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The Tyranny of the Lecture



Simon Fraser University
Burnaby, BC, 22 January 2015



The Tyranny of the Lecture



@eric_mazur

Simon Fraser University
Burnaby, BC, 22 January 2015









1 lecture

2 PI



1 lecture

2 PI


3 PI 2.0



1 lecture

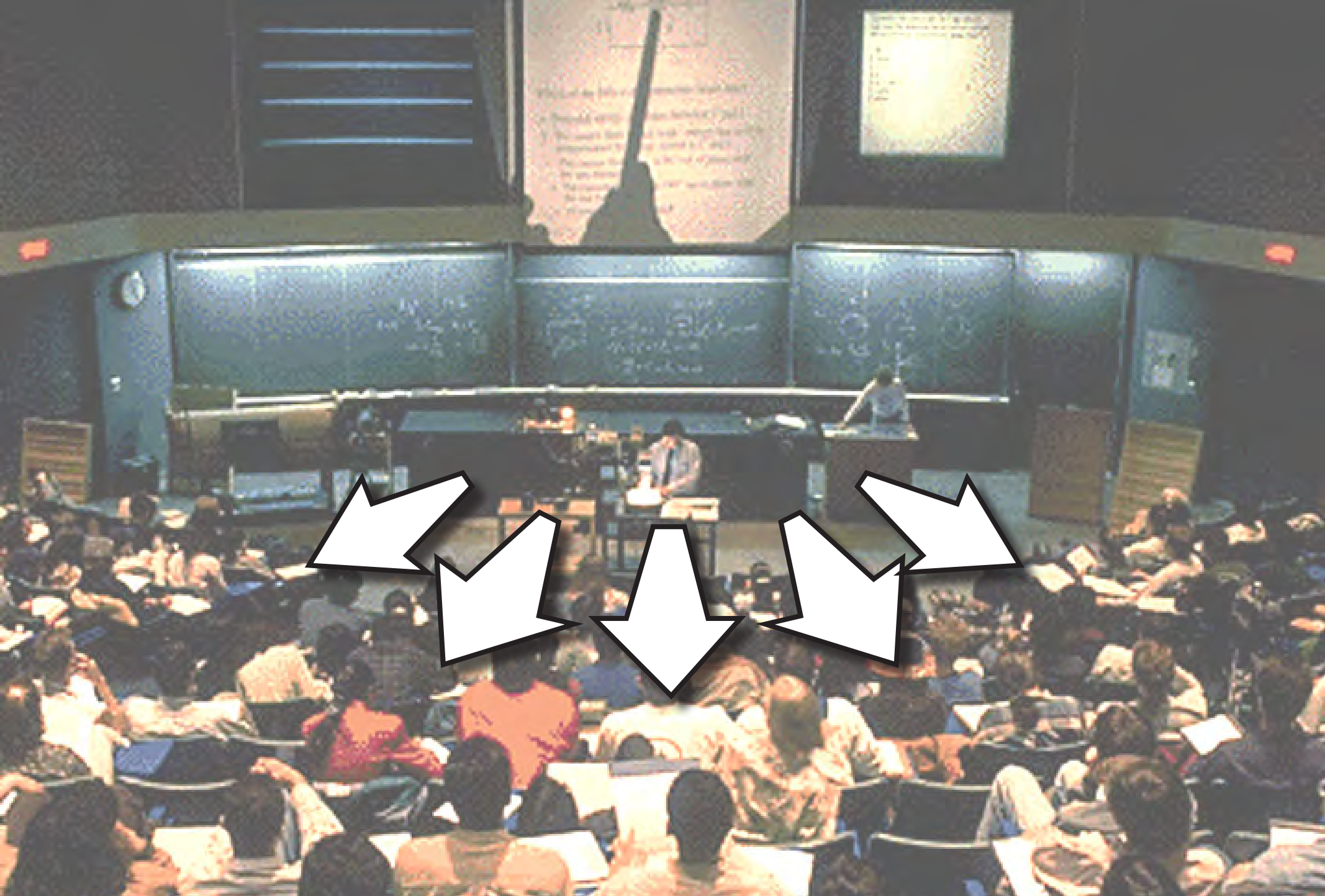
2 PI

3 PI 2.0



**What happens
in a lecture?**





in a lecture, students...

in a lecture, students...

1. don't pay utmost attention

in a lecture, students...

- 1. don't pay utmost attention**
- 2. think they know it**

in a lecture, students...

- 1. don't pay utmost attention**
- 2. think they know it**
- 3. are not confronted with misconceptions**

in a lecture, students...

1. don't pay utmost attention

2. think they know it

3. are not confronted with misconceptions

**false
sense of security**

The background is a painting of a face, focusing on the eyes. The eyes are large, blue, and highly detailed with visible brushstrokes. The face is rendered in a style that suggests a classical or expressionist influence. The text 'an illusion...' is written in a bold, red, serif font across the center of the image. The dots at the end of the text are also red and match the font style.

an illusion...





1. transfer of information



1. transfer of information

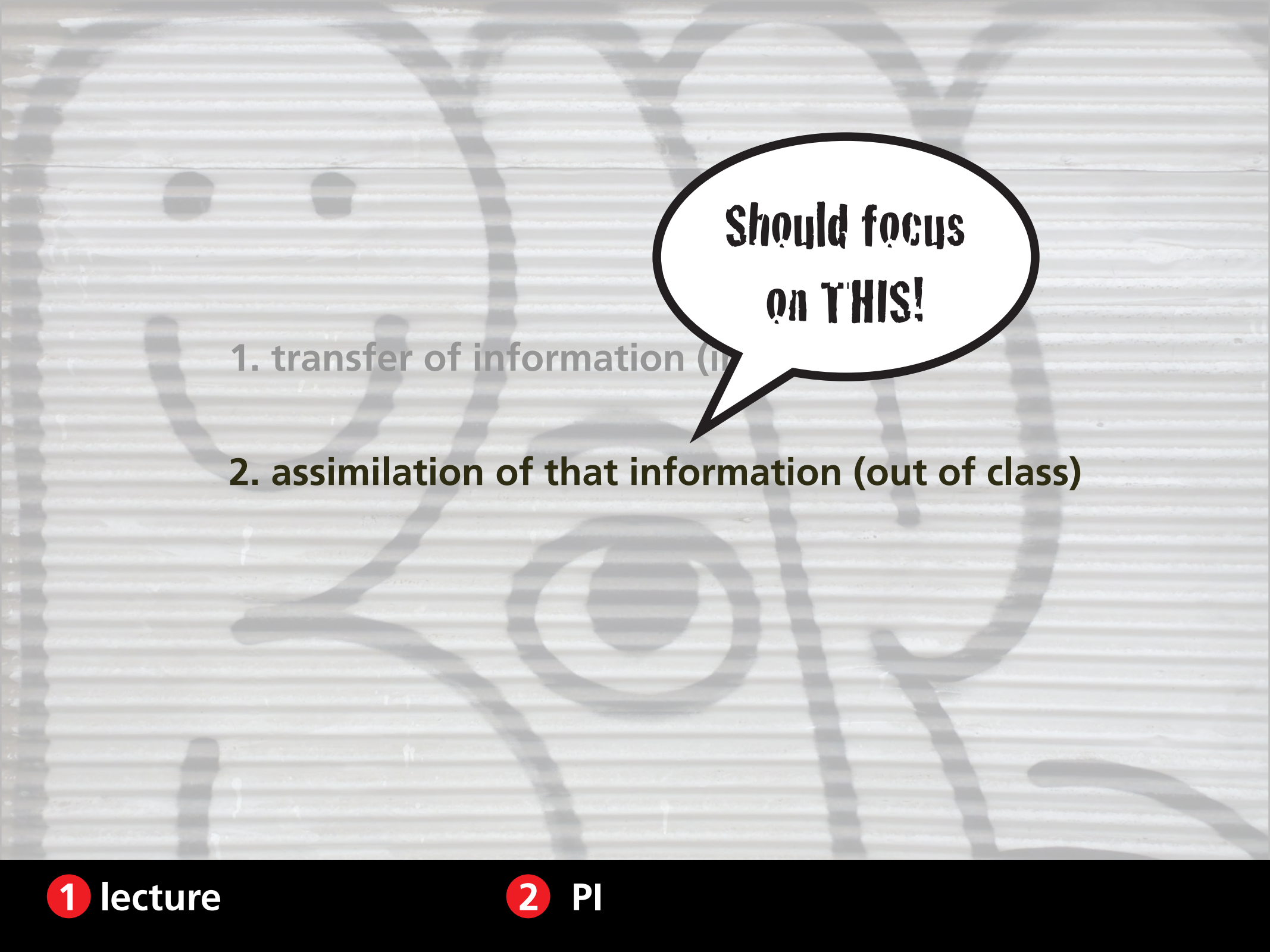
2. assimilation of that information



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)



1. transfer of information (out of class)

2. assimilation of that information (in class)

A photograph of a man in a grey plaid suit and red tie leaning over a green plastic chair in a lecture hall. He is looking down at a student with long blonde hair who is sitting. Another student with dark hair is visible behind her. The background shows other students and a wooden wall.

question



question



think



question



think



poll



question



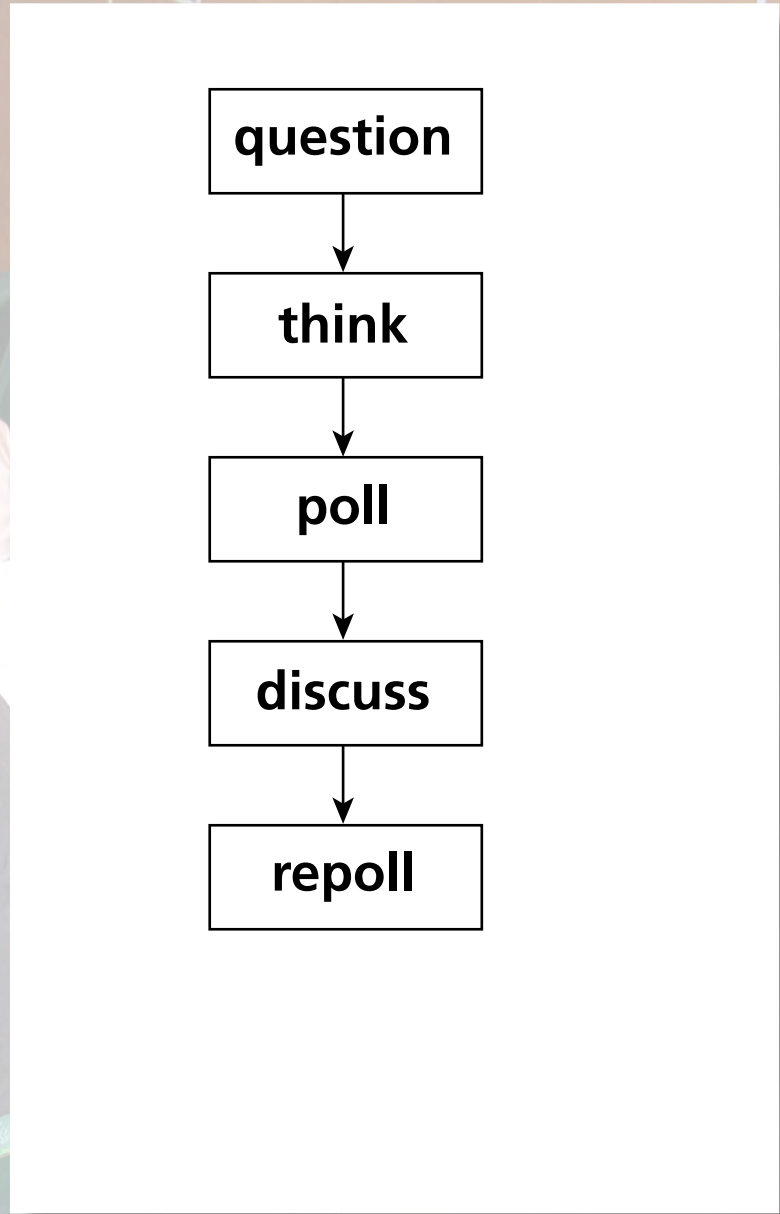
think

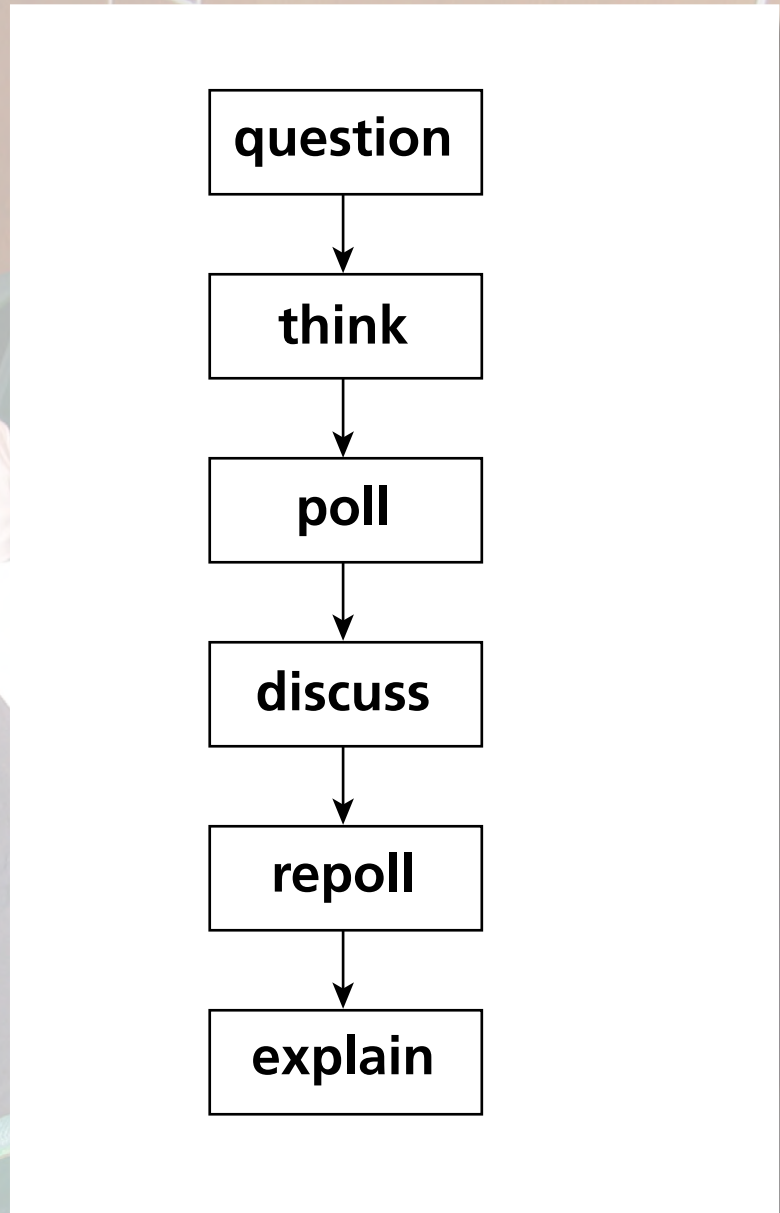


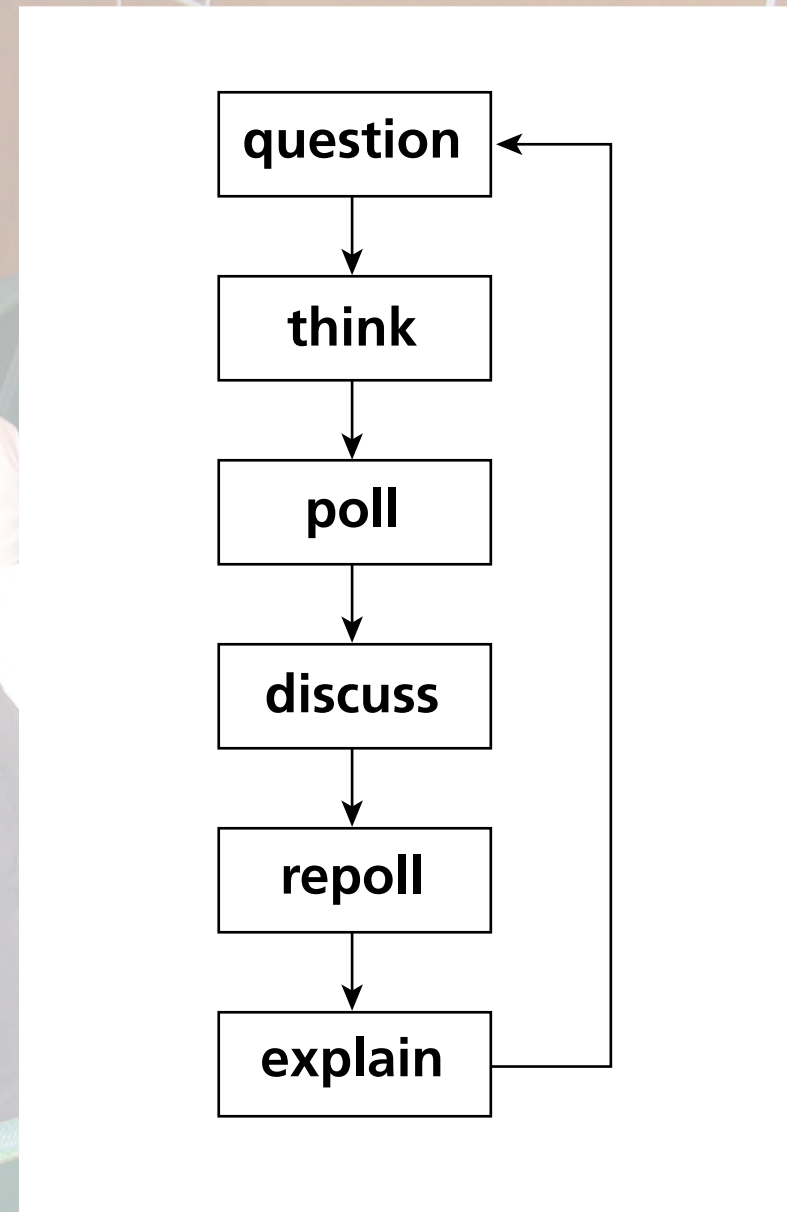
poll

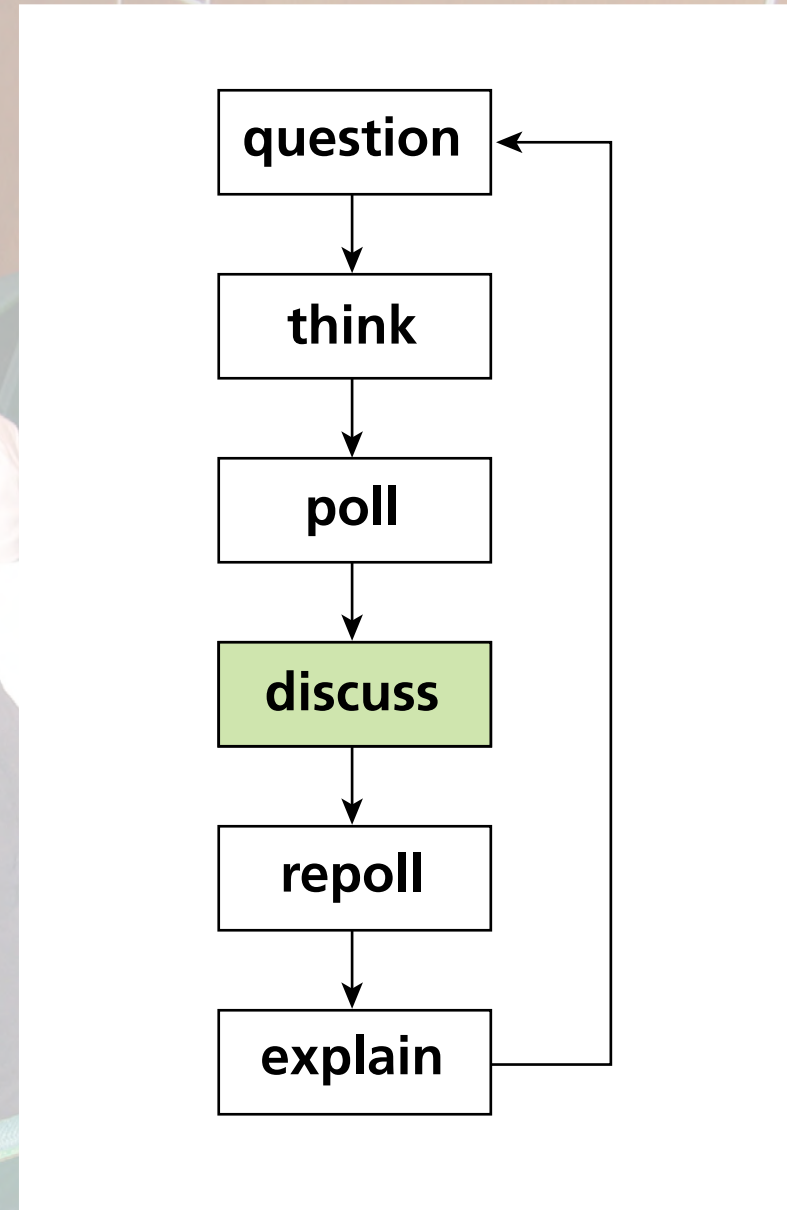


discuss









1 lecture

2 PI

Speak

speak



question

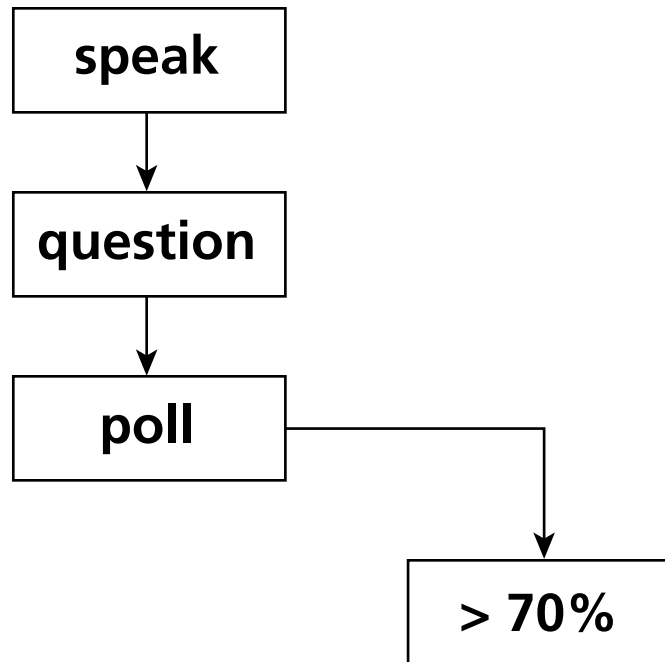
speak

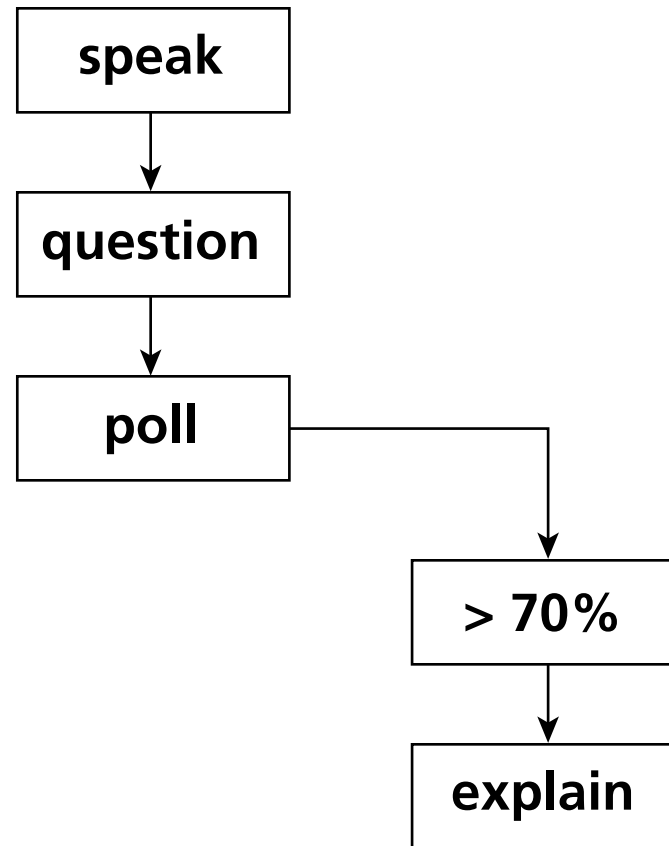


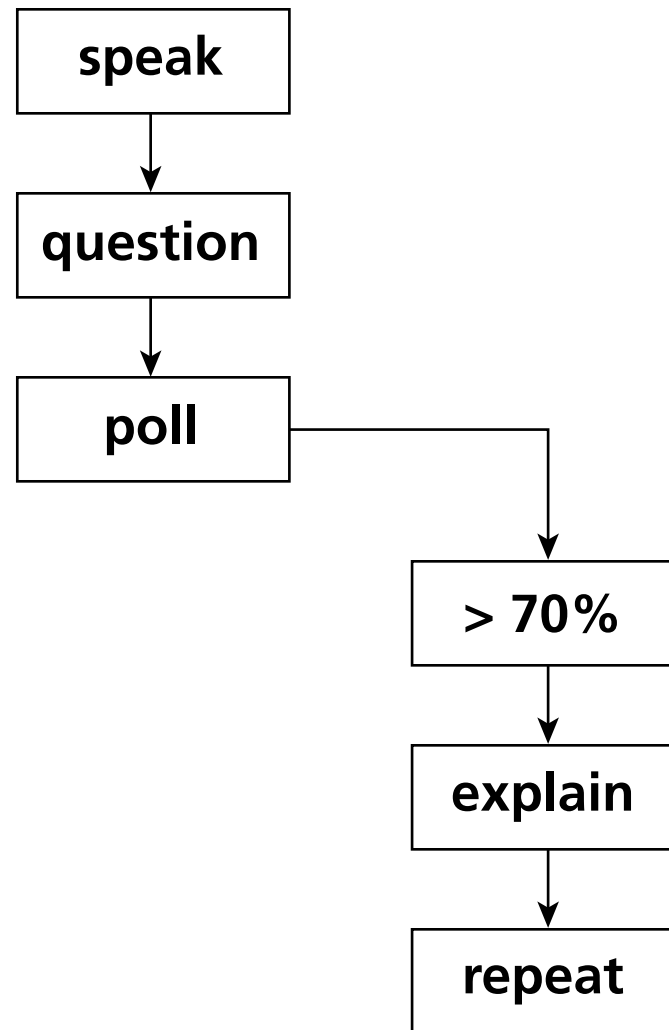
question

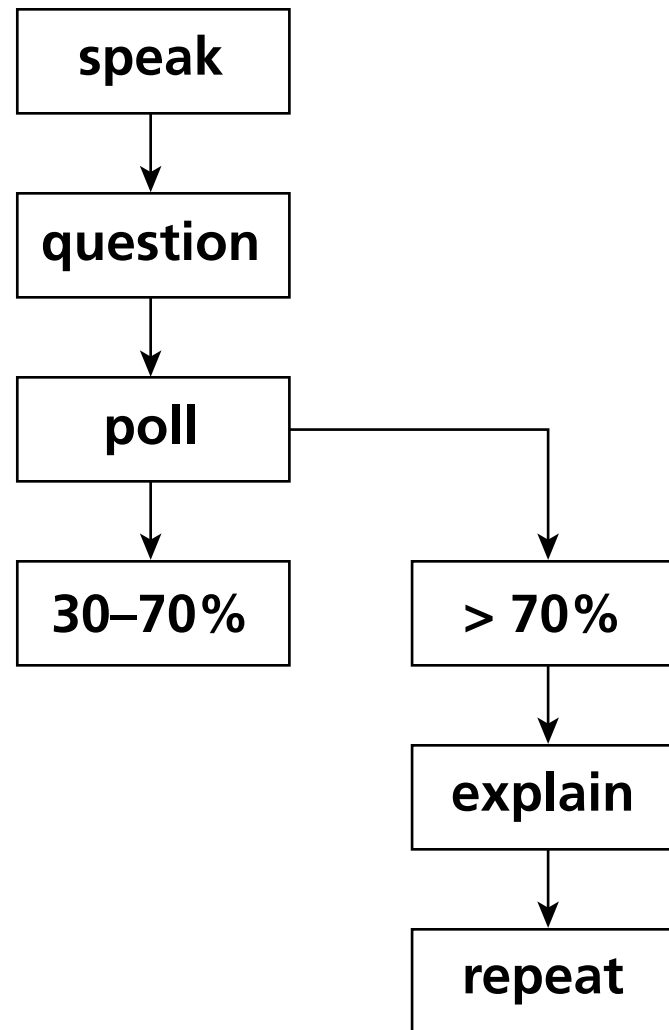


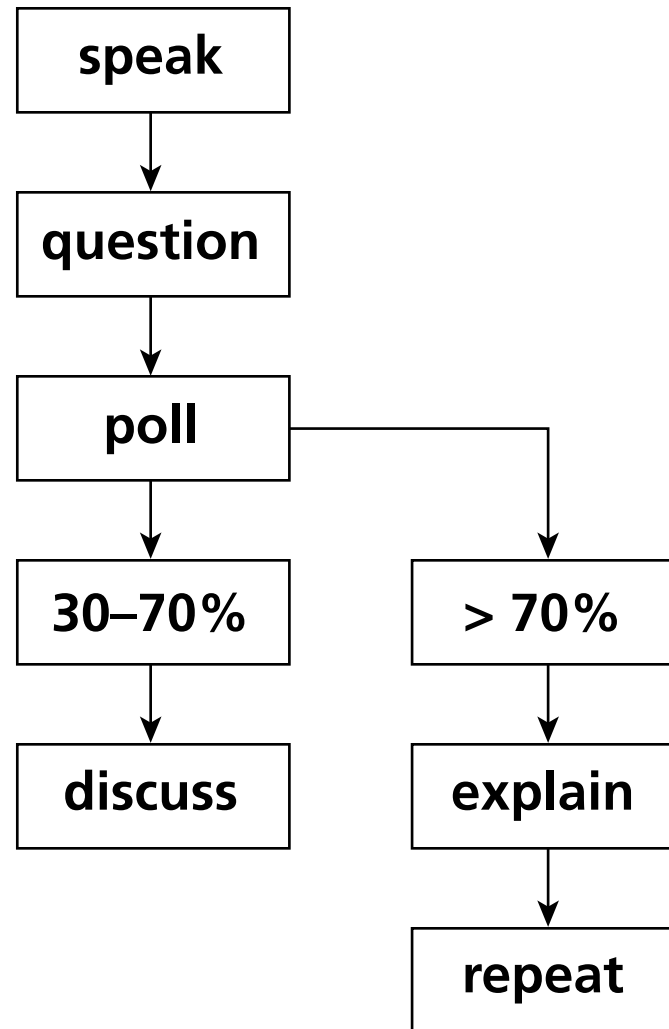
poll

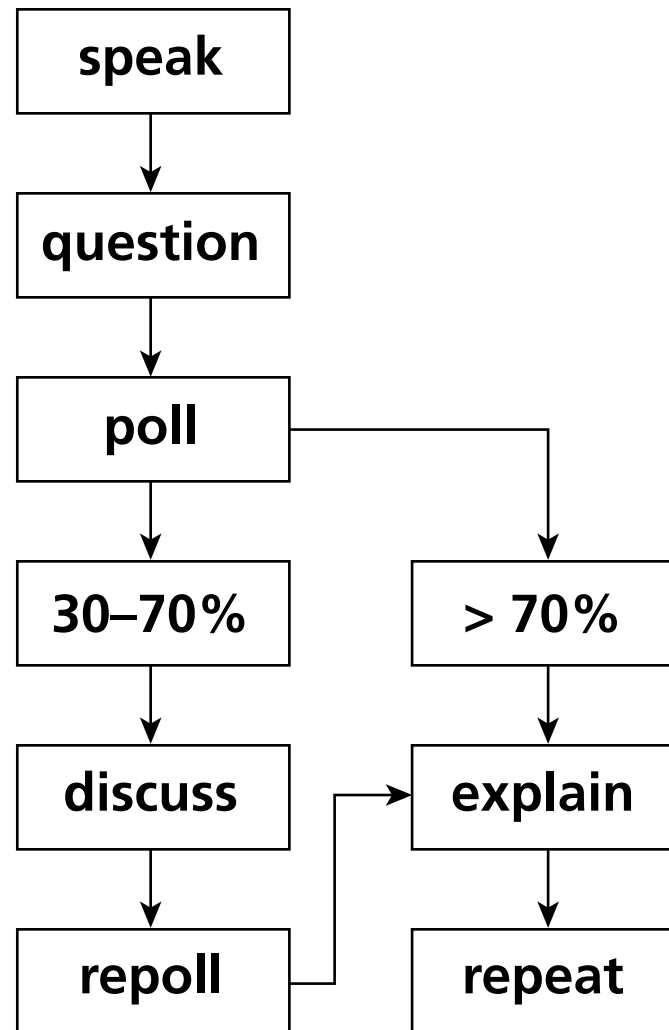


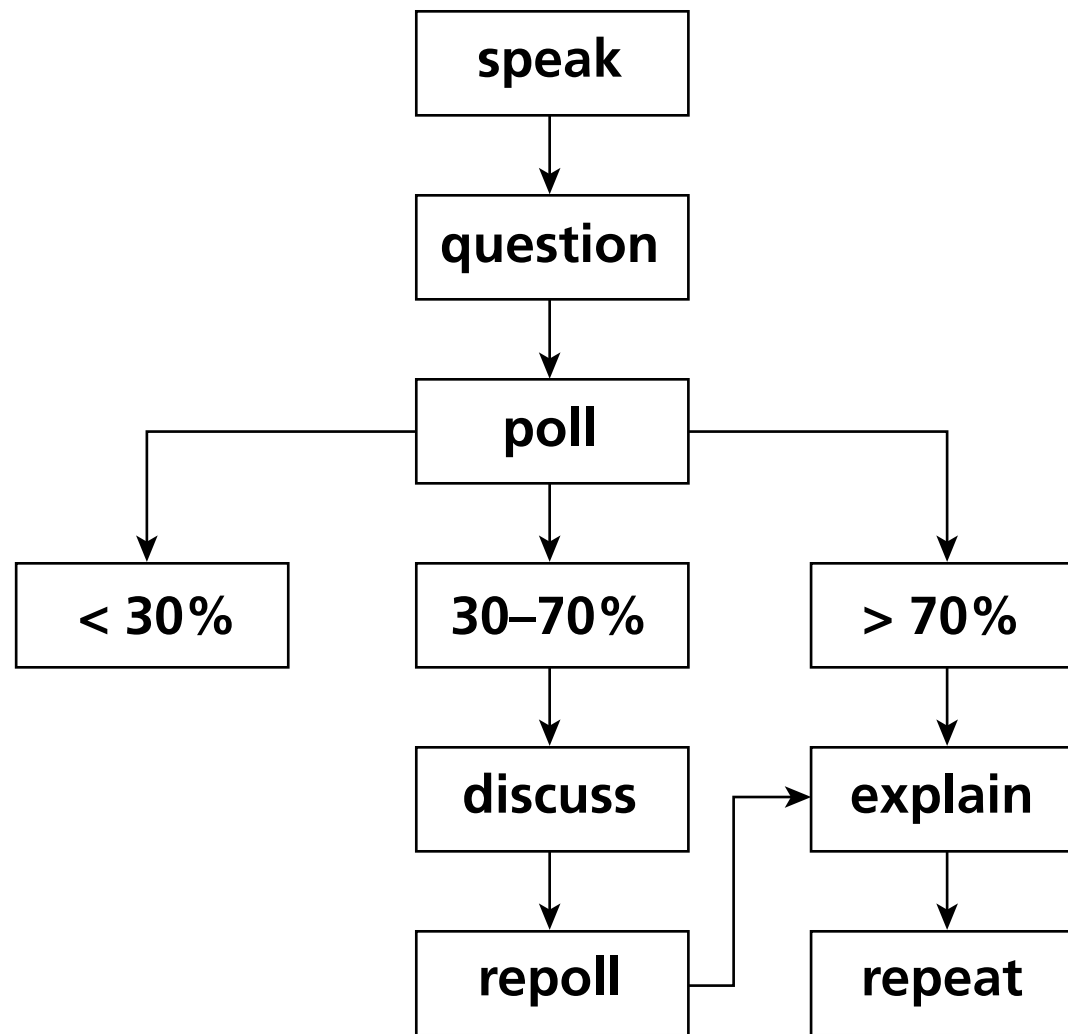


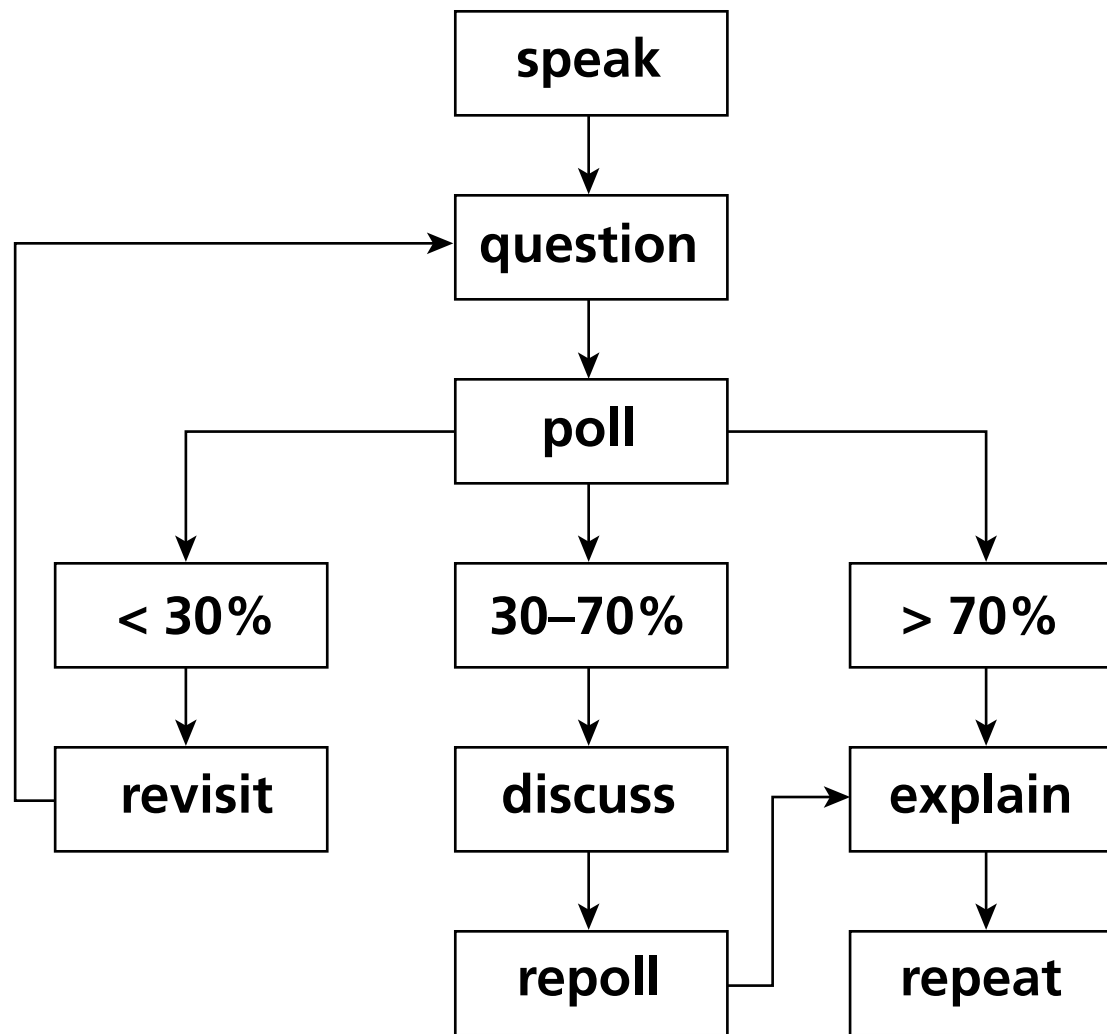


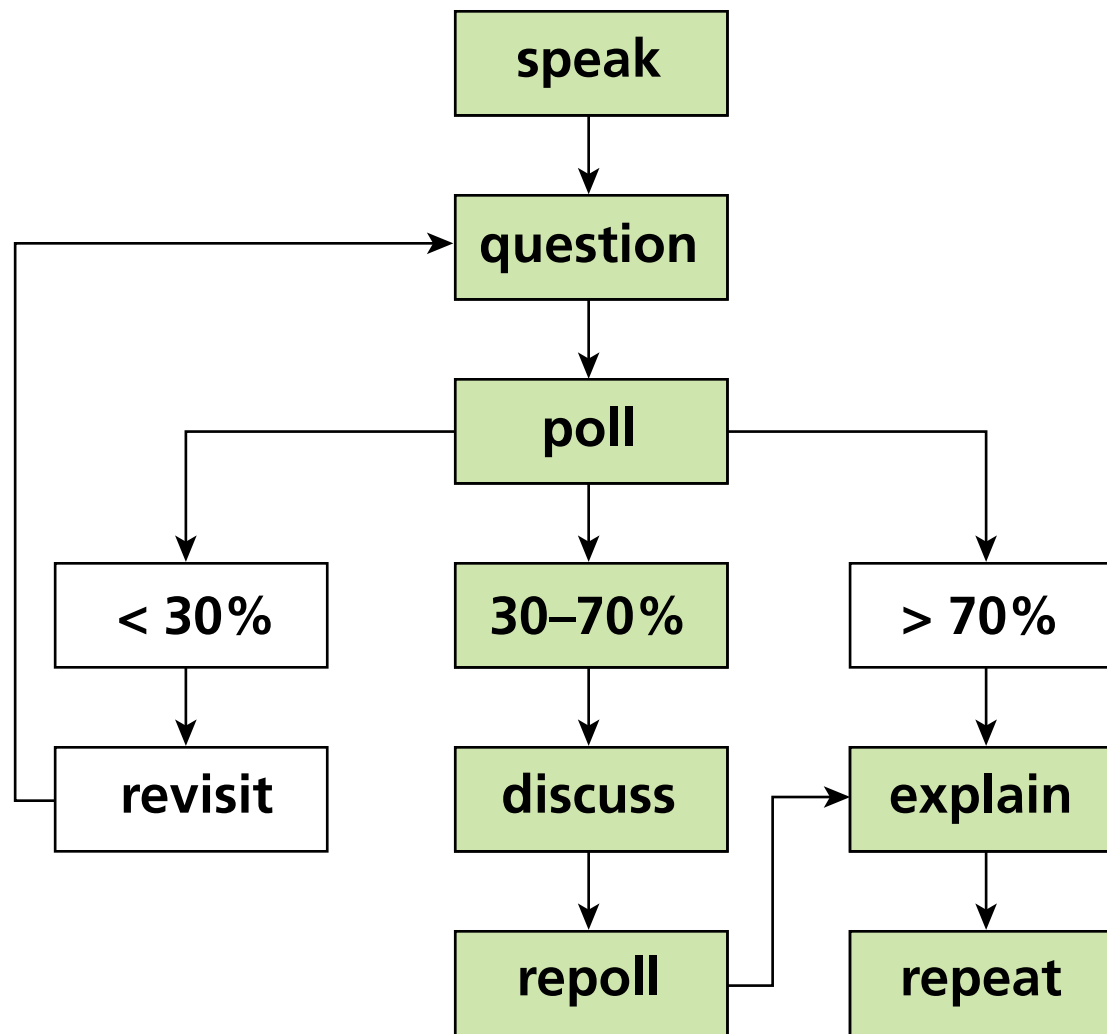








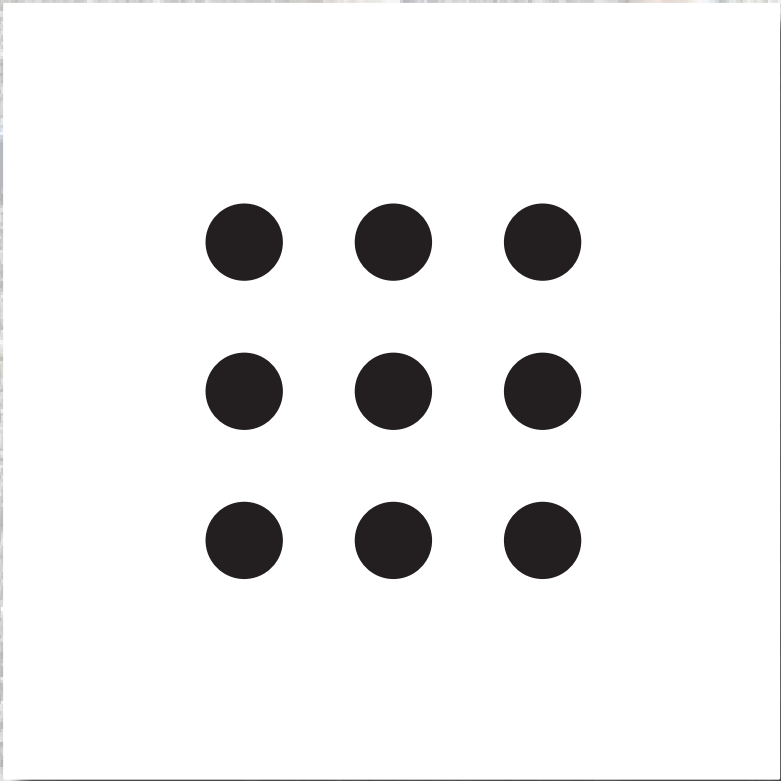


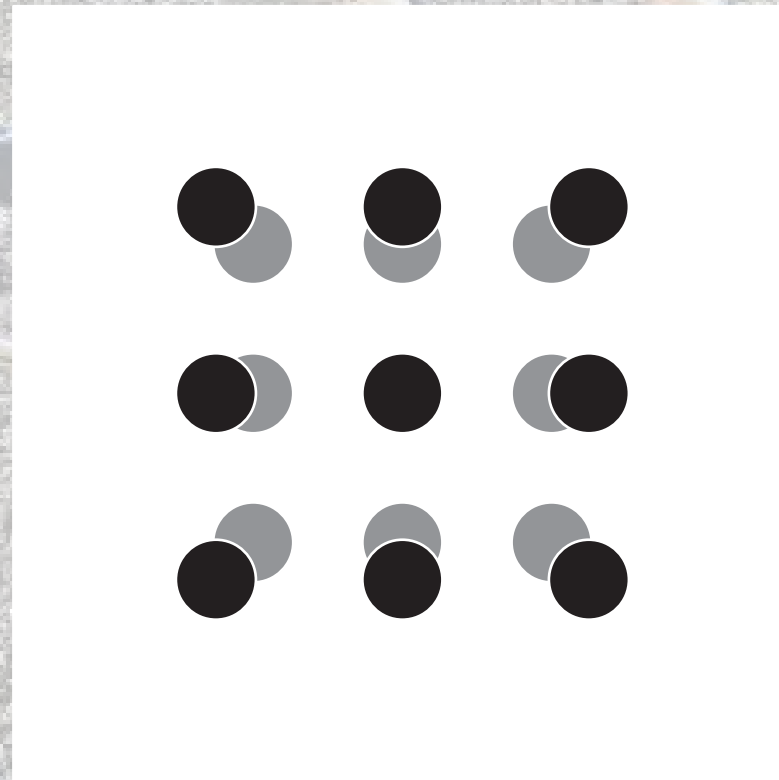




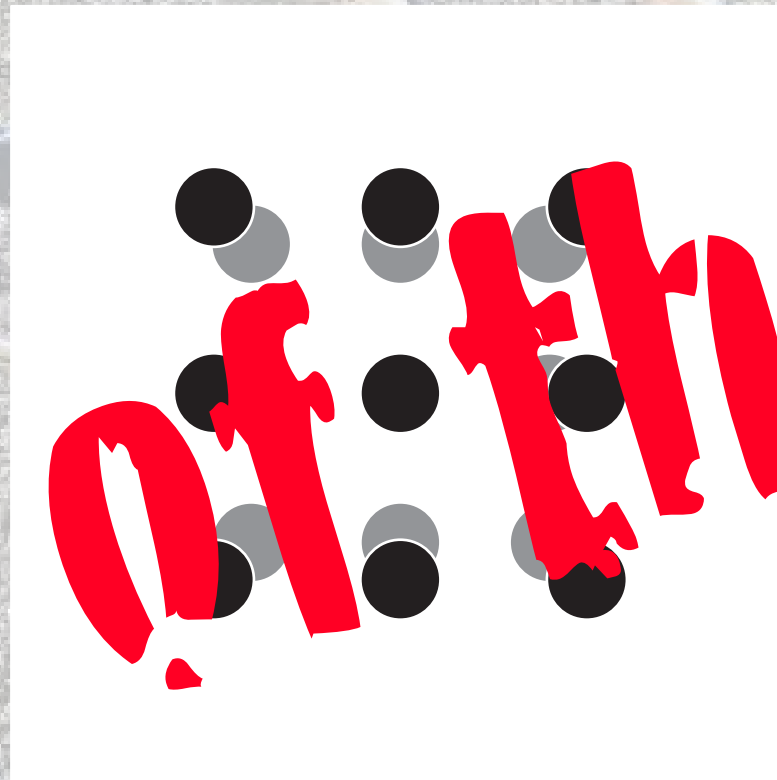
A photograph of a wavy metal track, possibly a model for a physics experiment, laid out on a bed of gravel. The track is made of a light-colored metal and is bent into a series of connected loops and curves. The gravel is dark and coarse. The background shows a grassy area. The text "thermal expansion" is overlaid in the center of the image.

thermal expansion

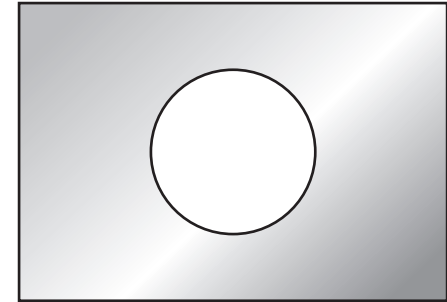




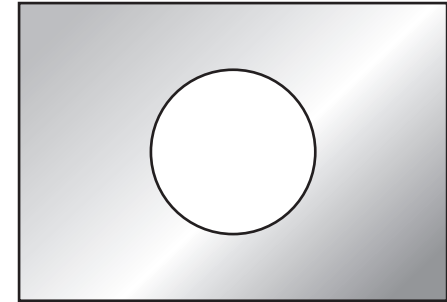
all of them



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



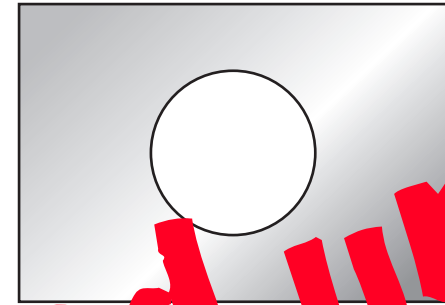
Consider a rectangular metal plate with a circular hole in it.



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.

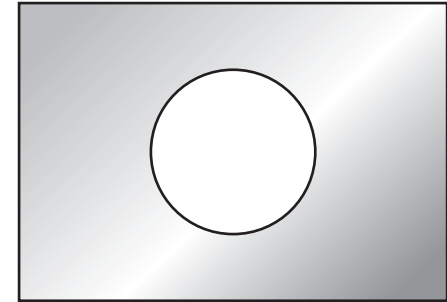


When the plate is uniformly heated, the diameter of the hole

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, 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...

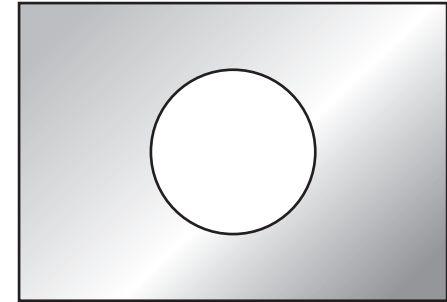
- 1. made a commitment**
- 2. externalized your answer**
- 3. moved from the answer/fact to reasoning**

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**

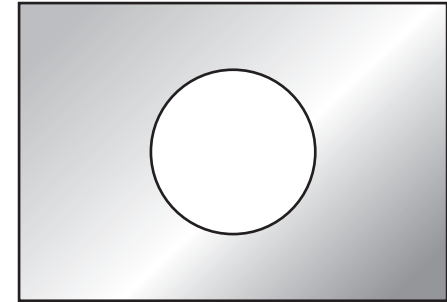
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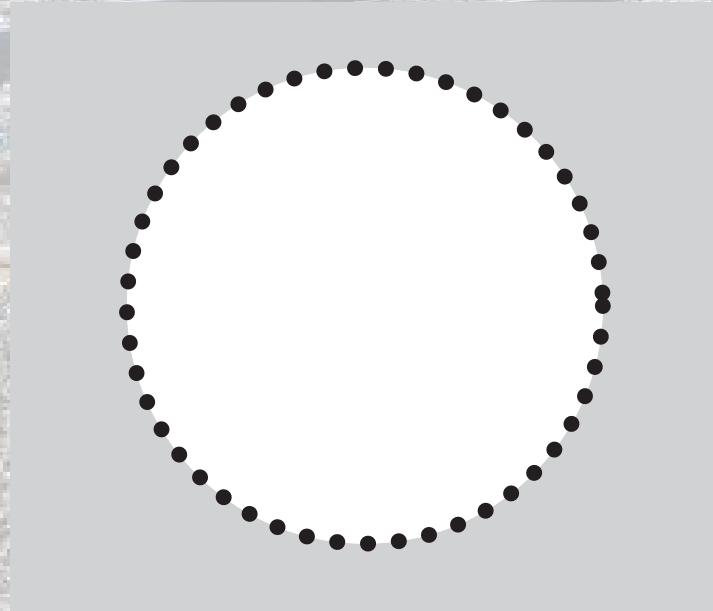
Consider a rectangular metal plate with a circular hole in it.



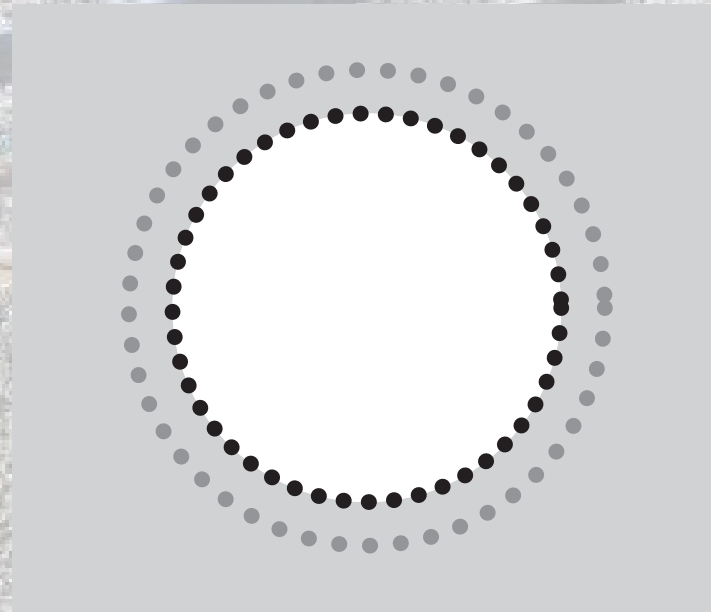
When the plate is uniformly heated, the diameter of the hole

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

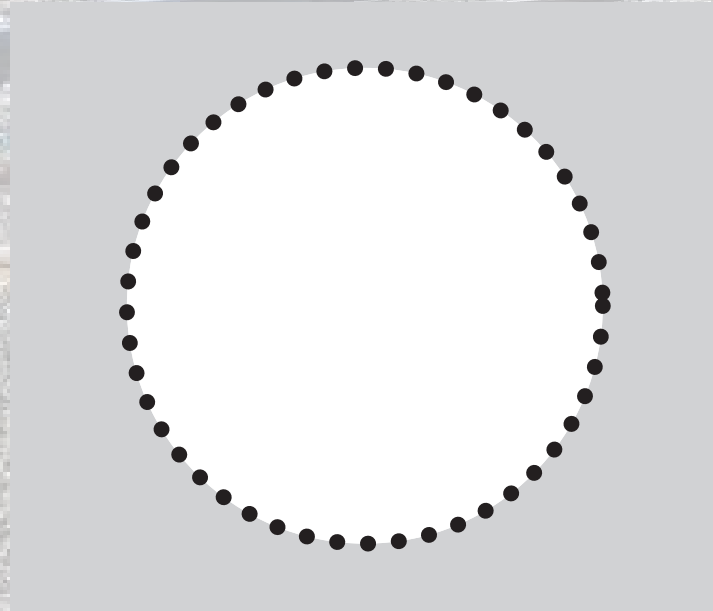
consider atoms at rim of hole



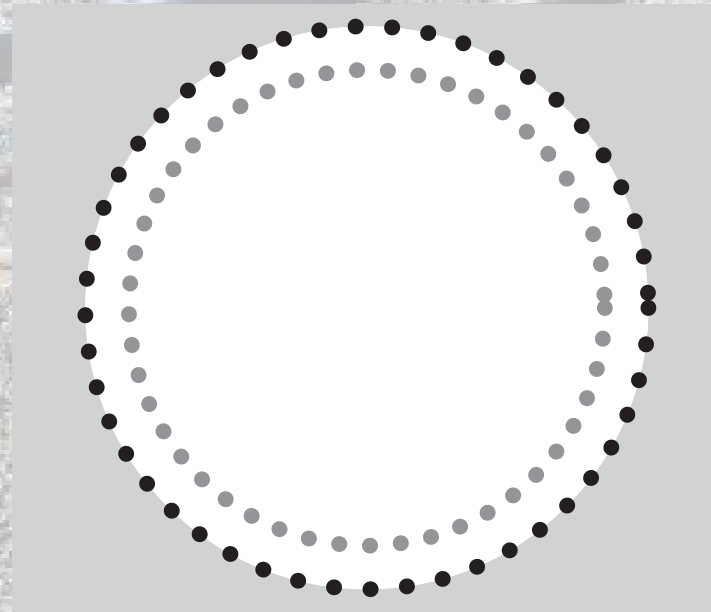
consider atoms at rim of hole



consider atoms at rim of hole



consider atoms at rim of hole



consider atoms at rim of hole

you won't forget this



Peer

Higher learning gains

INSTRUCTION

1 lecture

2 PI

The background features a large, light blue word 'Peer' with a dashed yellow line forming a circle around the 'ee'. Below it, the word 'INSTRUCTION' is written in a light blue, spaced-out font. Two red arrows point towards the center: one from the top right and one from the bottom left. The text 'Higher learning gains' and 'Better retention' is written in a bold, red, sans-serif font, slanted upwards from left to right.

Higher learning gains

Better retention

INSTRUCTION



Join now!

PeerInstruction.net



1 lecture

2 PI

3 PI 2.0

feedback

1 lecture

2 PI

3 PI 2.0



1991

① lecture

② PI

③ PI 2.0



1993

A black handheld remote control, likely for a garage door opener, is shown at an angle. It features a numeric keypad with buttons for 1 through 9, 0, and a red emergency stop button. A green logo with the letters 'FRS' is visible on the bottom right. The year '1998' is overlaid in large white text in the center.

1998





technology

1 lecture

2 PI

3 PI 2.0



How do I...

- design good questions?
- optimize the discussions?
- manage time?

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1 lecture

2 PI

3 PI 2.0

Use intelligent algorithms and data analytics to...

- **improve questioning**

- **manage discussions**

- **facilitate time management/flow**

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- lowest
- A 30-year fixed rate mortgage at 12%
 - A 15-year fixed rate mortgage at 12%
 - A 30-year fixed rate mortgage at 12%
 - A 15-year fixed rate mortgage at 12%
2. The biggest factor that leads American companies to manufacture their products overseas is:
- Higher quality of craftsmanship
 - Lower labor costs
 - Decreased transportation costs
 - Effective legal systems
3. Which of the following correctly summarizes the accounting equation for a sole proprietorship?
- $\text{Assets} = \text{Liabilities} + \text{Owners' equity}$
 - $\text{Liabilities} = \text{Assets} + \text{Owners' equity}$
 - $\text{Owner's equity} = \text{Assets} + \text{Liabilities}$
 - $\text{Revenue} = \text{Assets} - \text{Liabilities}$
4. In order to present a business plan to a group of potential investors, a businessperson would most likely use which of the following?
- Powerpoint
 - Quickbooks
 - Peoplesoft
 - Excel
5. In order to start an online business, an individual would need all but which of the following?
- business model
- depreciation?

extensible plug-in architecture for question types

Sample question types:

- direction
- mathematical expression
- long answer, short answer, word cloud
- numerical, data collection
- ranking, priority
- region (select point on image)
- sketch, composite sketch
- highlight passage



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optics i

current session: **766079** | 69 students[Back to all lectures](#) [Stop session](#) [Review results](#) [Seat map](#) [Show floating session ID](#) [Edit](#) [Delete](#)

Jump to ▼

1

2

3

4

5

6

7

8

9

10

11

12

13

14

15

**4.** direction Light enters horizontally into the combination of two perpendicular mirrors as shown below.[Deliver](#) [Show all results](#)

Indicate the direction of the incident light after it reflects off of both mirrors.



feedback & support

1 lecture**2** PI**3** PI 2.0

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optics i

current session: **766079** | 69 students[Map](#) [Show floating session ID](#) [Edit](#) [Delete](#)

6 7 8 9 10 11 12 13 14 15

perpendicular mirrors as shown below.

[Deliver](#) [Show all results](#)

Light enters horizontally into the combination of two perpendicular mirrors as shown below. Indicate the direction of the incident light after it reflects off of both mirrors.



Submit response

[Switch to text response](#)

feedback & support

1 lecture

3 PI 2.0

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optics i

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Light enters horizontally into the combination of two perpendicular mirrors as shown below. Indicate the direction of the incident light after it reflects off of both mirrors.



Submit response

[Switch to text response](#)

feedback & support

1 lecture

3 PI 2.0

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6 7 8 9 10 11 12 13 14 15

perpendicular mirrors as shown below.

[Deliver](#) [Show all results](#)

Round 1

57 responses, 58% correct



feedback & support

1 lecture

3 PI 2.0

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6 7 8 9 10 11 12 13 14 15

perpendicular mirrors as shown below.

[Deliver](#) [Show all results](#)

Round 1

57 responses, 58% correct



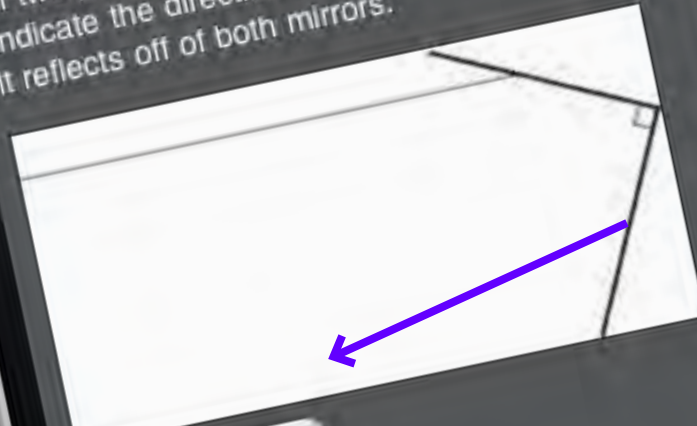
Round 2

51 responses, 73% correct

✓ 8 get it now
✗ 0 still don't get it[feedback & support](#)

Indicate the d

Light enters horizontally into the combination of two perpendicular mirrors as shown below. Indicate the direction of the incident light after it reflects off of both mirrors.



Submit response

[Switch to text response](#)

1 lecture

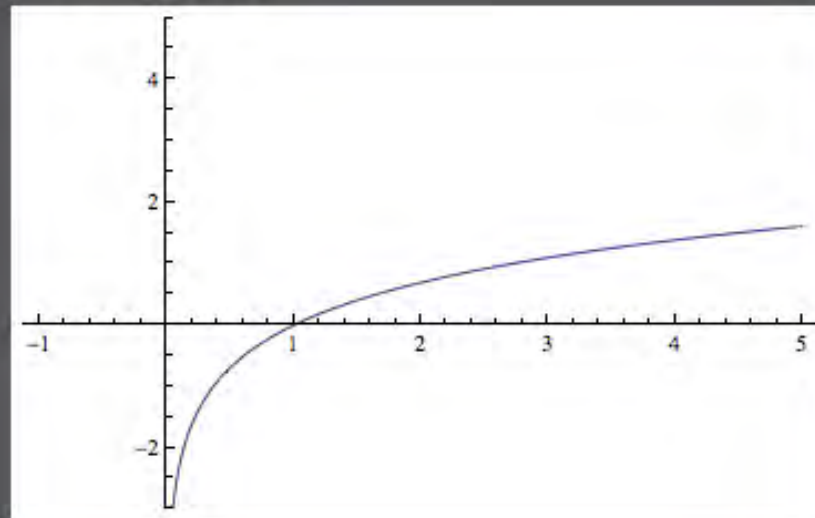
3 PI 2.0

If $2x - y = 4$, then $x =$

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This is a graph of $f(x) = \ln x$. Sketch a graph of the derivative $f'(x)$.

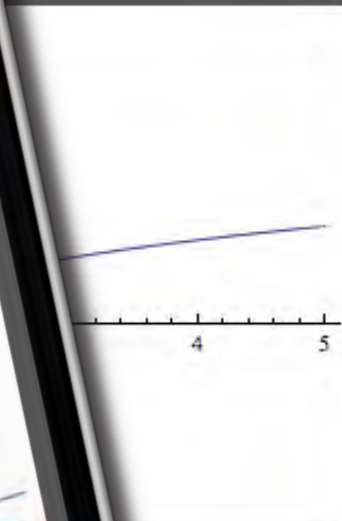


1 lecture

2 PI

3 PI 2.0

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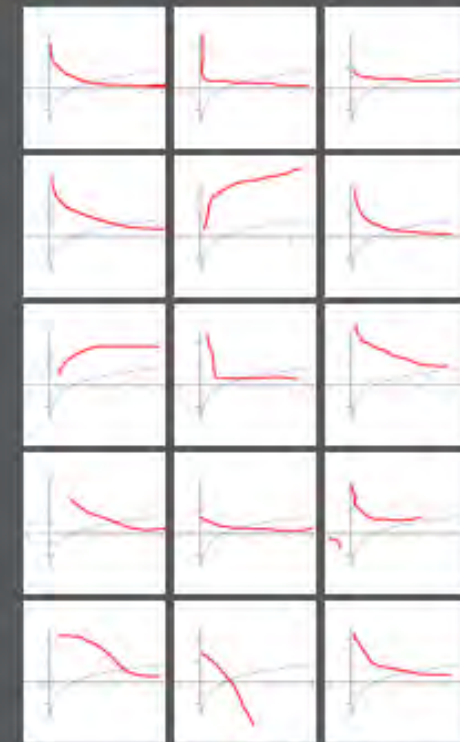
[Courses](#) [Participate](#)[ases](#) [Users](#) [Tour](#) [Help](#)This is a graph of $f(x) =$ **1** lecture**3** PI 2.0

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[Courses](#) [Participate](#)[ases](#) [Users](#) [Tour](#) [Help](#)This is a graph of $f(x) =$ 

Round 1

15 responses



6 get it now

0 still don't get it

1 lecture

3 PI 2.0



1 lecture

2 PI

3 PI 2.0



human interaction

1 lecture

2 PI

3 PI 2.0

Carrier 9:31 PM 100%

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Jump to 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19

A positively charged rod is held near a neutral conducting sphere as illustrated below. A positively charged particle is moved from point A to point B. The potential difference from



Round 1 74 responses, 61% correct

A. 61%	A. 83%
B. 4%	B. 0%
C. 35%	C. 17%
D. 0%	D. 0%
E. 0%	E. 0%

Round 2 75 responses, 83% correct

Search:

A. positive
B. zero
C. negative
D. depends on the path taken from A to B
E. cannot be determined without knowing more about the polarization induced in the sphere

1 lecture

2 PI

3 PI 2.0

Carrier 100%


9:31 PM
learning catalytics

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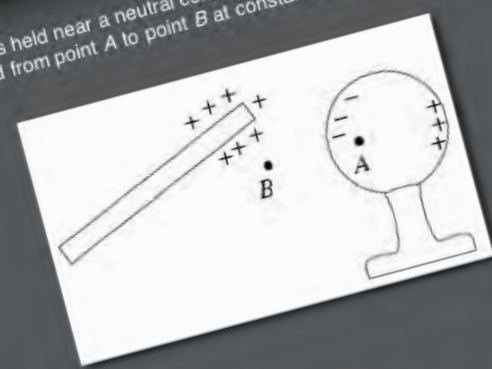
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A positively charged rod is held near a neutral conducting sphere as illustrated below. A positively charged particle is moved from point A to point B at constant speed. The potential difference from A to B is



Round 1
74 responses, 61% correct

A. 61%	
B. 4%	
C. 35%	
D. 0%	
E. 0%	

Round 2
75 responses, 83% correct

A. 83%	
B. 0%	
C. 17%	
D. 0%	
E. 0%	

Search:

1 lecture

2 PI

3 PI 2.0

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Round 2
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Search:

1 lecture

2 PI

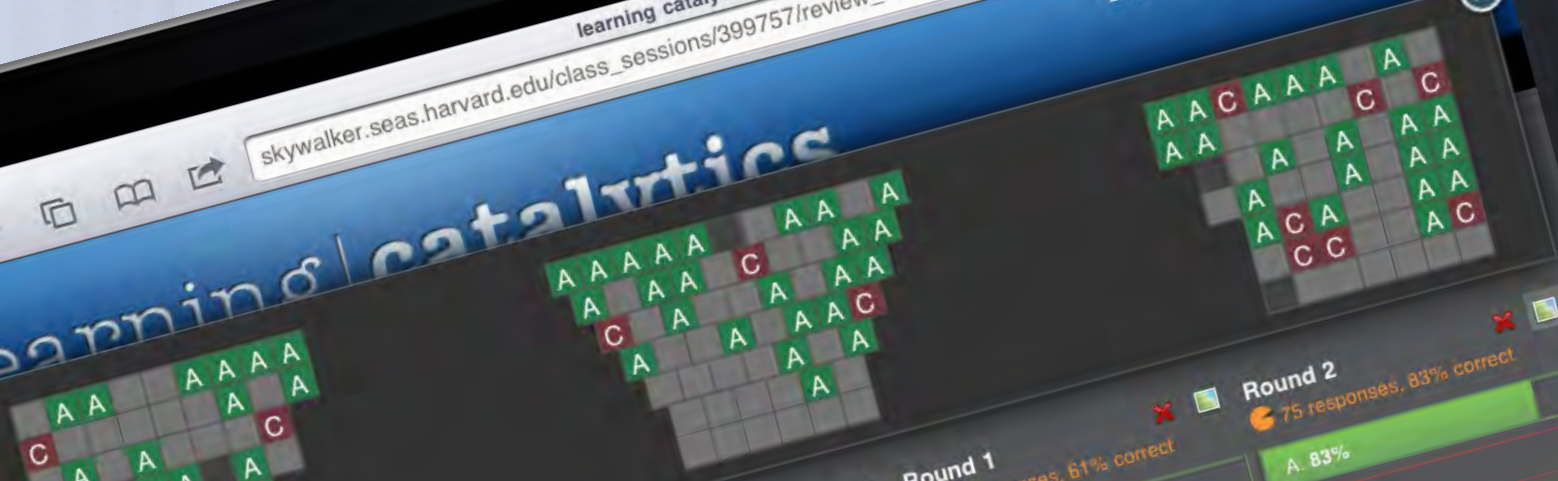
3 PI 2.0

Carrier 100%

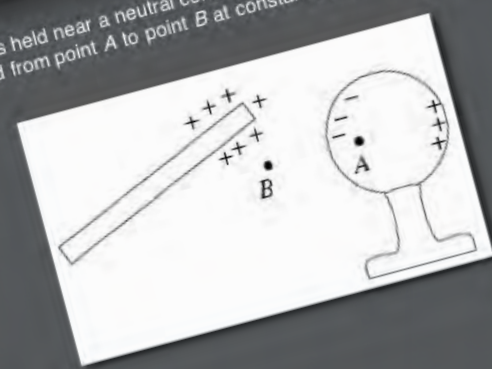
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A. positive
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Round 1
74 responses, 61% correct

A. 61%	
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Round 2
75 responses, 83% correct

A. 83%	
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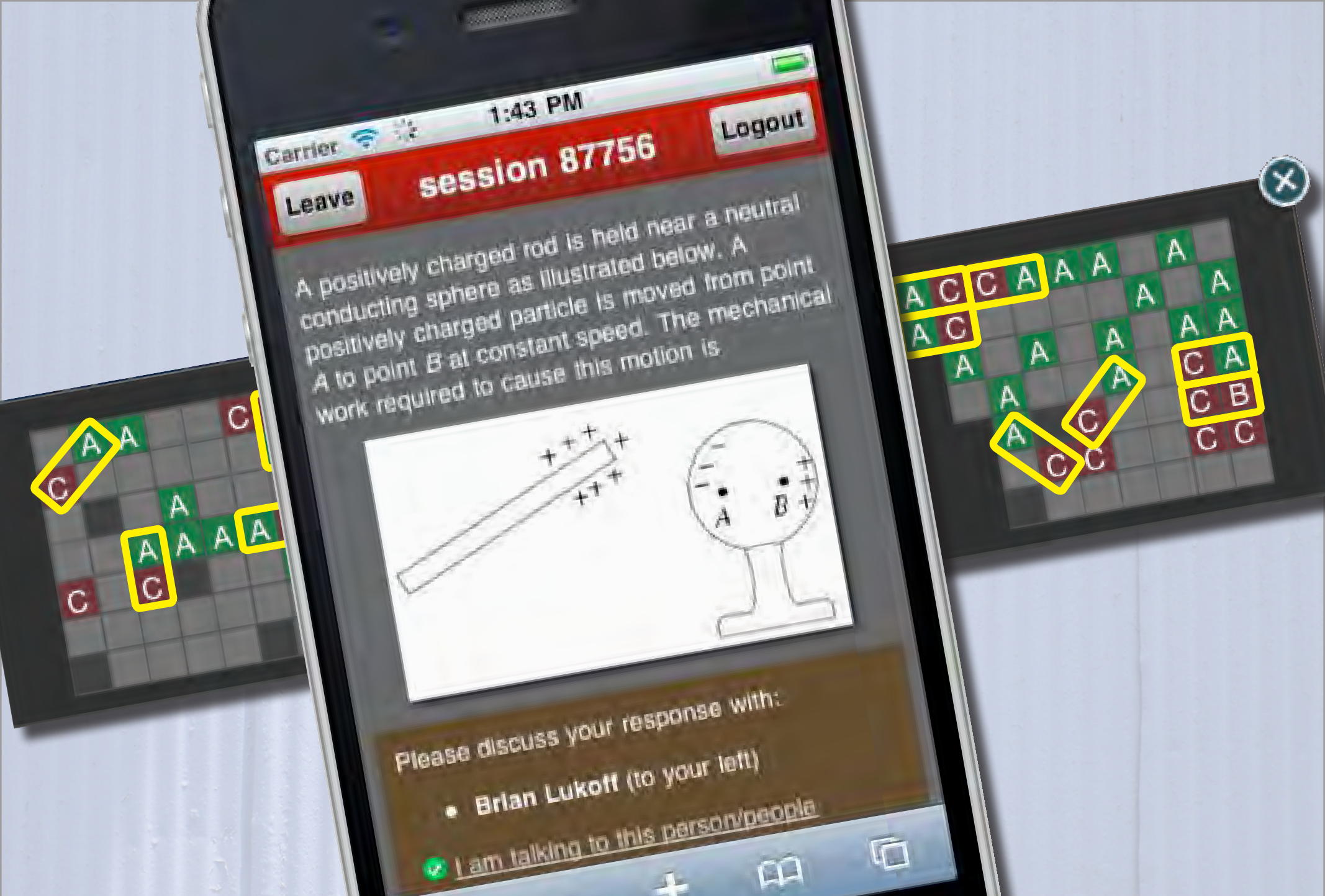
Search:

1 lecture

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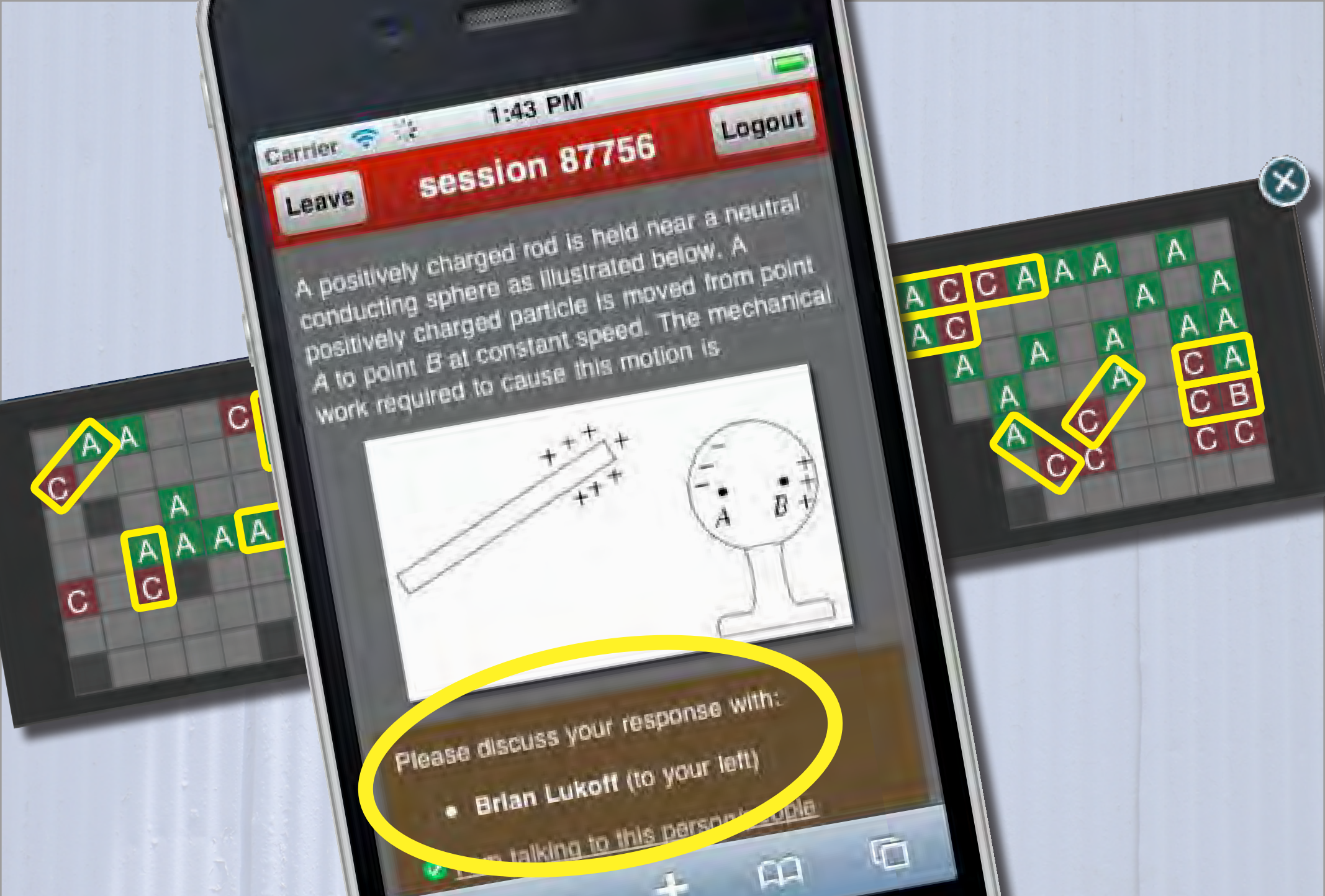
let system manage pairing



1 lecture

2 PI

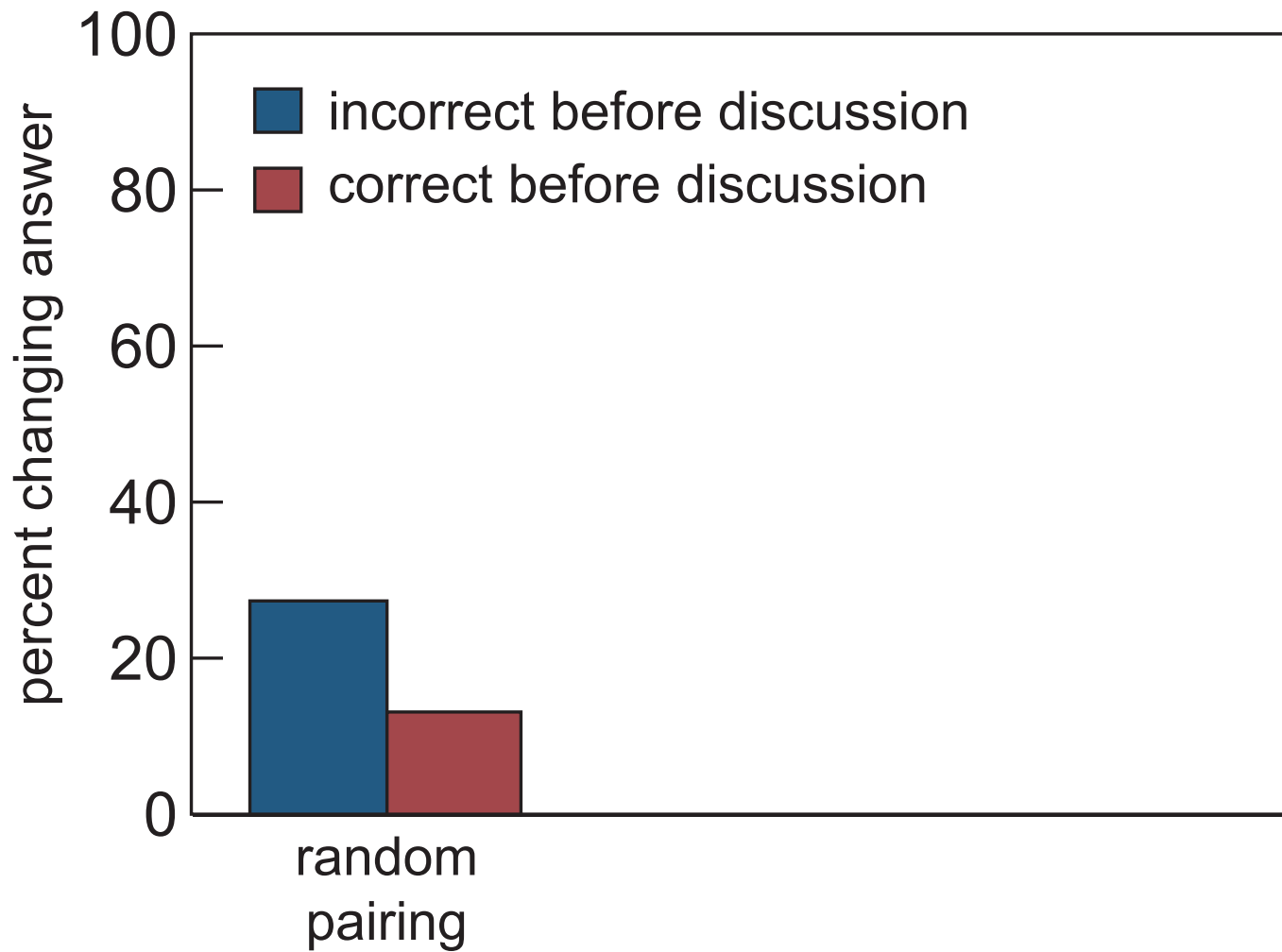
3 PI 2.0

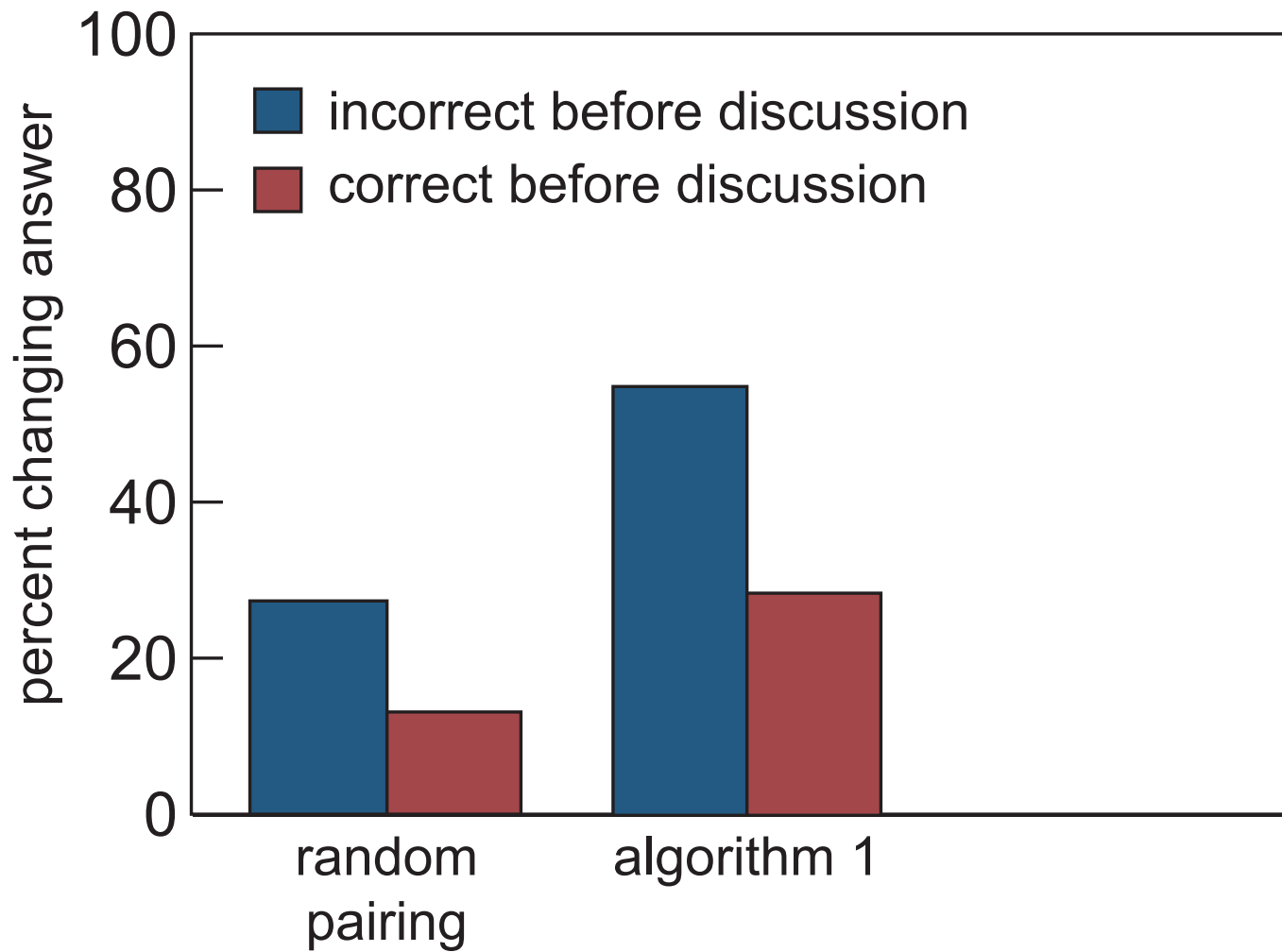


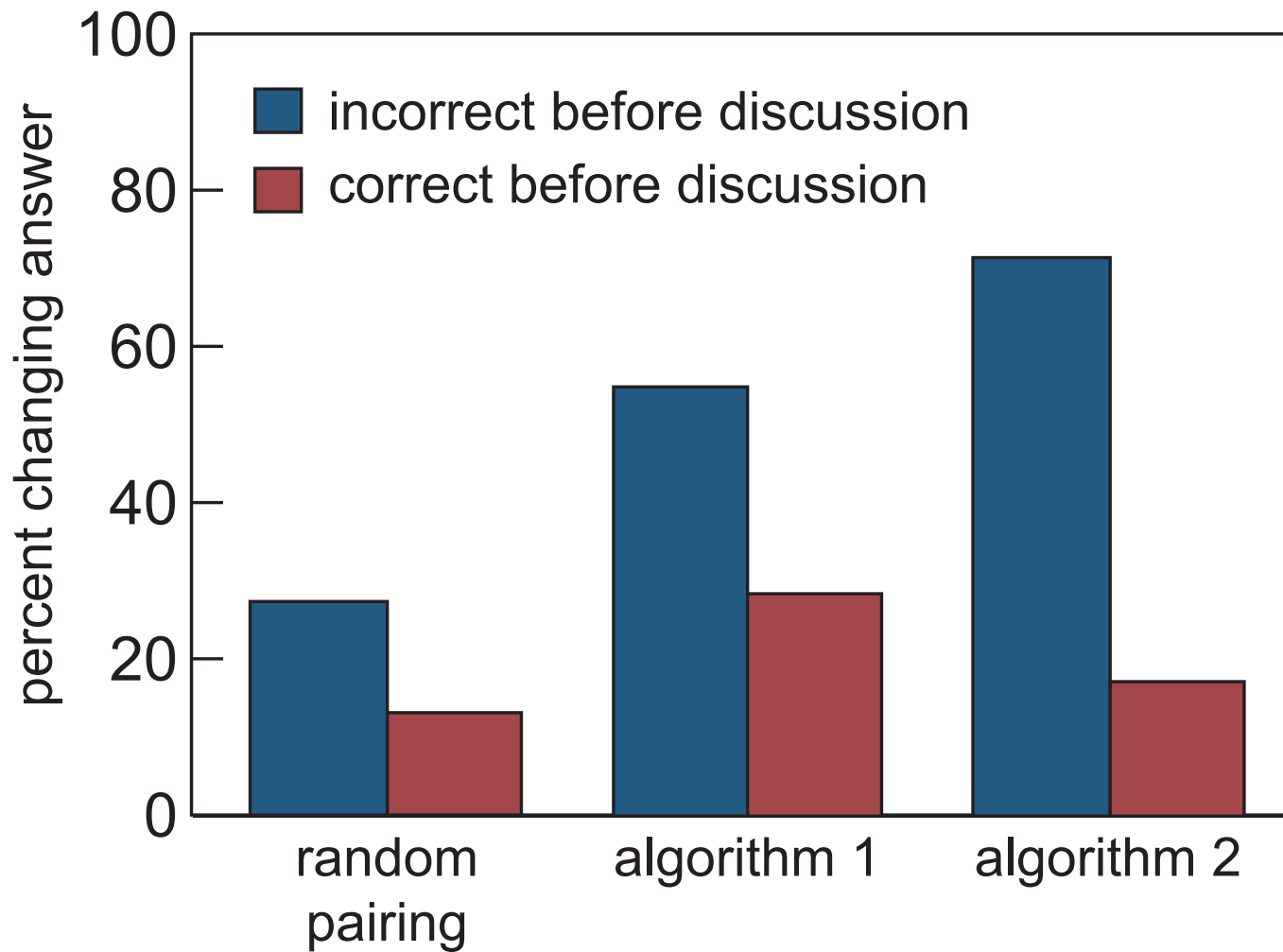
1 lecture

2 PI

3 PI 2.0









1 lecture

2 PI

3 PI 2.0



Education is not just about:

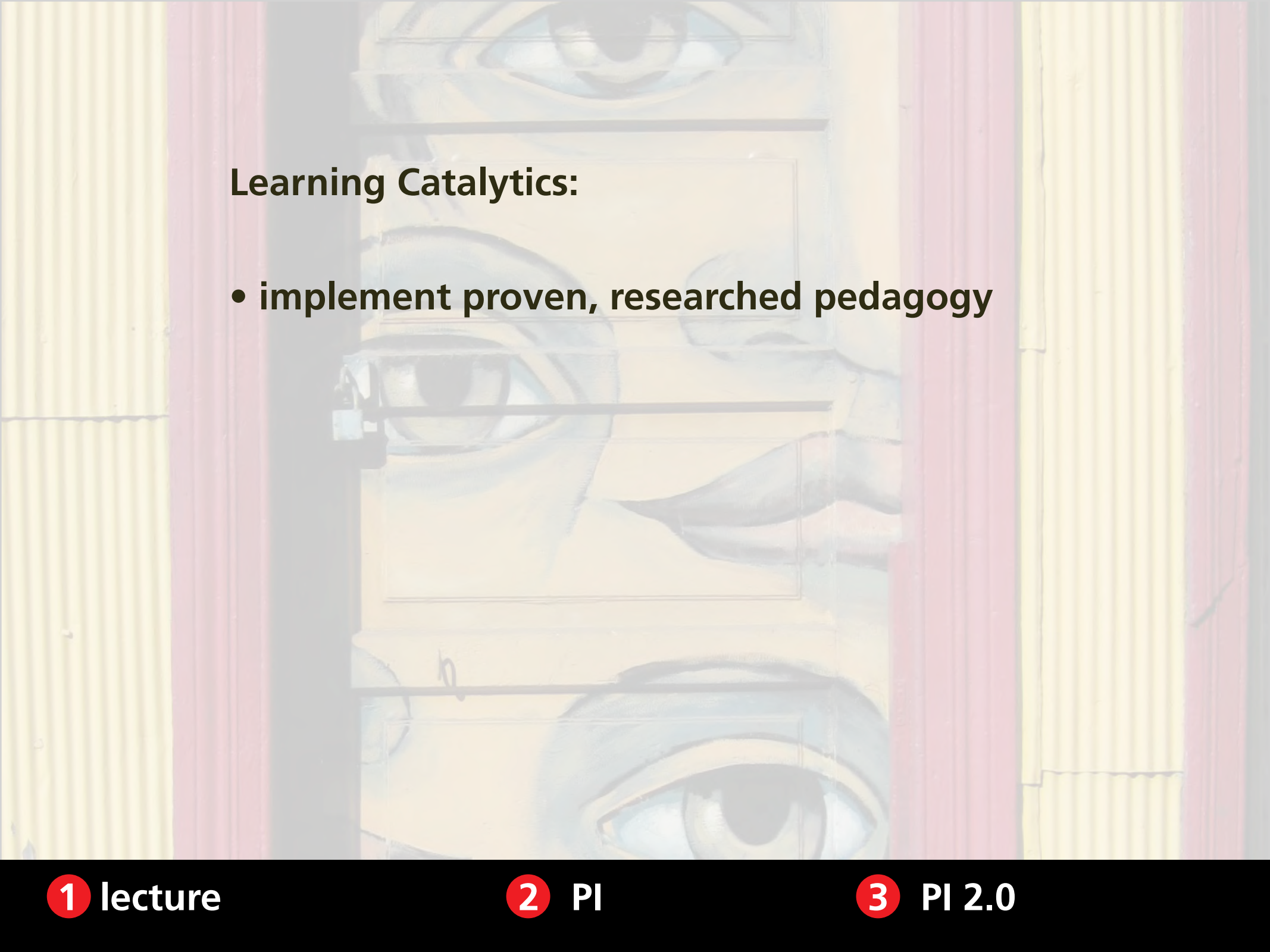
- **transferring information**
- **getting students to do what we do**



Education is not just about:

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

discovery & exploration a must!



Learning Catalytics:

- **implement proven, researched pedagogy**



Learning Catalytics:

- **implement proven, researched pedagogy**
- **use consumer devices**



Learning Catalytics:

- implement proven, researched pedagogy
- use consumer devices
- avoid pitfalls of MC assessment

Learning Catalytics:

- implement proven, researched pedagogy
- use consumer devices
- avoid pitfalls of MC assessment
- create a smart classroom *anywhere*

Funding:

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