked Questions

“How do I move information transfer out of classroom?”

Frequently Asked Questions

"How can I be sure that my students will prepare for class?"

Getting students to read

Students do not come to class prepared, because...

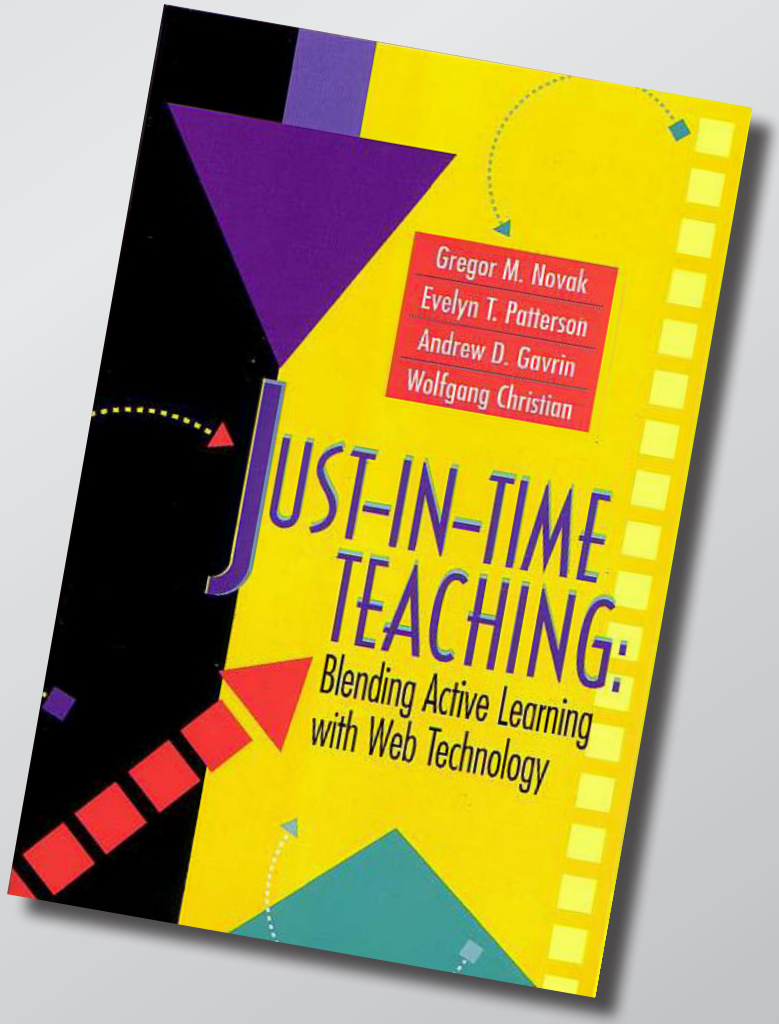
1. they don't have time.
2. they are not motivated to learn.
3. their instructors take away the incentive.
4. they do not have the requisite skills.
5. of some other reason.
6. They do come prepared in my class!

(select what you consider to be the main reason)

Getting students to read

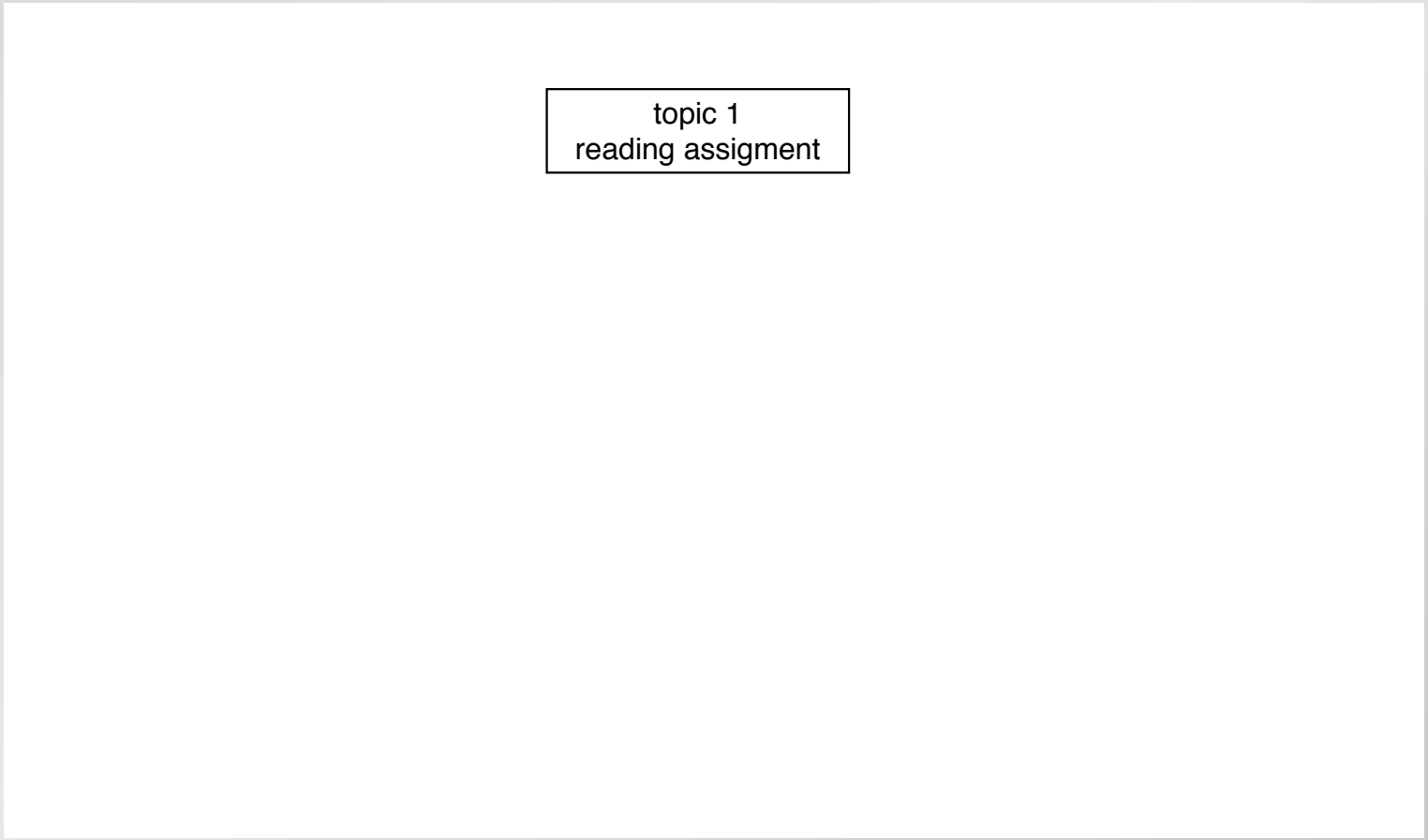
Just-in-time-Teaching (JiTT)

www.jitt.org



Getting students to read

JiTT workflow



Getting students to read

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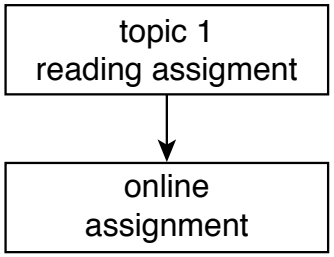
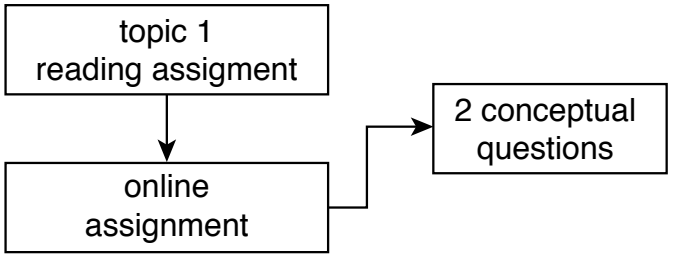


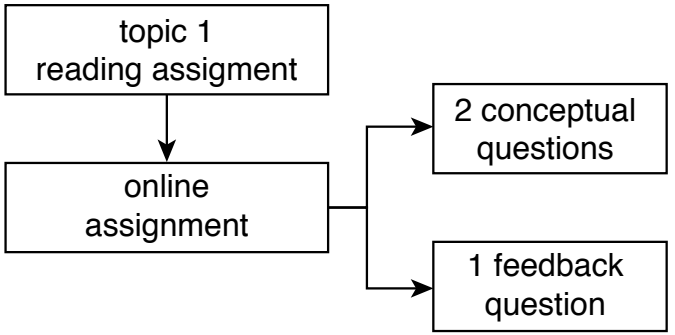
Getting students to read

JiTT workflow



Getting students to read

JiTT workflow



Getting students to read

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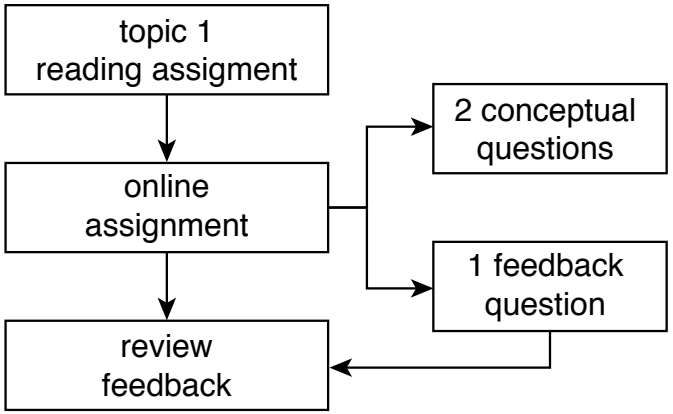

Getting students to read

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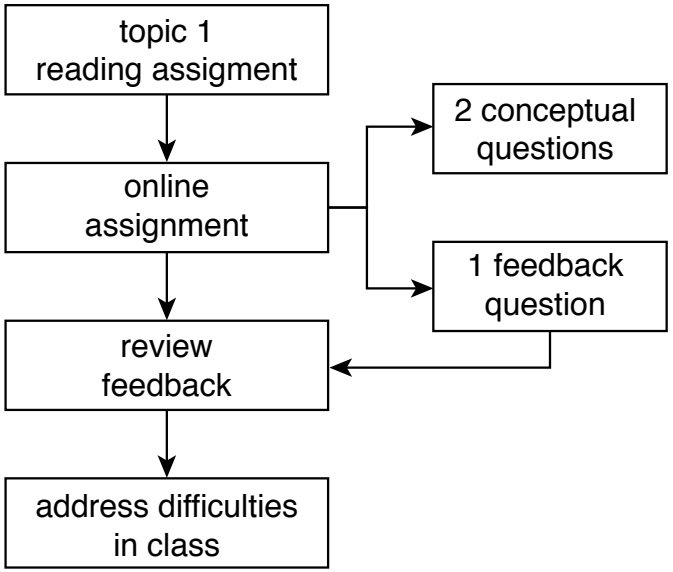

Getting students to read

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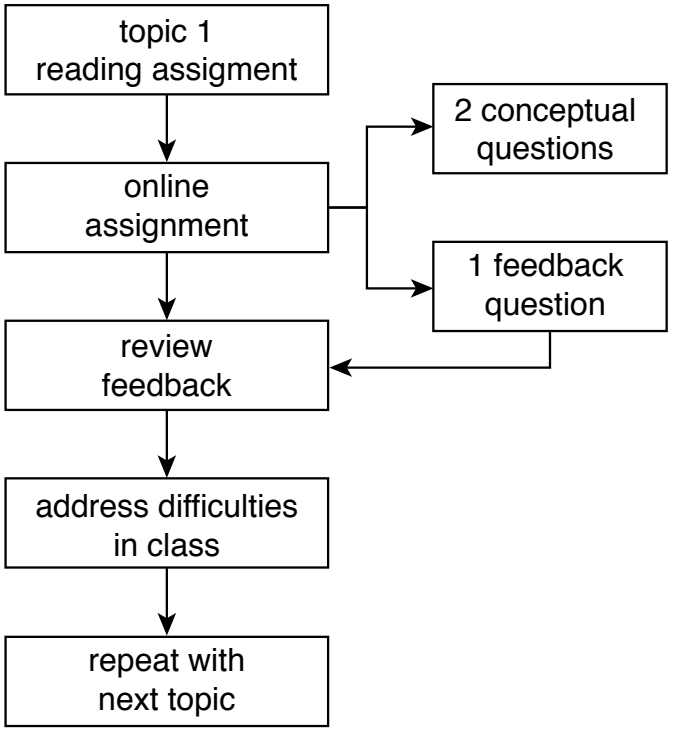
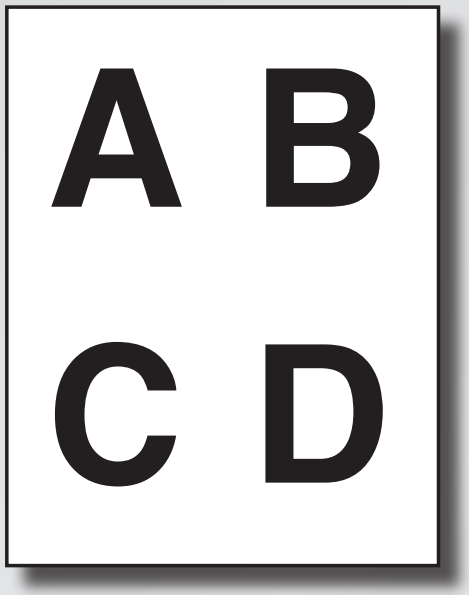


Frequently Asked Questions

“Do I need clickers?”

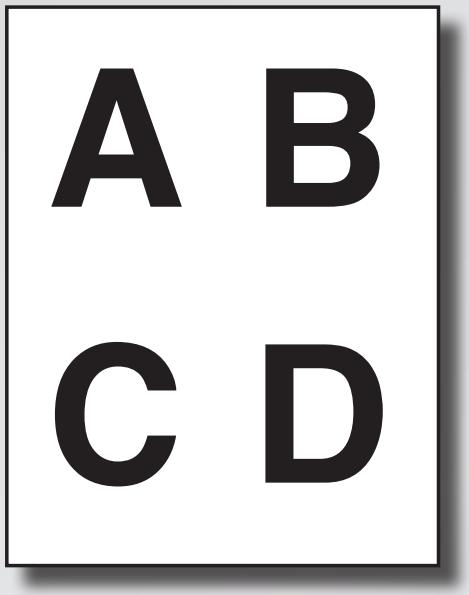
Clickers necessary?

Flashcards: simple and effective



Clickers necessary?

Flashcards: simple and effective



Meltzer and Mannivanan, South Eastern Louisiana University

Clickers necessary?

circumference

Clickers necessary?

circumference

of a circle of radius R is $2\pi R$

Clickers necessary?

Imagine a rope that fits snugly along the equator.

Clickers necessary?

Imagine a rope that fits snugly along the equator.

Suppose the rope is cut and 1 m of rope is inserted between the cut ends. If the rope were to maintain a circular shape, how far off the surface of the Earth would it float?

1. the width of a few atoms
2. the width of a few hairs
3. about 0.15 m
4. exactly 1 m
5. more than 1 m

Clickers necessary?

You all got fired up!

Clickers necessary?

You all got fired up!

(WITHOUT CLICKERS!)

Clickers necessary?

Imagine a rope that fits snugly along the equator.

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Clickers necessary?

circumference at the equator:

$$2\pi R_{\mathrm{E}}$$

Clickers necessary?

circumference at the equator:

$$2\pi R_{\mathrm{E}}$$

new circumference:

$$2\pi R_{\mathrm{E}} + 1\ \mathrm{m}$$

Clickers necessary?

circumference at the equator:

$$2\pi R_{\mathrm{E}}$$

new circumference:

$$2\pi R_{\mathrm{E}} + 1\ \mathrm{m}$$

radius of circle with new circumference:

$$2\pi R = 2\pi R_{\mathrm{E}} + 1\ \mathrm{m}, \quad \textbf{and so} \quad R = R_{\mathrm{E}} + \frac{1\ \mathrm{m}}{2\pi}.$$

Clickers necessary?

It’s not the technology, but the pedagogy!

Clickers necessary?

It's not the technology, but the pedagogy!

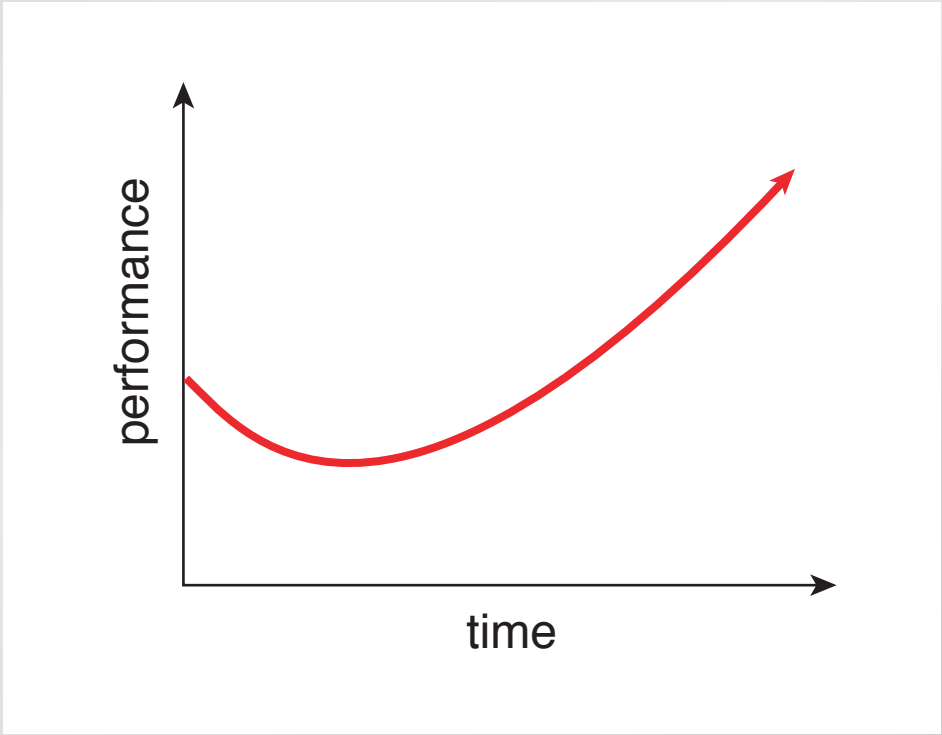
(but clickers do offer advantages)

Frequently Asked Questions

"How do I deal with students who resist this new approach to studying?"

Student resistance

After changing, things might get *worse* before they get better!



Student resistance

Written on Wednesday Feb 16, two weeks into the course:

> Subject: concerns
>
> Professor Mazur,
>
> Here are a few concerns. I speak for many of my classmates.
>
> 1) You are giving us WAY to much work. After spending multiple hours on the problem set, and not being able to figure out many of the questions, I now see that we have an additional 6 or 7 pages or homework in the workbook. I just spent 4 hours on the lab, and I am not confident on almost half of the questions. This is more work than I have had all semester in all of my other classes combined.
>
> 2) If you are going to give us this much work, I would suggest re-structuring the lectures. I find the readings very difficult to understand. I am not a bad student (I got a solid A in physics 1a), but it is very difficult to internalize the readings. You should spend most of the lecture going over, point by point, the readings in their entirety. While the PRS clickers are fun, they do not help me understand the complex material.
>
> I am extremely flustered by the incredibly large amount of work, and my inability to understand it, and I am strongly considering dropping the course.

Student resistance

Written on Monday May 23, just after the final exam:

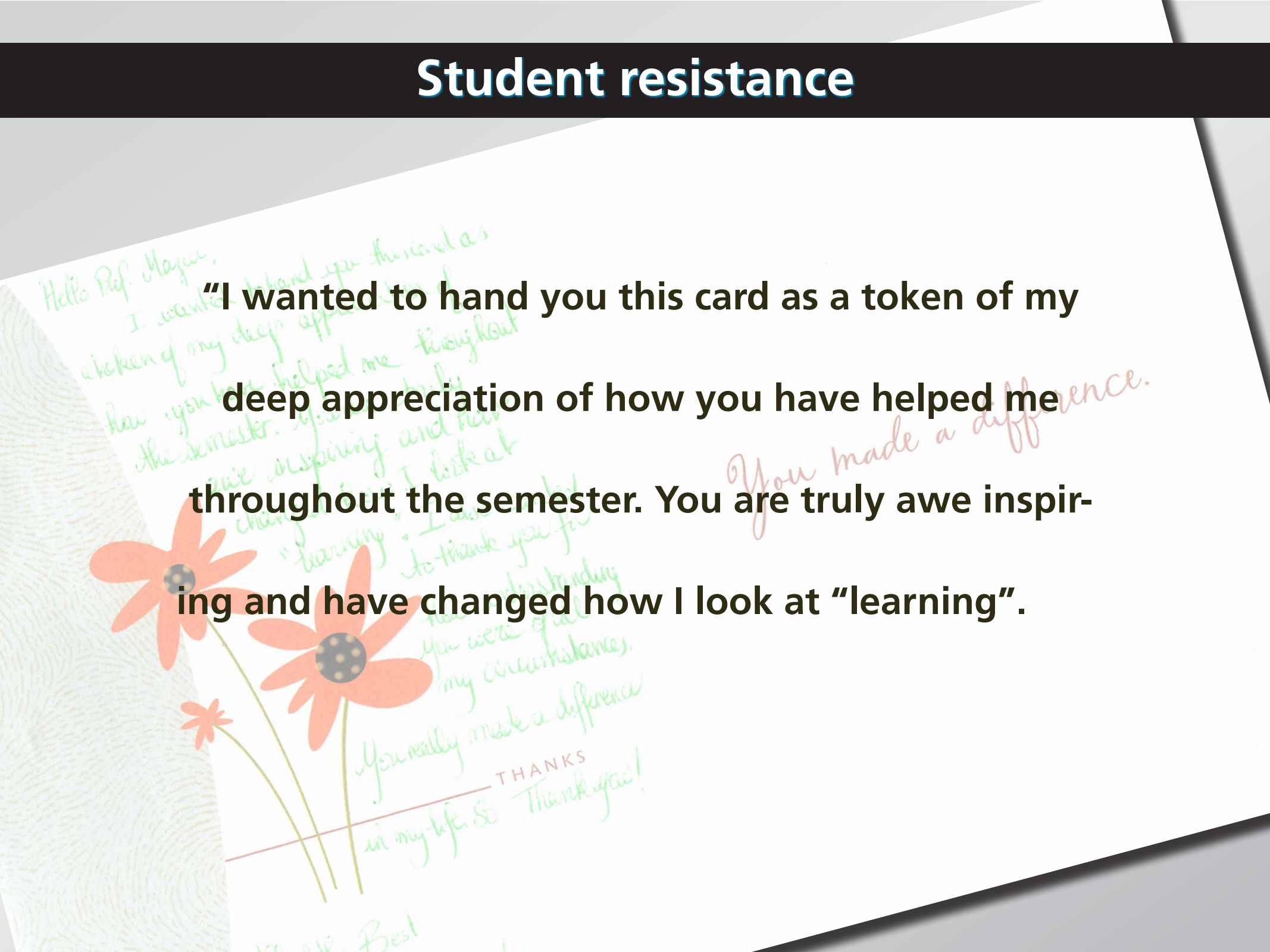
> Subject: Thanks!
>
> Professor Mazur,
>
> First of all I want to thank you for a great semester. You are an excellent professor, and it is clear that you truly care about each and every student.
>
> The exam went well today. I'm not sure to what extent you will curve the final grades (if at all), but it looks like I may be right around the cutoff point between an A and an A-. I studied as hard as I could and I'm keeping my fingers crossed about the A, but no matter what happens with my grade you should know that you are one of the best professors that I have ever had at Harvard.
>
> Thanks again!

Student resistance

Student resistance

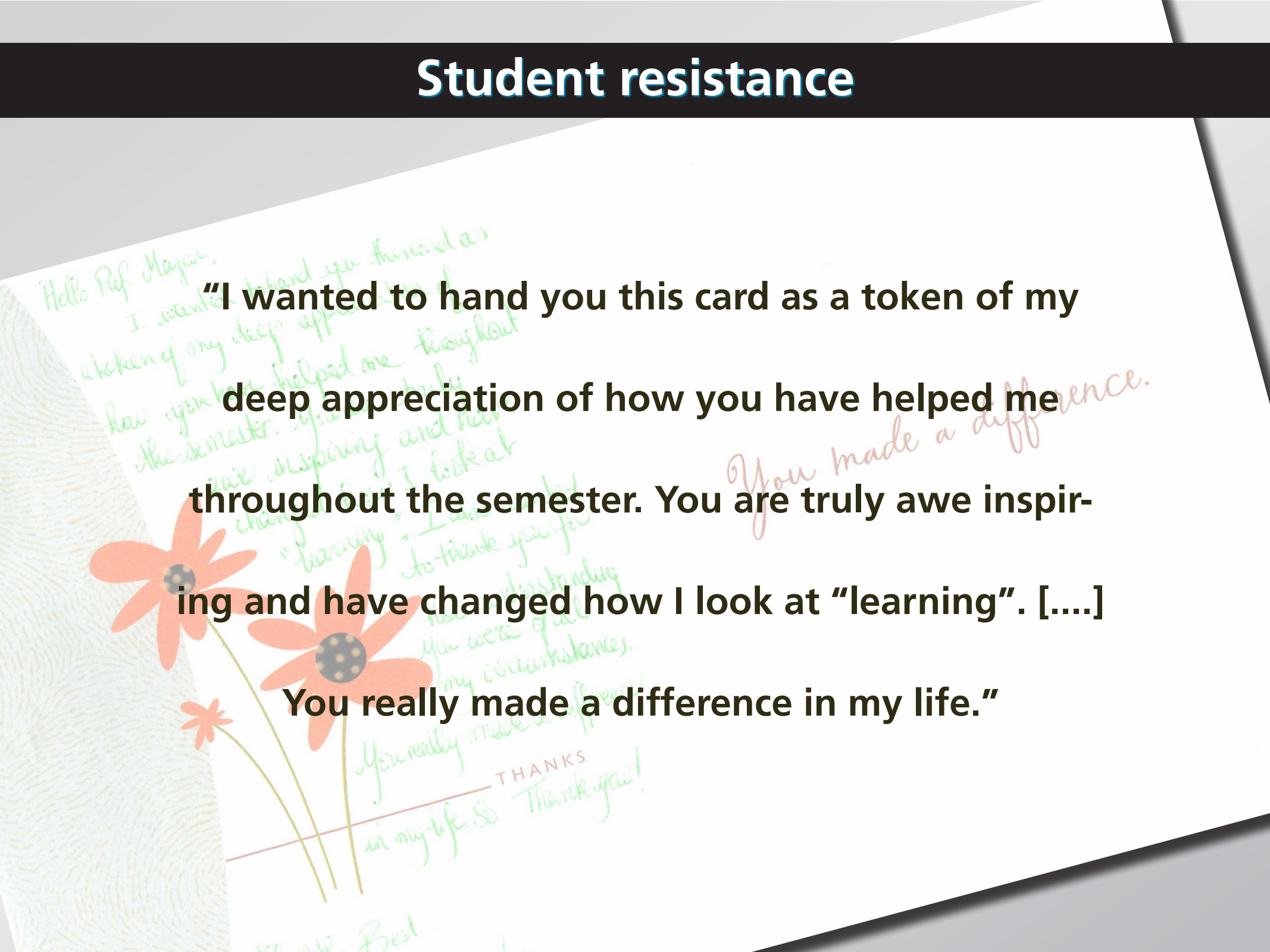
"I wanted to hand you this card as a token of my deep appreciation of how you have helped me throughout the semester.

Student resistance



"I wanted to hand you this card as a token of my deep appreciation of how you have helped me throughout the semester. You are truly awe inspiring and have changed how I look at "learning".

Student resistance



"I wanted to hand you this card as a token of my deep appreciation of how you have helped me throughout the semester. You are truly awe inspiring and have changed how I look at "learning". [....] You really made a difference in my life."

Student resistance

and don’t forget…

Student resistance

and don’t forget…

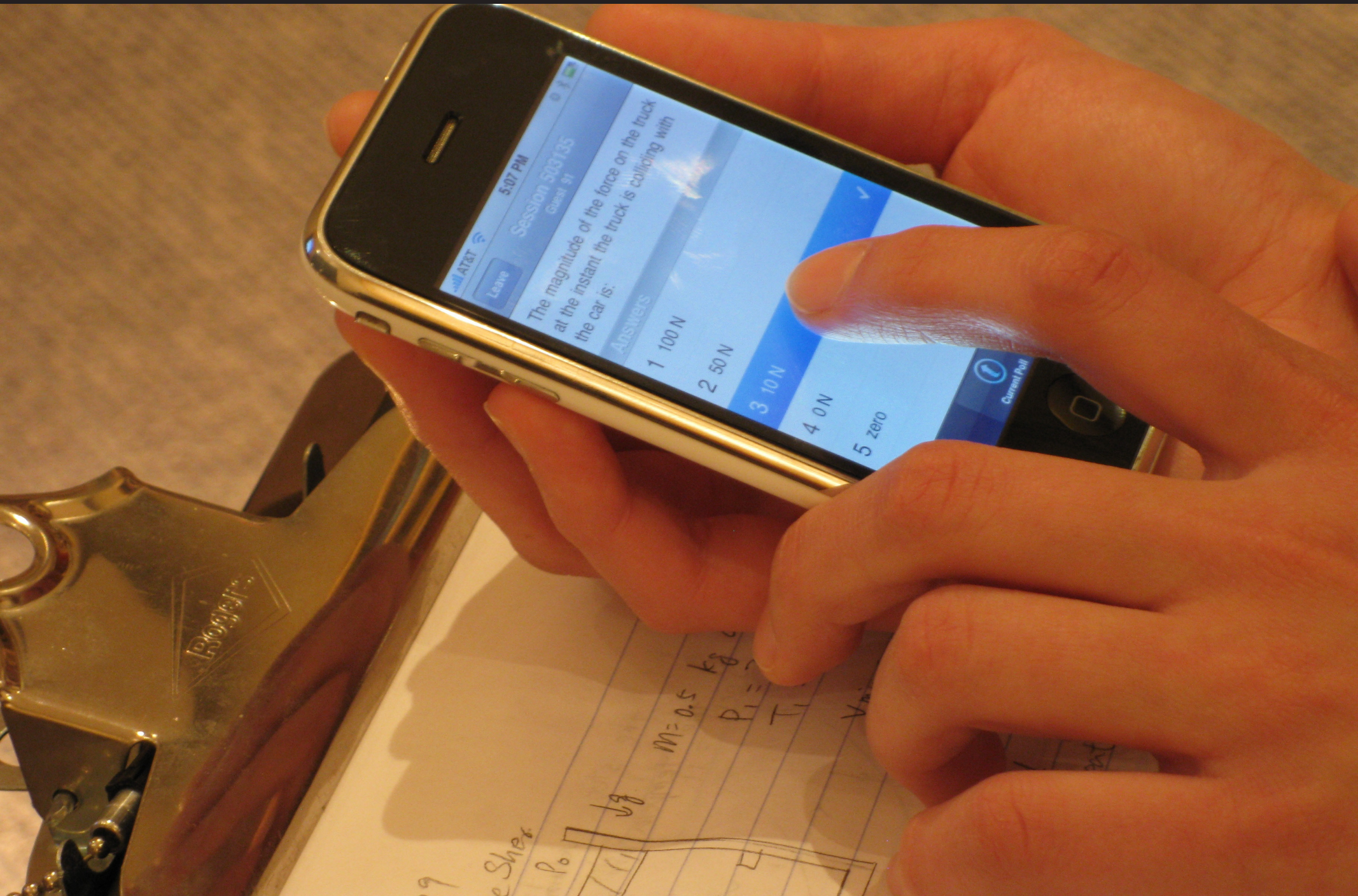
PI leads to better learning and retention!

Getting started

“I still need help getting started…”

Join now!
PeerInstruction.net

Summary


AT&T
5:07 PM
Session 5051755
Guest 51
Leave
The magnitude of the force on the truck at the instant the truck is colliding with the car is:
Answers
1 100 N
2 50 N
3 10 N
4 0 N
5 zero
Current Poll

Summary

PI easy to implement (and improves learning gains)

Summary

PI easy to implement (and improves learning gains)

technology facilitates active engagement (but not required)

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