

The Tyranny of the Lecture



4th International Symposium on Engineering Education
The University of Sheffield
Sheffield, UK, 19 July 2012



The Tyranny of the Lecture



@eric_mazur
#lectyr

4th International Symposium on Engineering Education
The University of Sheffield
Sheffield, UK, 19 July 2012







1 lecture



1 lecture

2 PI



THE LECTURE HALL

THE LECTURE HALL

THE LECTURE HALL

THE LECTURE HALL

1 lecture

2 PI

3 PI 2.0




**EXCITING
stuff!**

1 lecture

2 PI

3 PI 2.0



**What happens
in a lecture?**



1 lecture



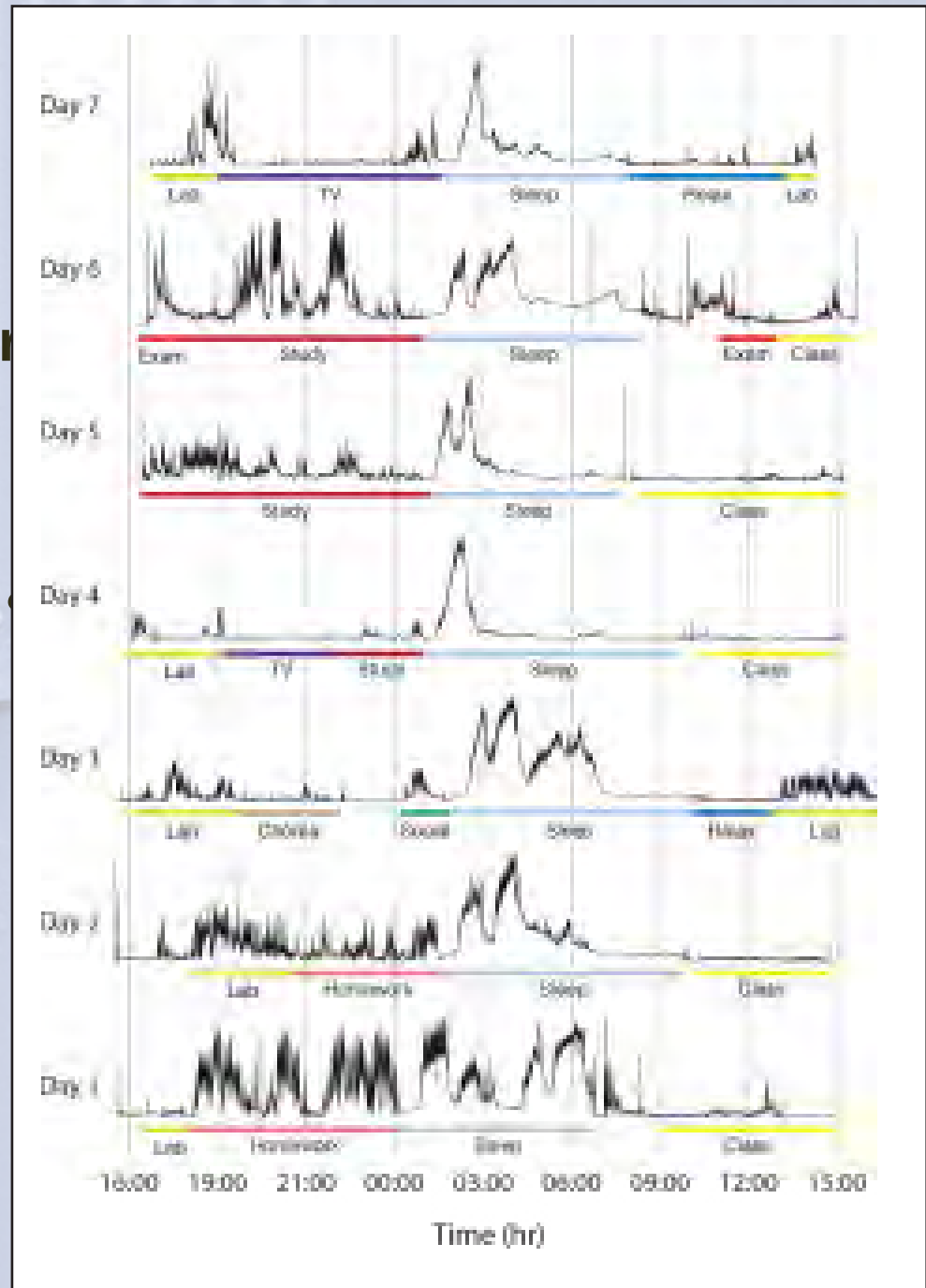
in a lecture, students...

in a lecture, students...

1. don't pay utmost attention

in a lecture

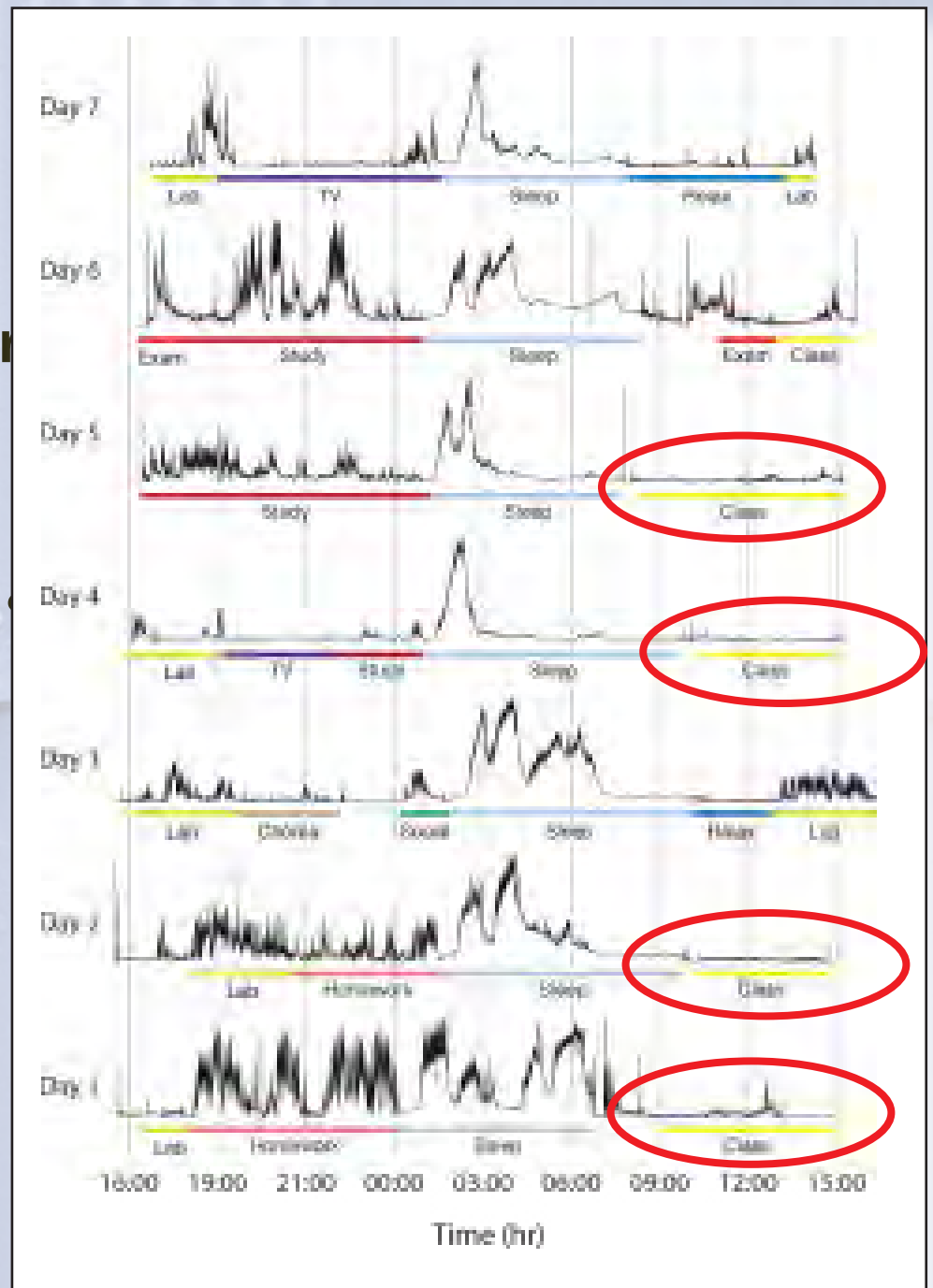
1. don't pay utmost



doi: 10.1109/TBME.2009.2038487

in a lecture

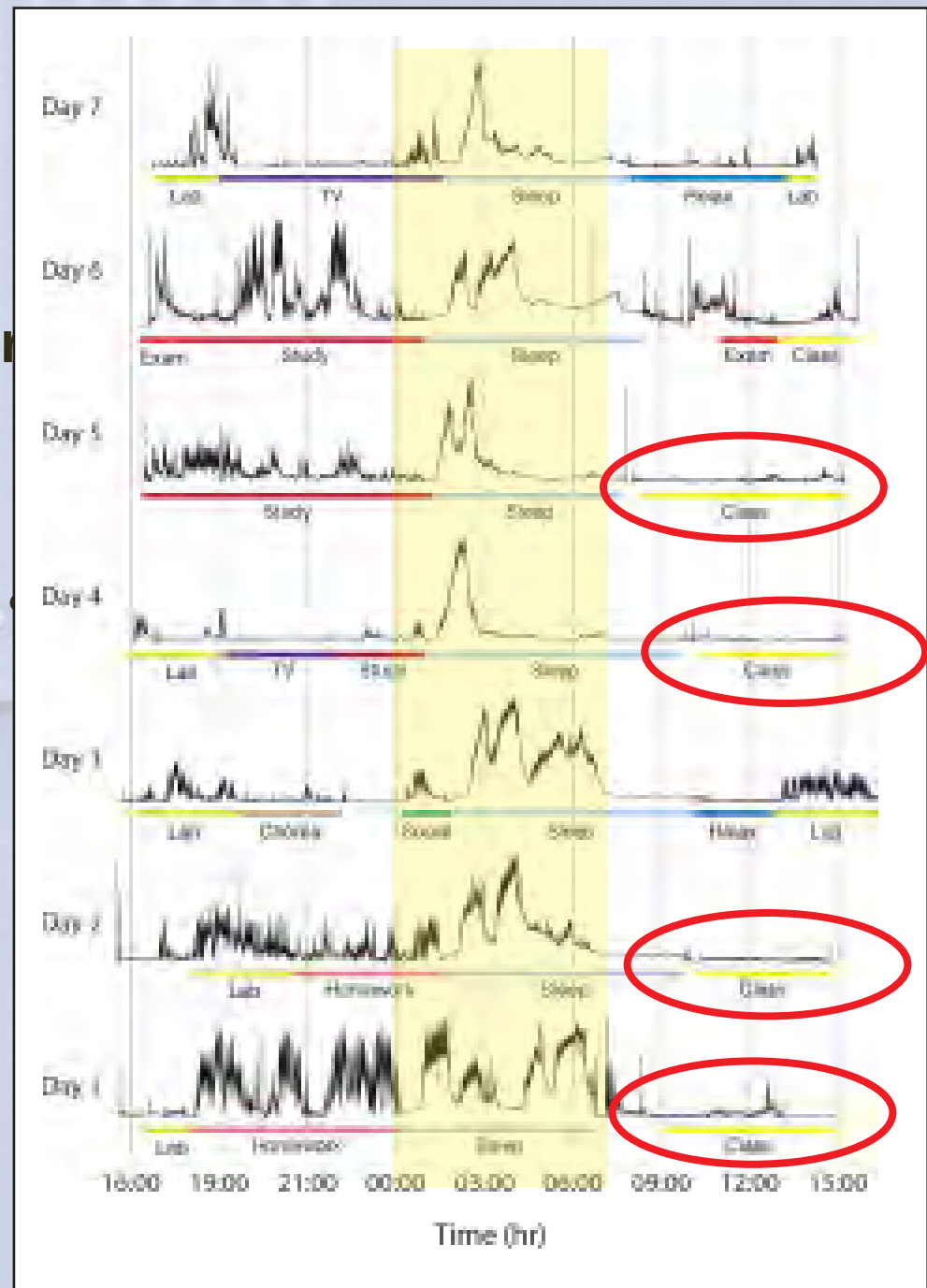
1. don't pay utmost



doi: 10.1109/TBME.2009.2038487

in a lecture

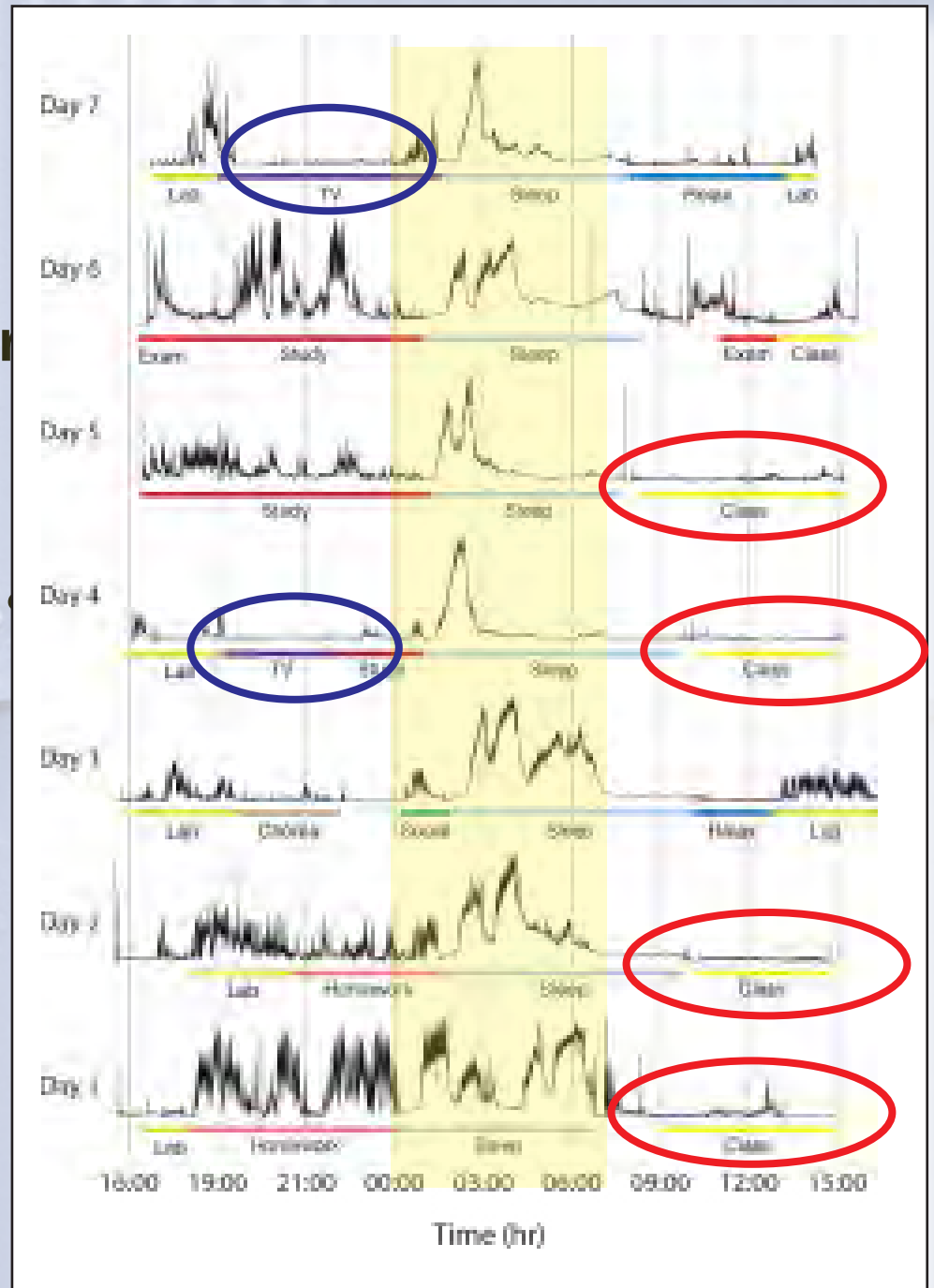
1. don't pay utmost



doi: 10.1109/TBME.2009.2038487

in a lecture

1. don't pay utmost



doi: 10.1109/TBME.2009.2038487

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

A painting of a face, possibly by Hans Holbein the Younger, showing a man's face with large, expressive eyes looking through the slats of a window shutter. The shutter is painted in shades of yellow and red. The text 'an illusion.' is overlaid in red, bold, lowercase letters.

an illusion. . .



1 lecture

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)

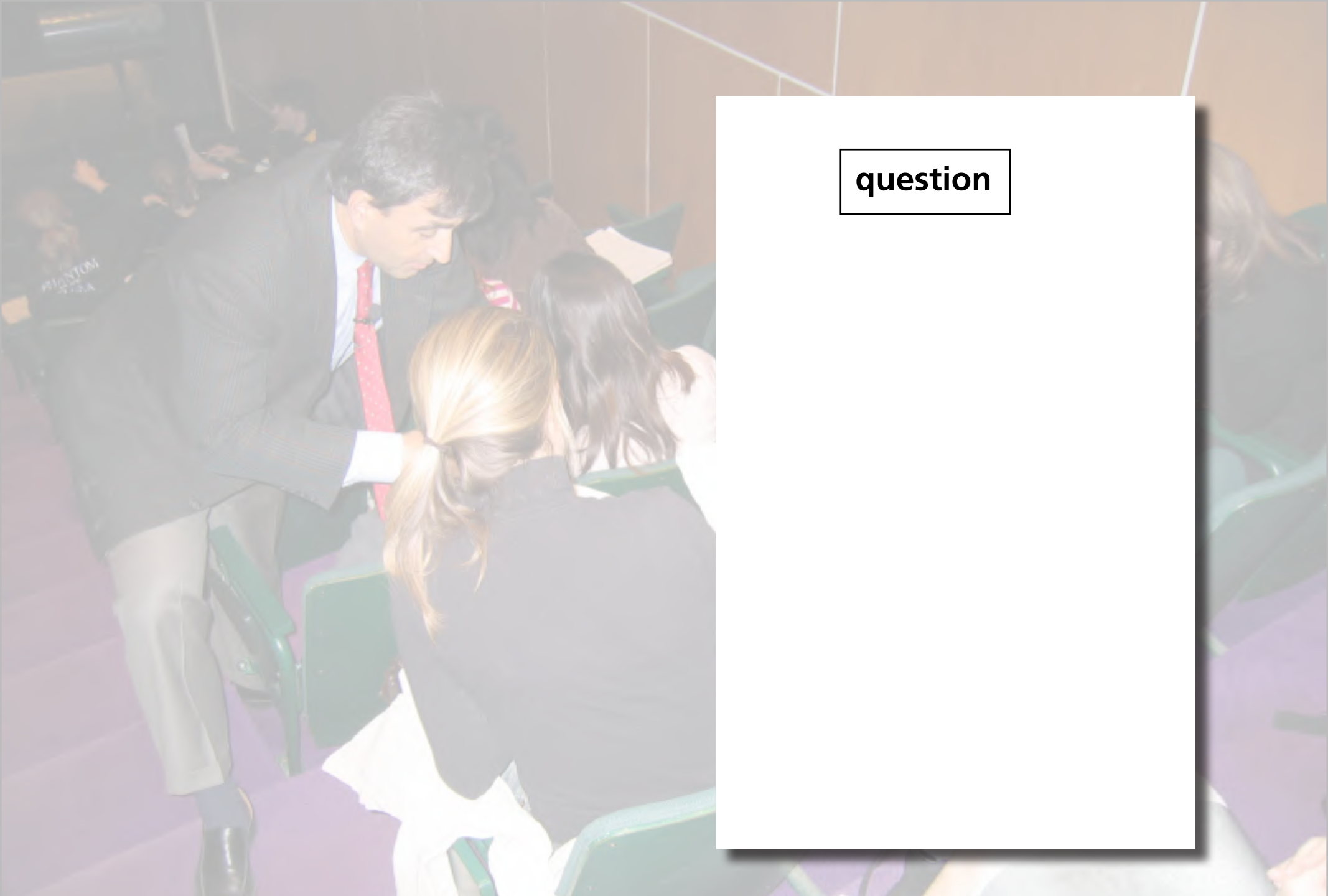
- 
- 1. transfer of information (in class)**
 - 2. assimilation of that information (out of class)**

- 
- 1. transfer of information (out of class)**
 - 2. assimilation of that information (in class)**

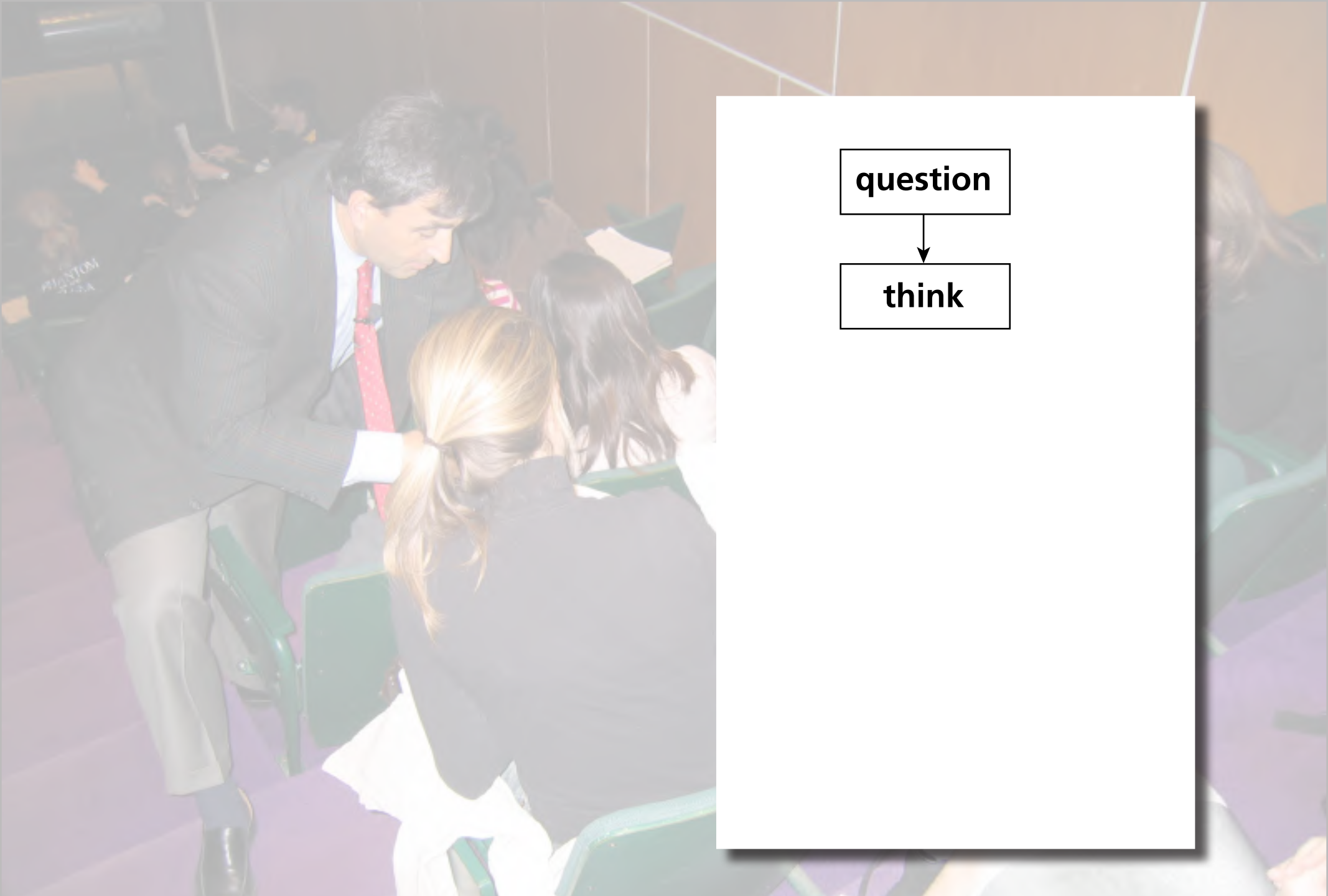
A photograph of a lecture hall with a professor in a dark suit and red tie leaning over a row of green plastic chairs. He is looking at a book held by a student. Other students are visible in the background, some taking notes. The scene is dimly lit, with the professor's face and the book being the primary light sources.

1. transfer of information (out of class)

2. assimilation of that information (in class)



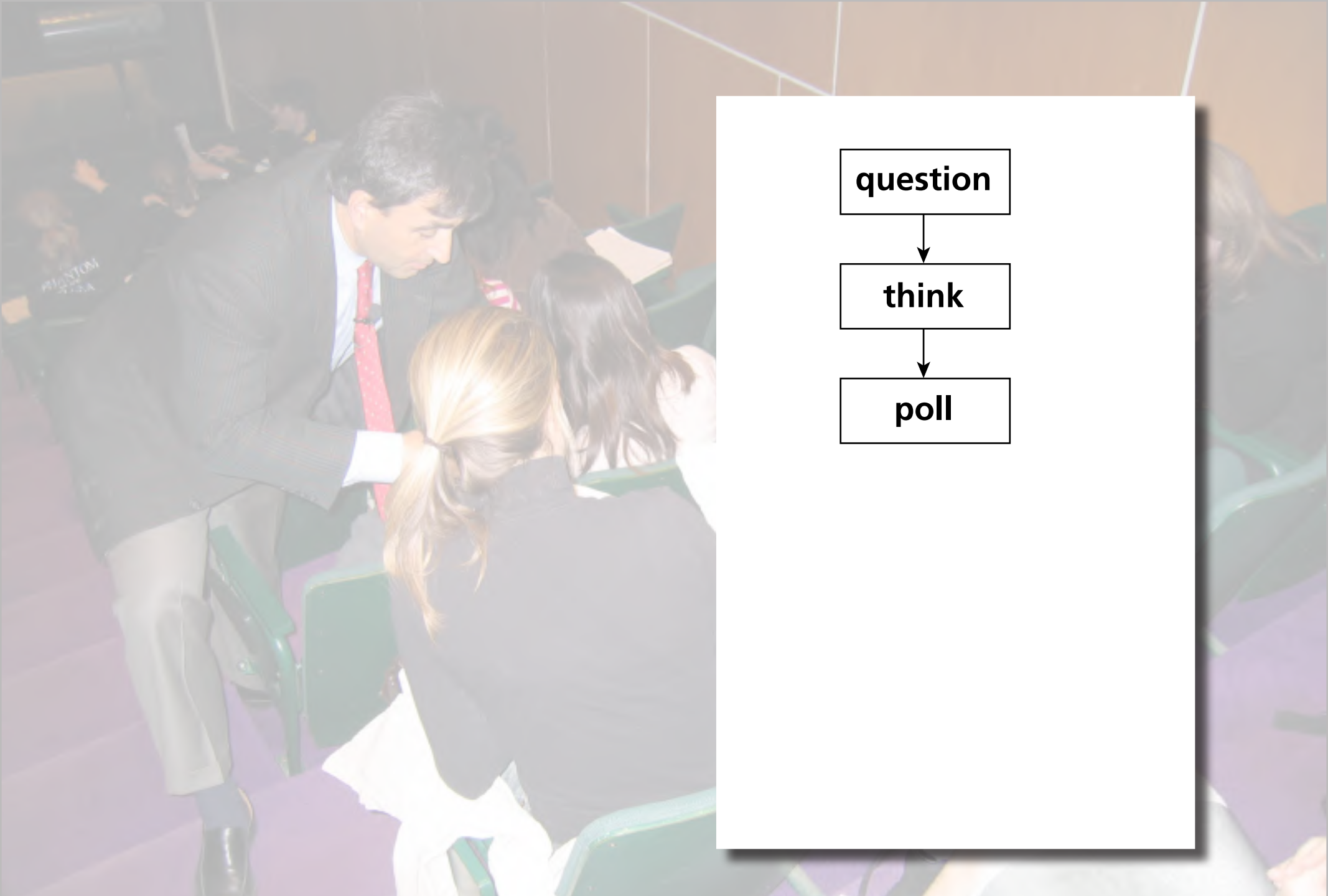
question



question



think



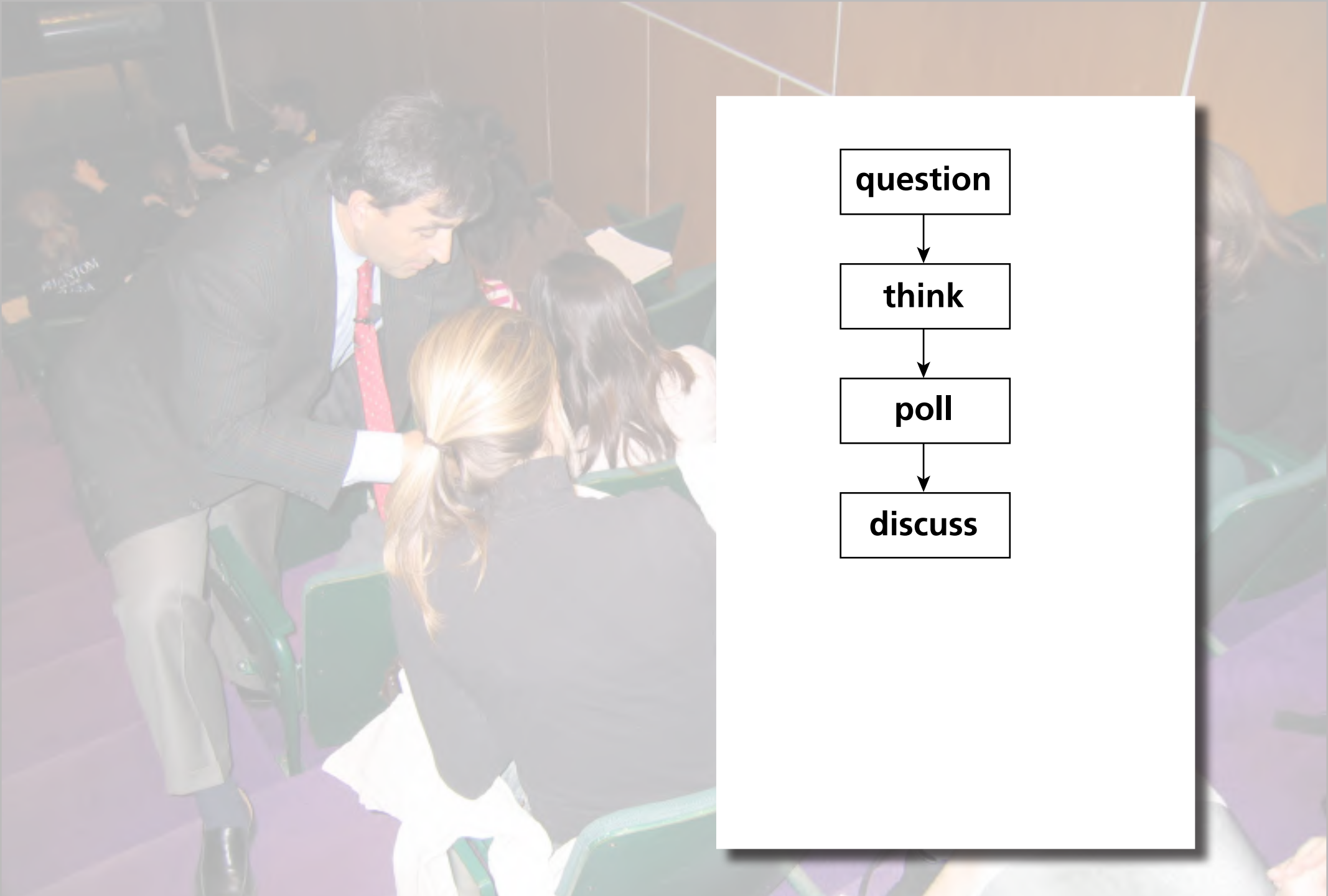
question



think



poll



question



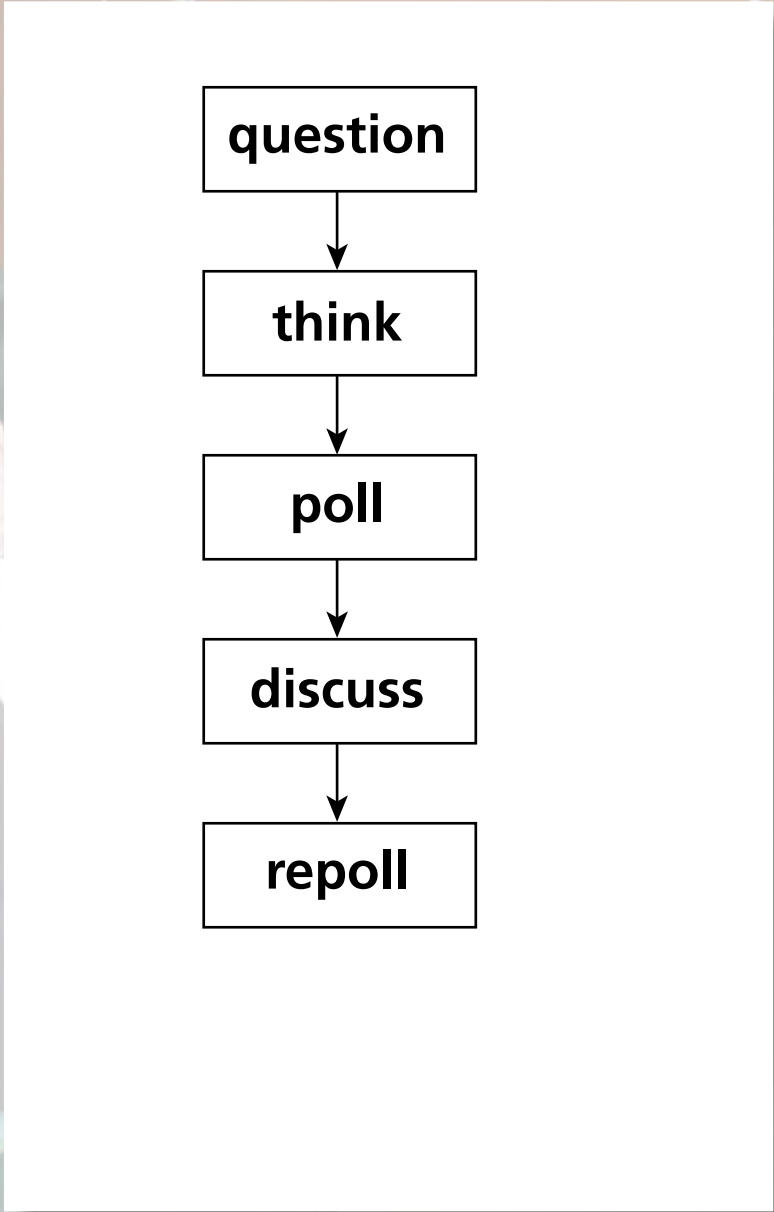
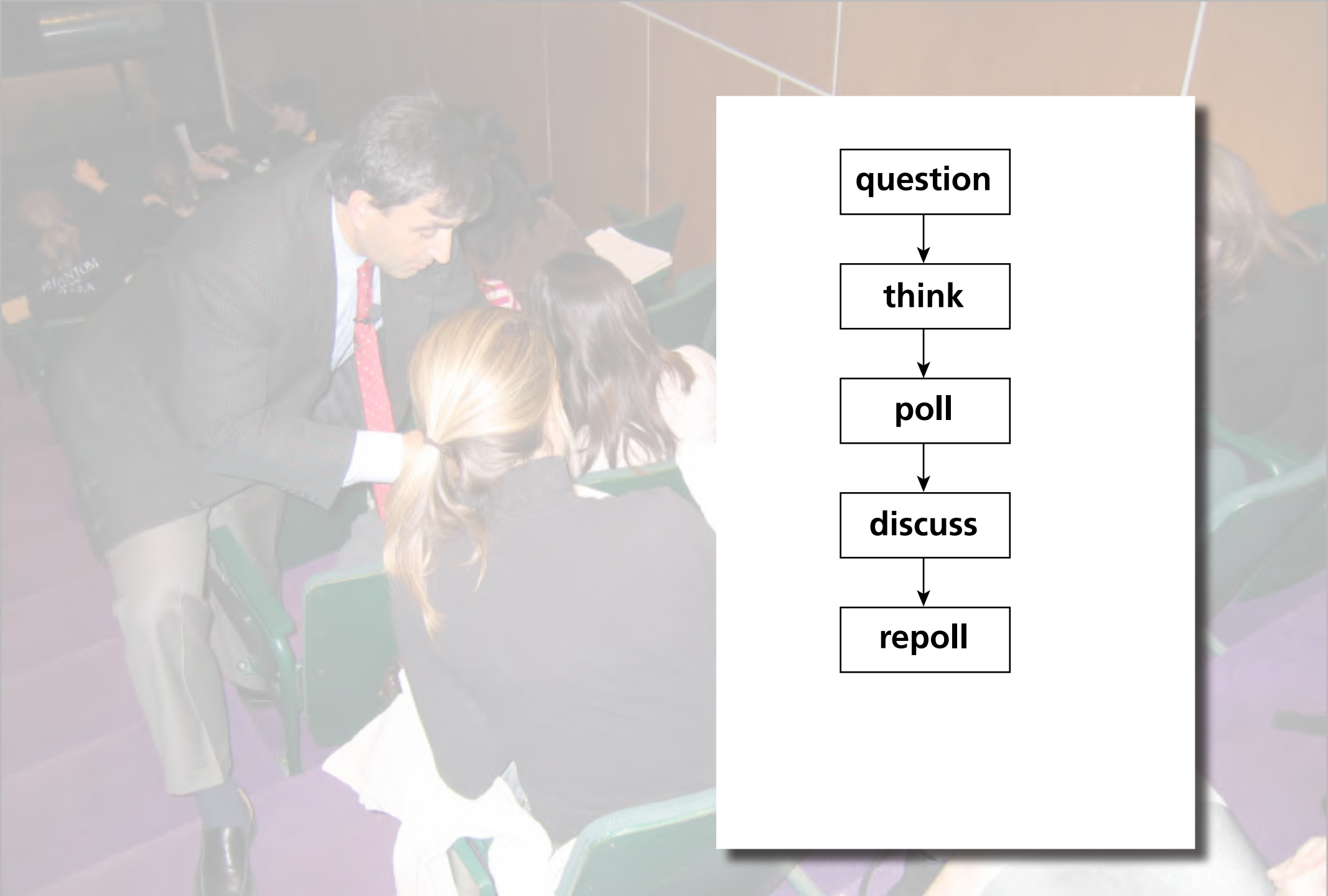
think

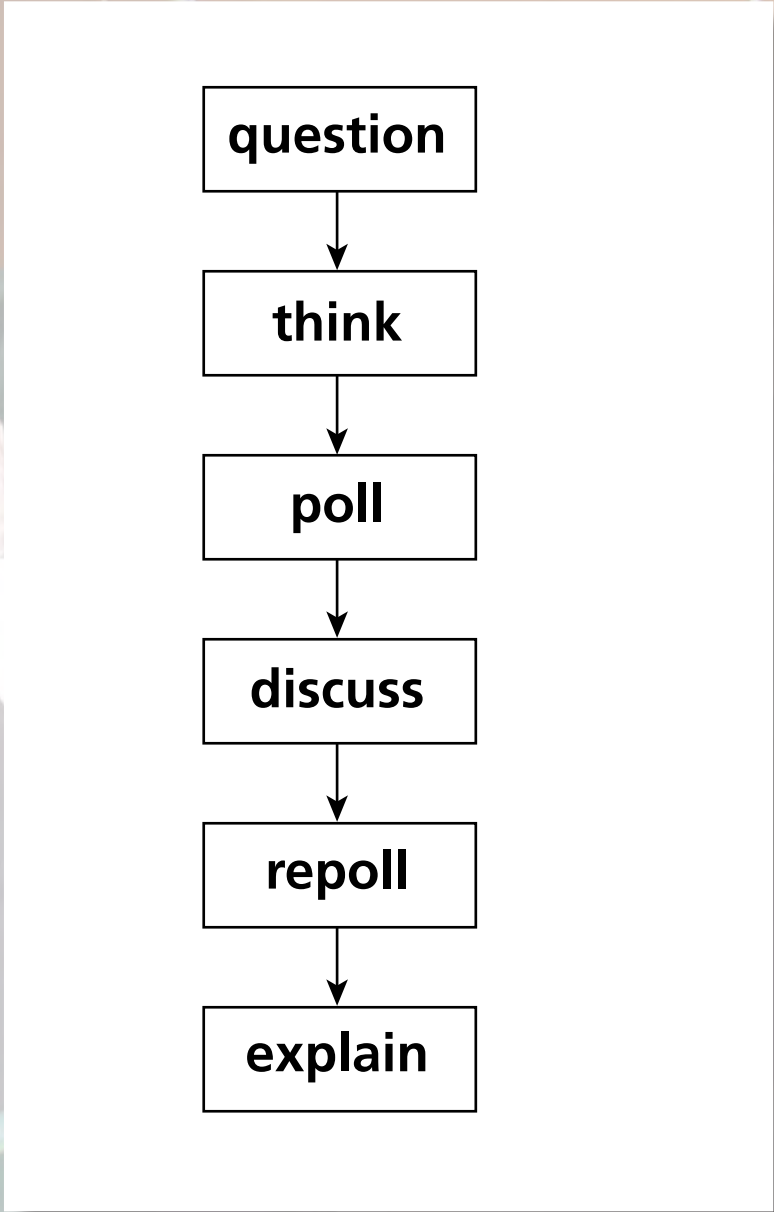
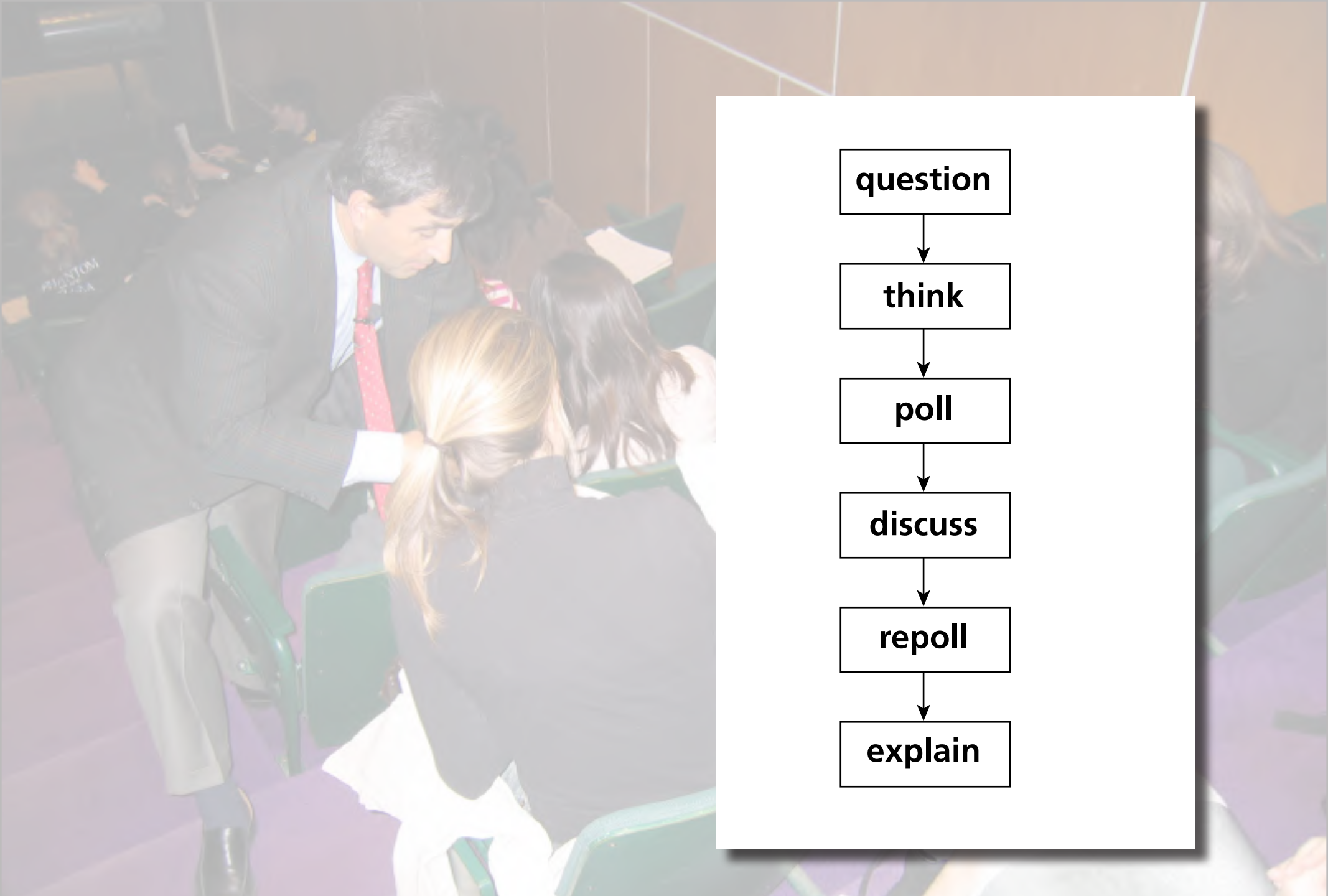


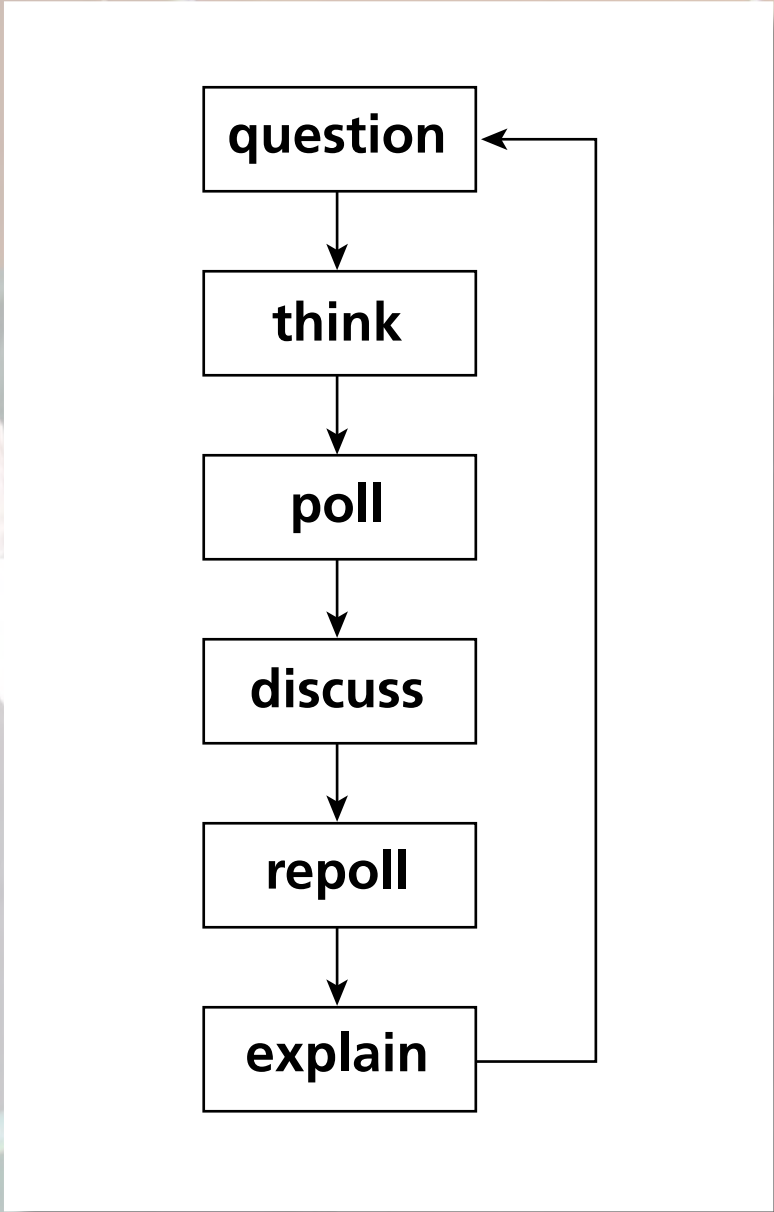
poll

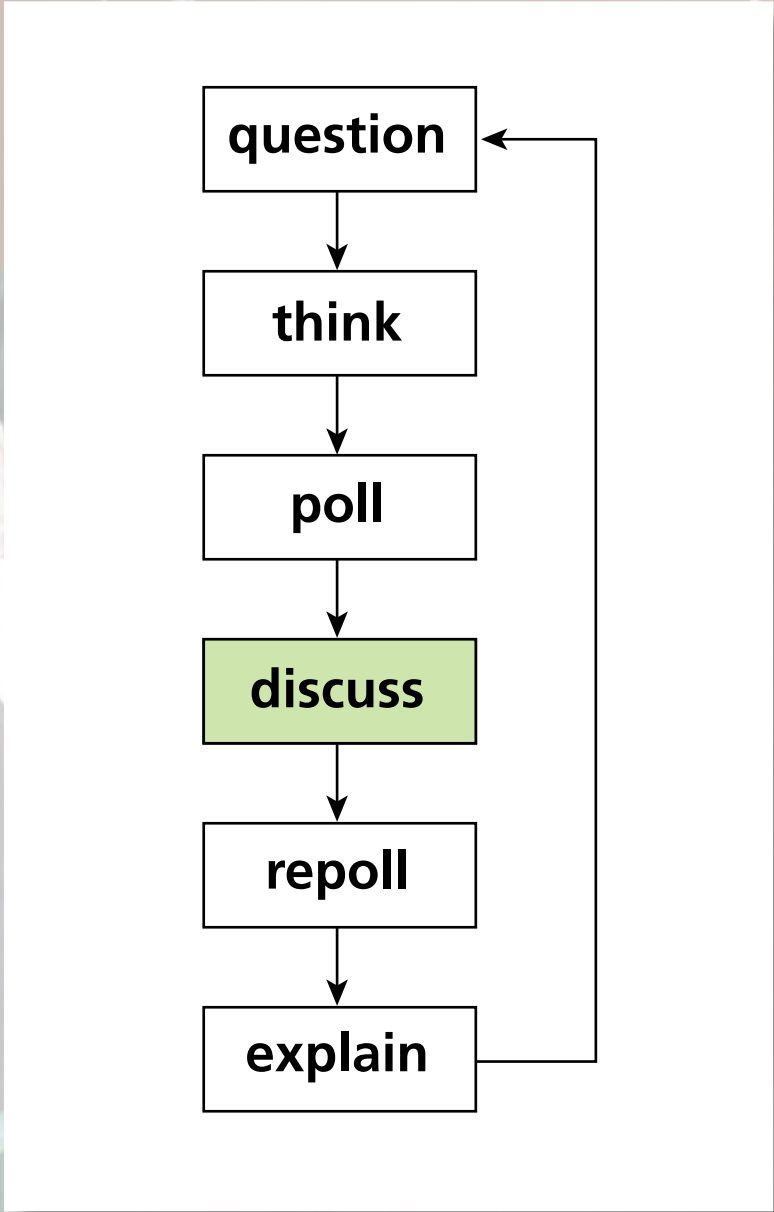


discuss









1 lecture

2 PI

Peer
Higher learning & gains

INSTRUCTION

1 lecture

2 PI

Peer

Higher learning gains

Better retention

INSTRUCTION

First International Asia-Pacific Conference on Peer Instruction



Beijing, China

mazur@harvard.edu

14-16 December 2012



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



1998



1 lecture

2 PI

3 PI 2.0



technology

1 lecture

2 PI

3 PI 2.0



How do I...

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

learning | catalytics

1 lecture

2 PI

3 PI 2.0

learning | catalytics



Gary King



Brian Lukoff



Eric Mazur

1 lecture

2 PI

3 PI 2.0

Use intelligent algorithms and data analytics to...

- improve questioning
- manage discussions

- facilitate time management/flow

learning | catalytics

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

extensible plug-in architecture for question types

- lowest
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 - $\text{Revenue} = \text{Assets} - \text{Liabilities}$
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 - depreciation?

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

Sample question types:

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- mathematical expression

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3 ID 1234567

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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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current session: **766079** | 69 students

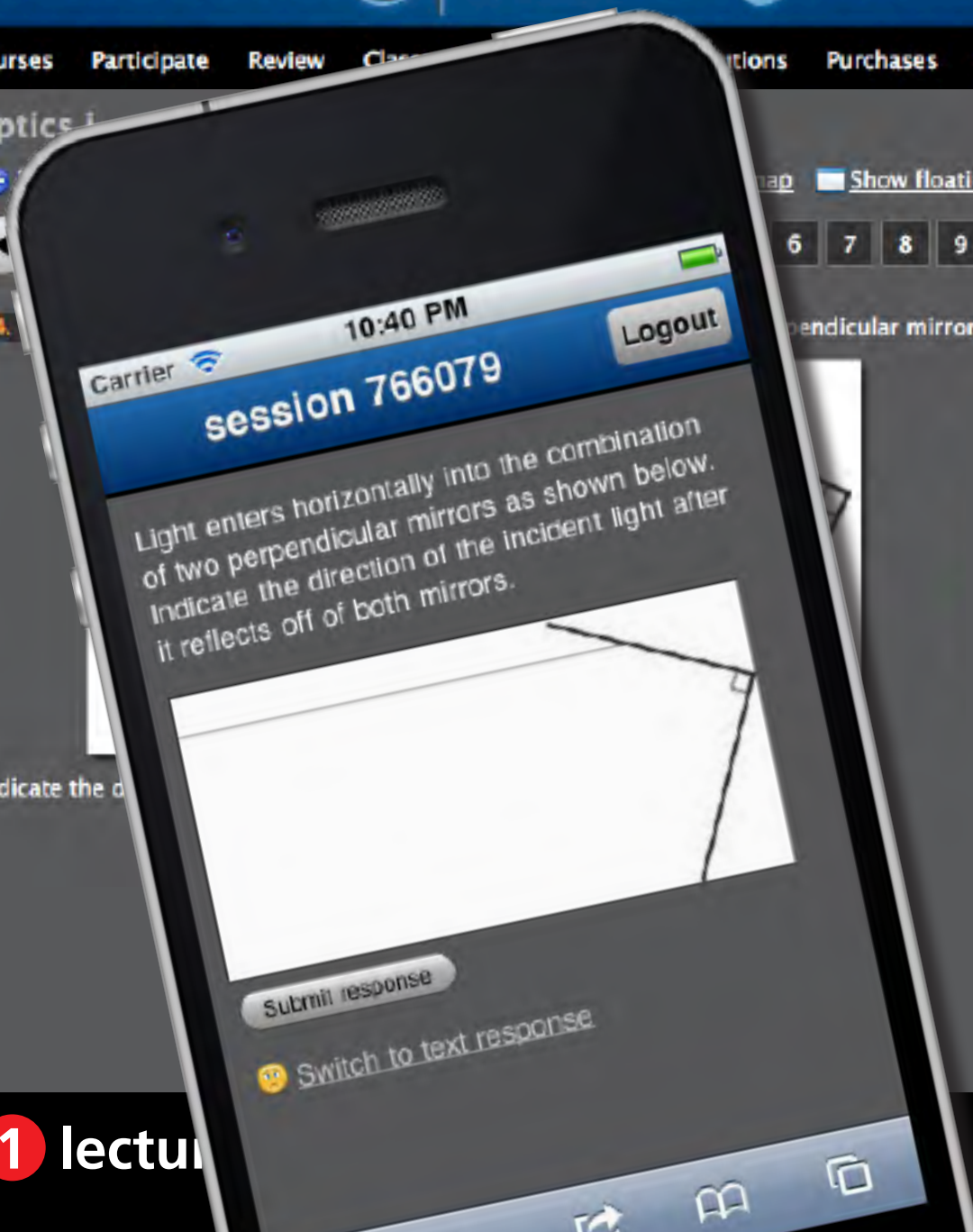
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6 7 8 9 10 11 12 13 14 15

perpendicular mirrors as shown below.

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1 lecture

3 PI 2.0

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current session: **766079** | 69 students

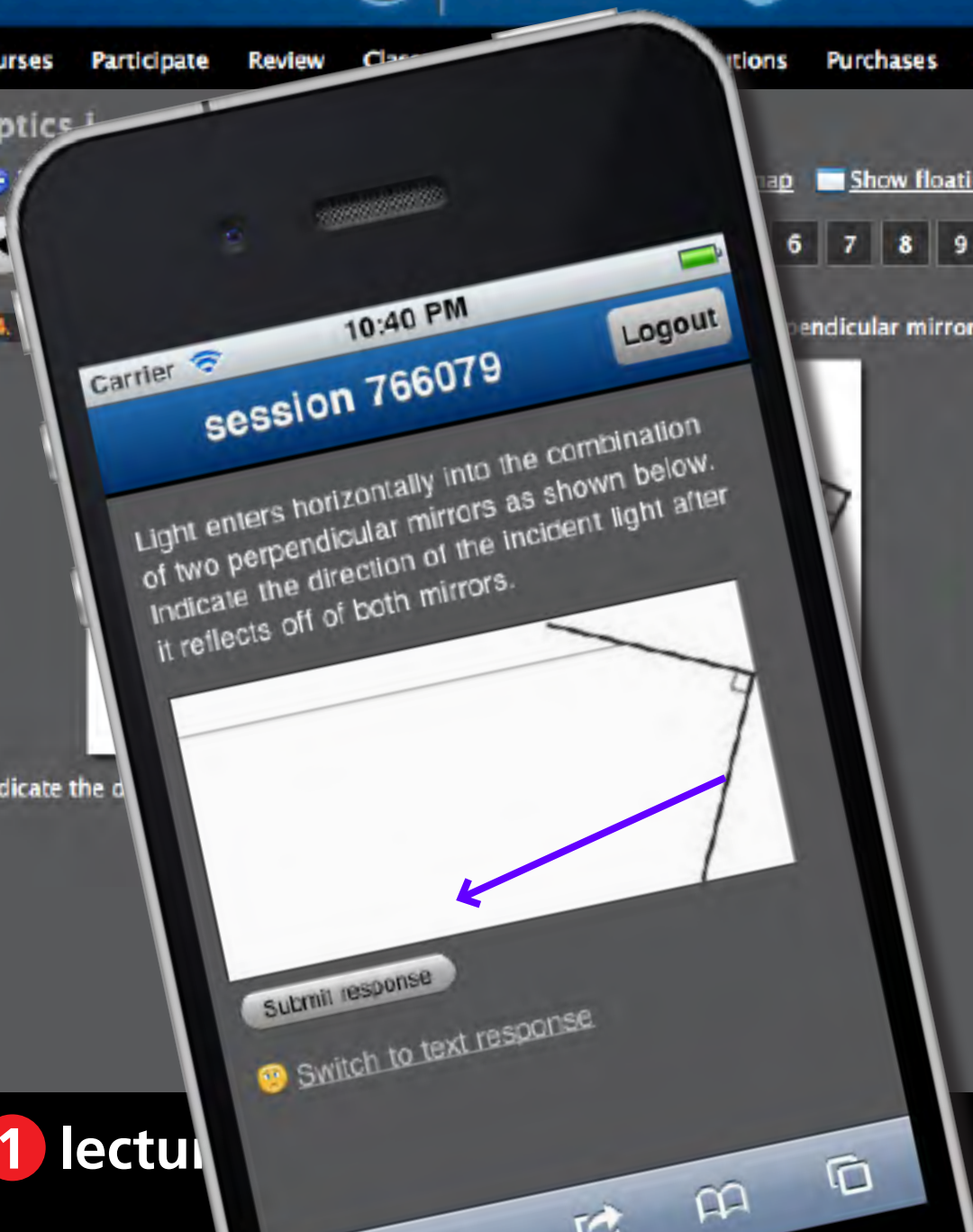
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6 7 8 9 10 11 12 13 14 15

perpendicular mirrors as shown below.

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1 lecture

3 PI 2.0

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current session: **766079** | 69 students

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6 7 8 9 10 11 12 13 14 15

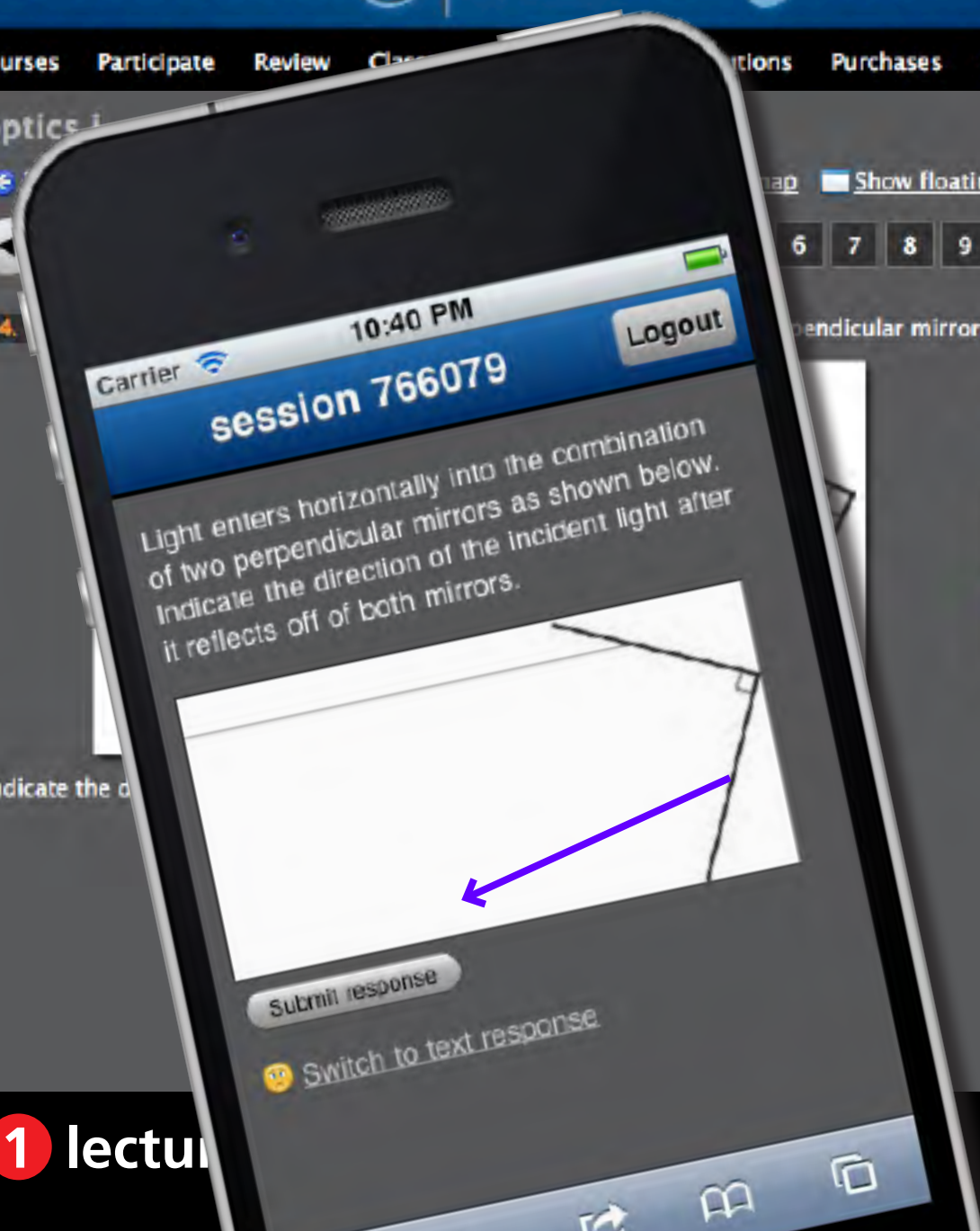
perpendicular mirrors as shown below.

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Round 1
57 responses, 58% correct



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1 lecture

3 PI 2.0

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current session: **766079** | 69 students



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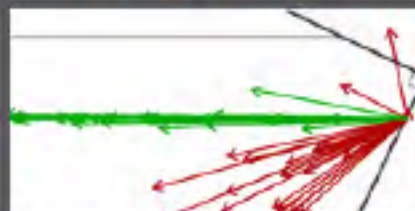
6 7 8 9 10 11 12 13 14 15

perpendicular mirrors as shown below.


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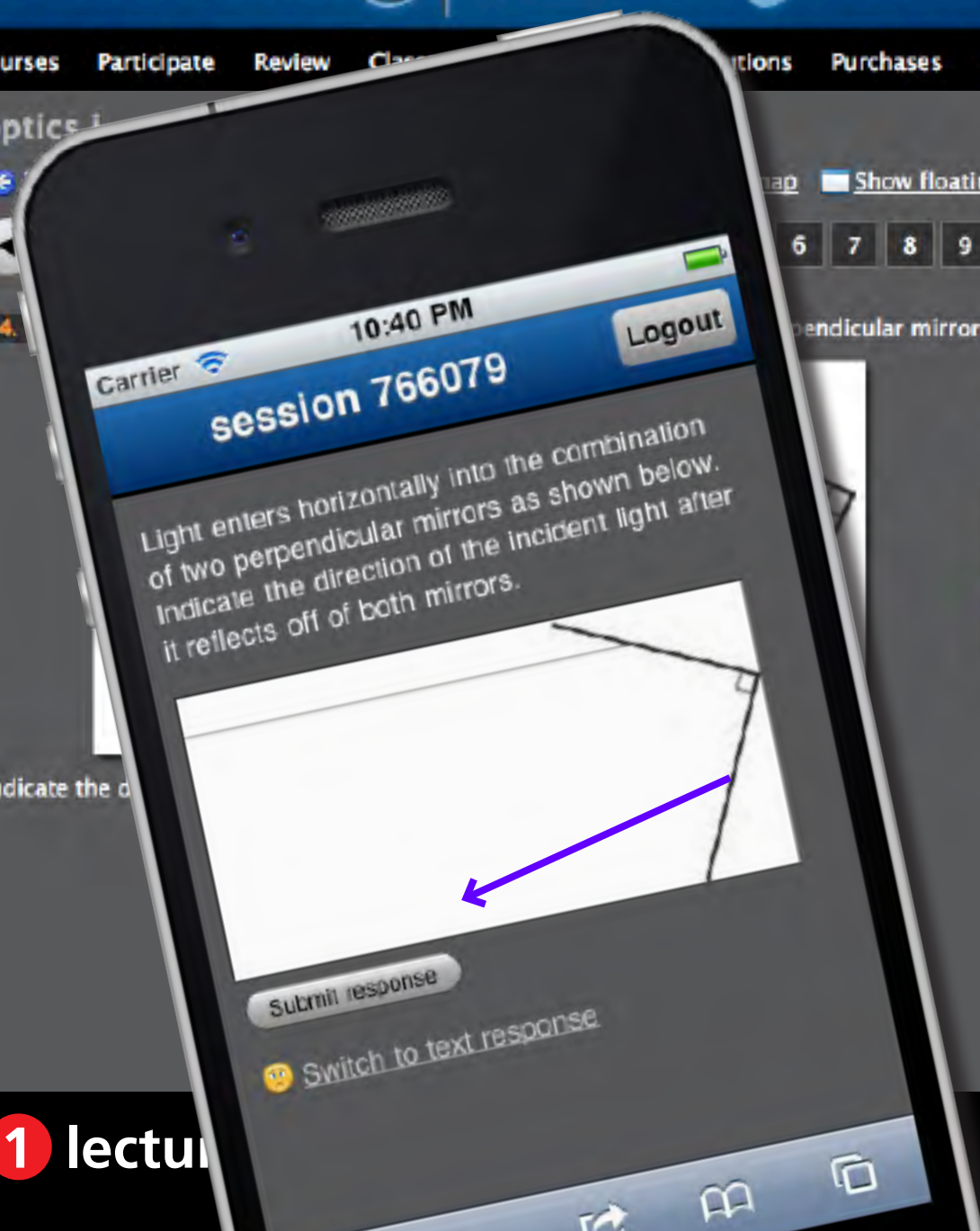
Round 1  
57 responses, 58% correct

Round 2  
51 responses, 73% correct



✓ 8 get it now
✗ 0 still don't get it

 [feedback & support](#)



1 lecture

3 PI 2.0

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

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

Sample question types:

- direction

- mathematical expression

- long answer, short answer, word cloud

- numerical, data collection

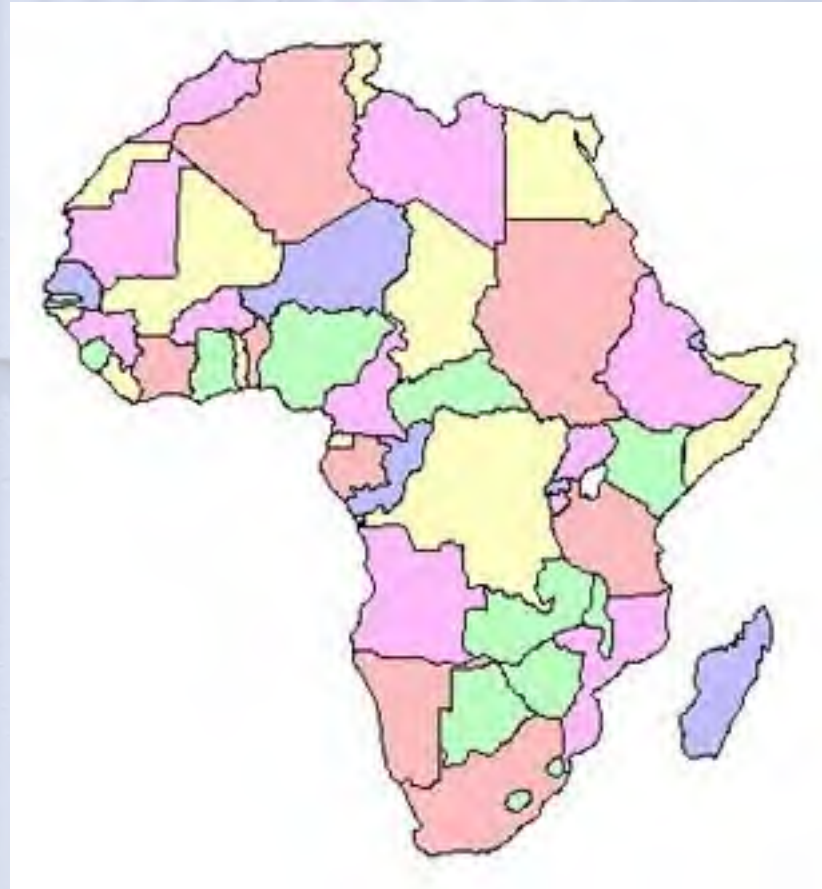
- ranking, priority

- region (select point on image)

- sketch, composite sketch

- highlight passage

Where is Tanzania?



Sample question types:

- direction

- mathematical expression

- long answer, short answer, word cloud

- numerical, data collection

- ranking, priority

- region (select point on image)

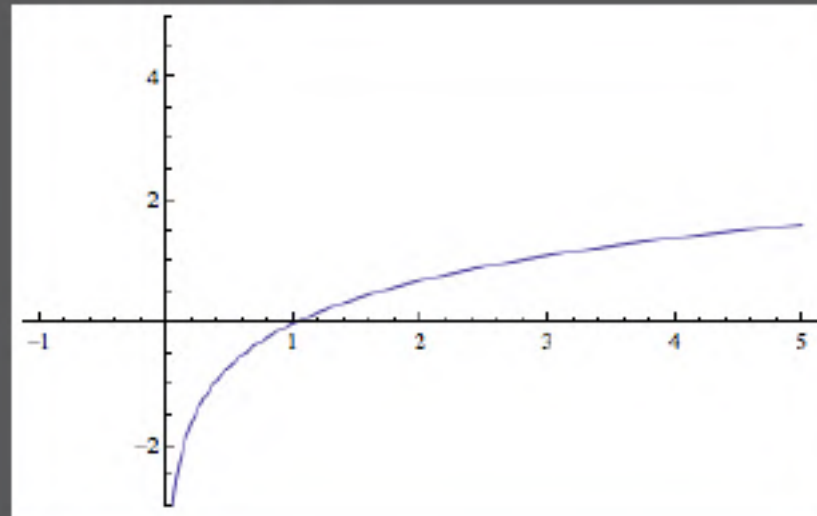
- sketch, composite sketch

- highlight passage

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

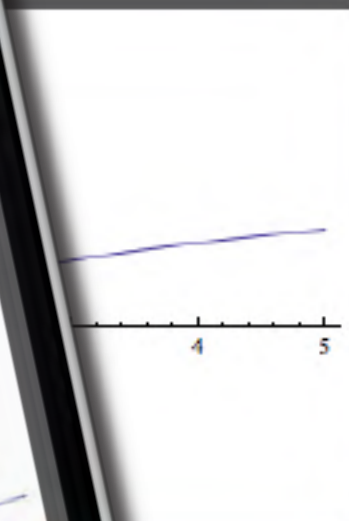
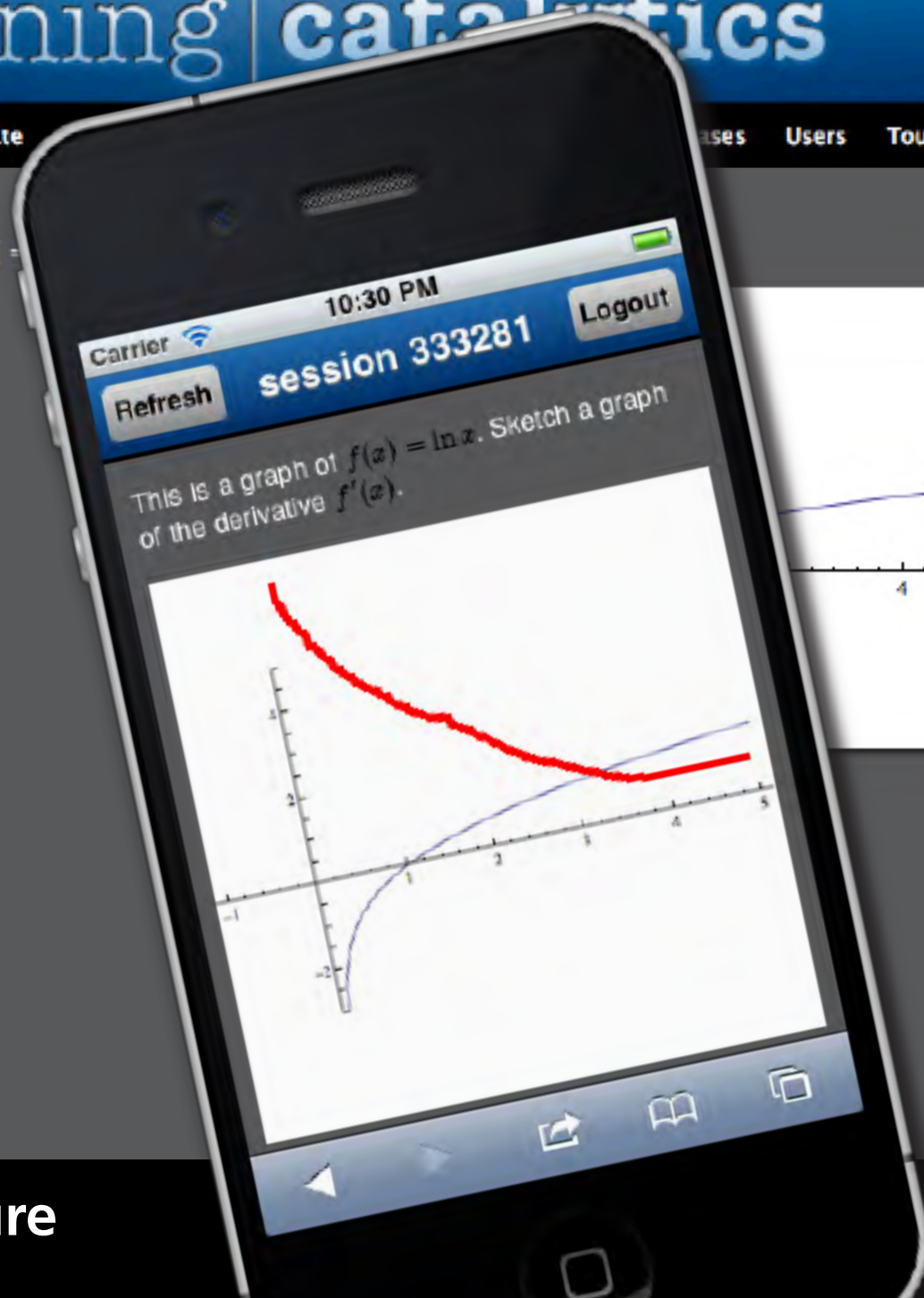


1 lecture

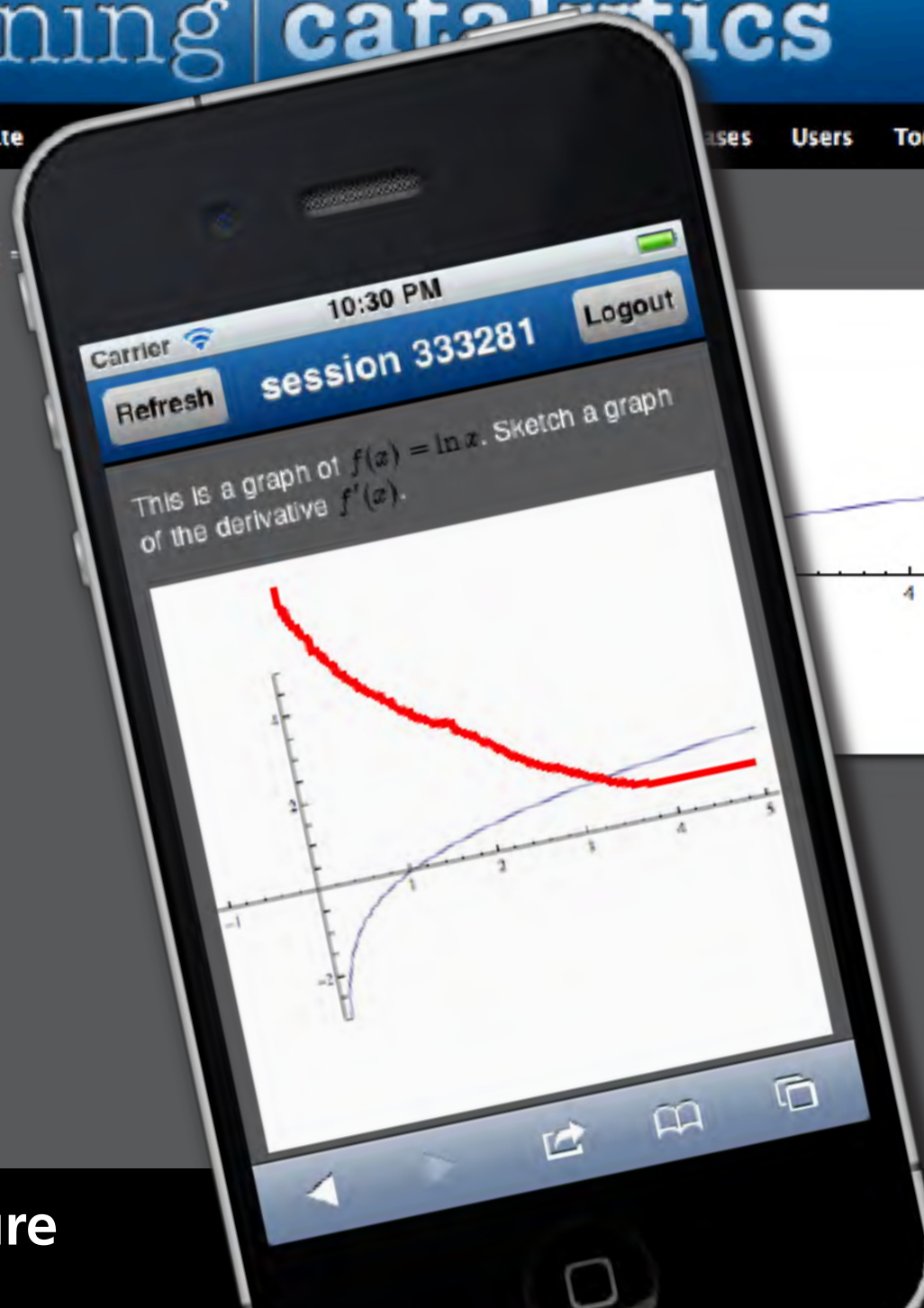
2 PI

3 PI 2.0

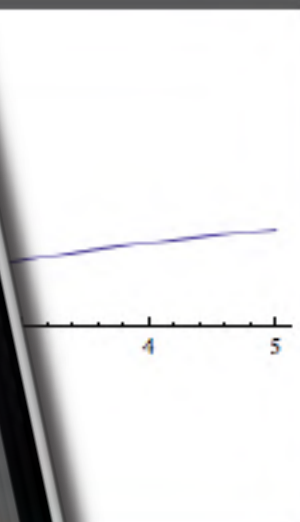
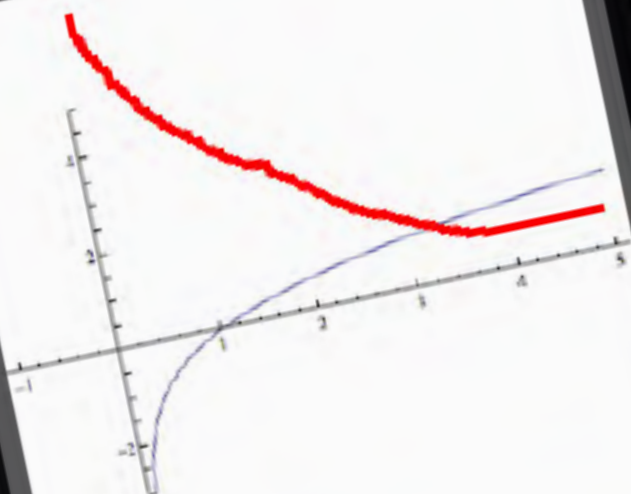
learning | catalytics

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

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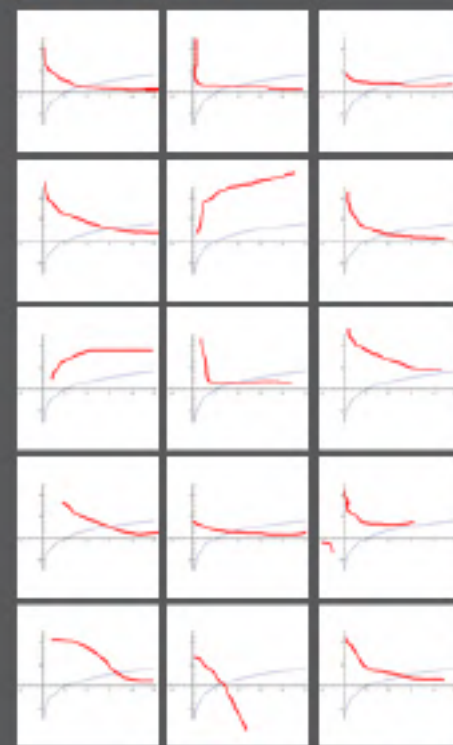
[Courses](#) [Participate](#)[ases](#) [Users](#) [Tour](#) [Help](#)This is a graph of $f(x) =$ 

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



Round 1

15 responses



✓ 6 get it now

✗ 0 still don't get it

1 lecture

3 PI 2.0

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

data analytics



1 lecture

2 PI

3 PI 2.0



human interaction

1 lecture

2 PI

3 PI 2.0

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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.



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%

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

Search: _____

1 lecture

2 PI

3 PI 2.0

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learning catalytics

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 A to B is

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.

Round 1
 74 responses, 81% correct

- A. 81%
- 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

Carrier 9:31 PM 100%

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Search:

1 lecture

2 PI

3 PI 2.0

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learning catalytics

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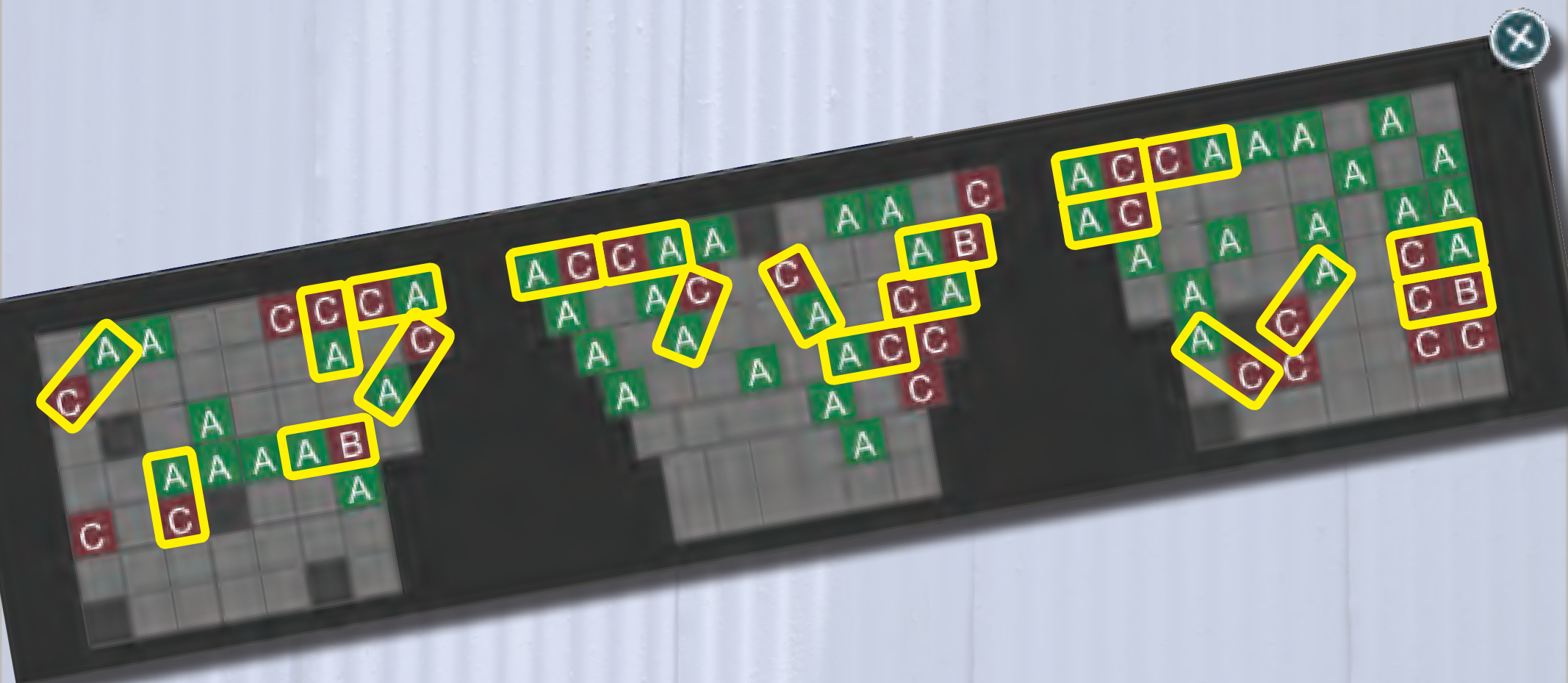
Search: _____

1 lecture

2 PI

3 PI 2.0

let system manage pairing

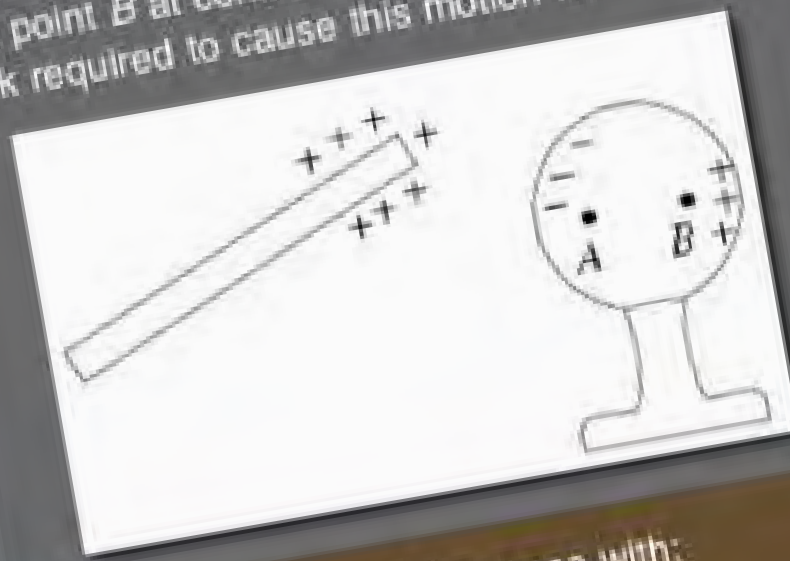


1 lecture

2 PI

3 PI 2.0

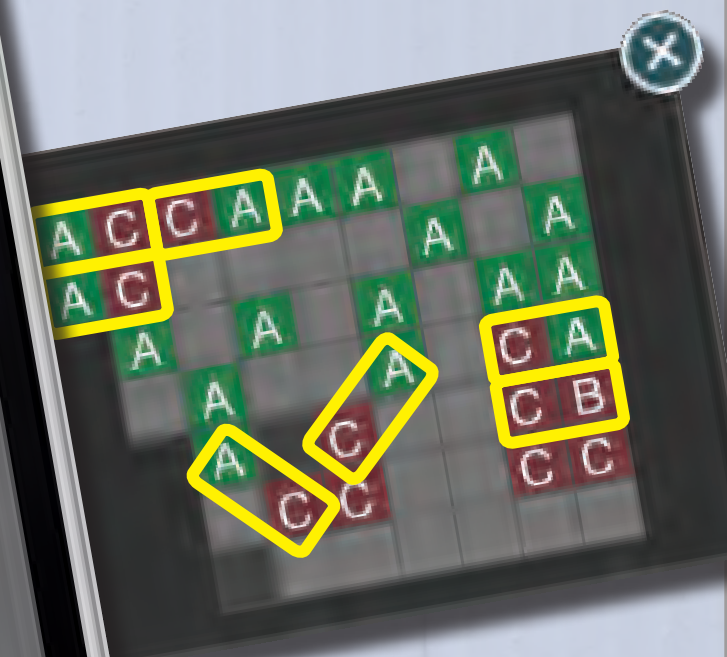
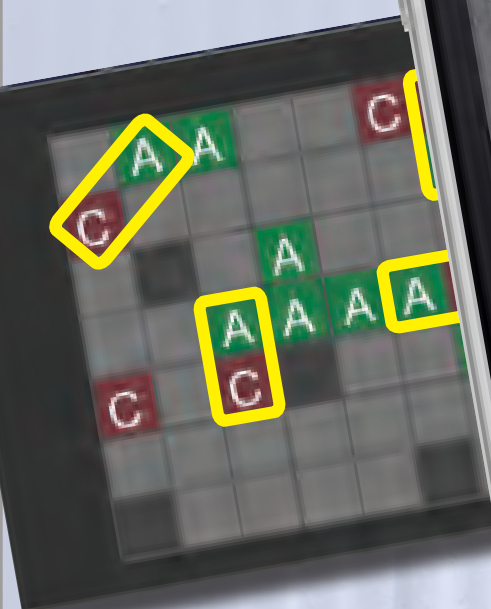
A positively charged rod is held near a neutral conducting sphere as illustrated below. A positively charged particle is moved from point A to point B at constant speed. The mechanical work required to cause this motion is



Please discuss your response with:

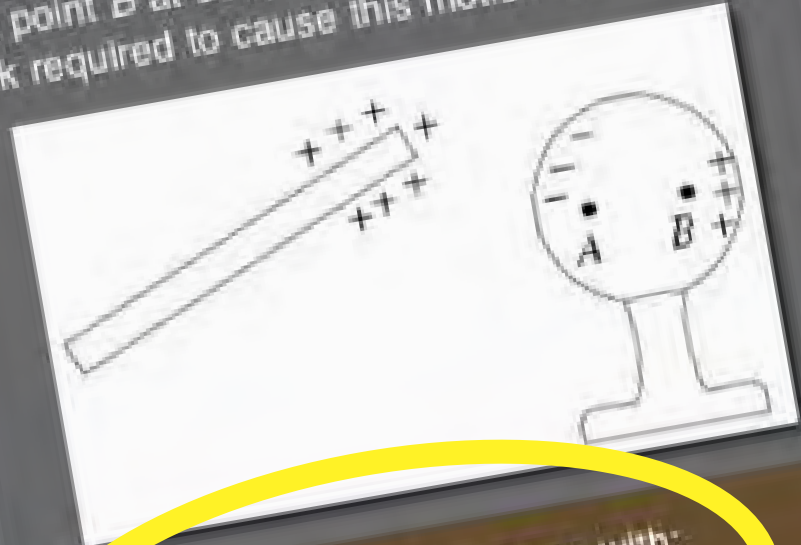
- Brian Lukoff (to your left)

I am talking to this person/people



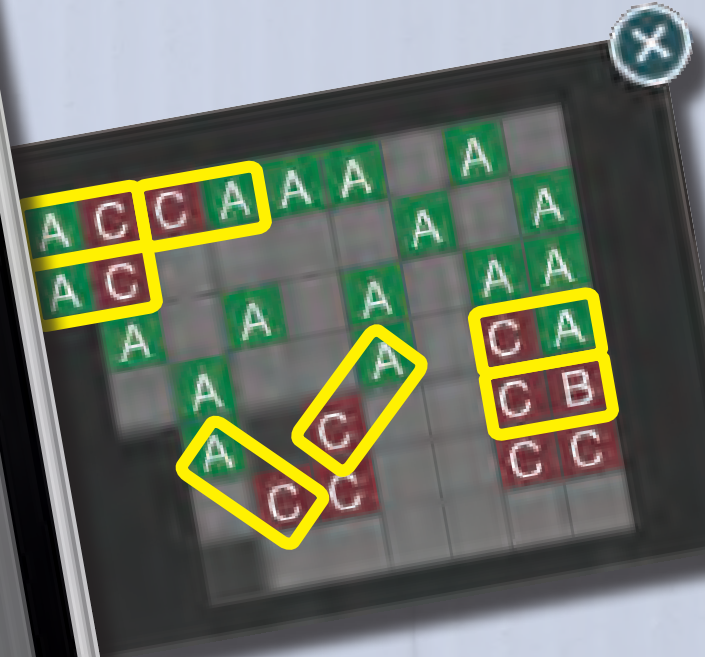
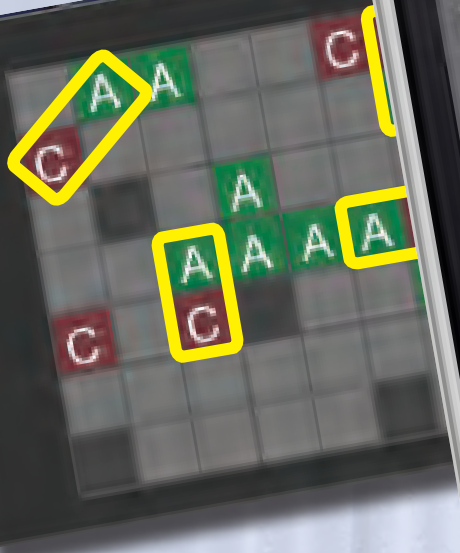
Leave

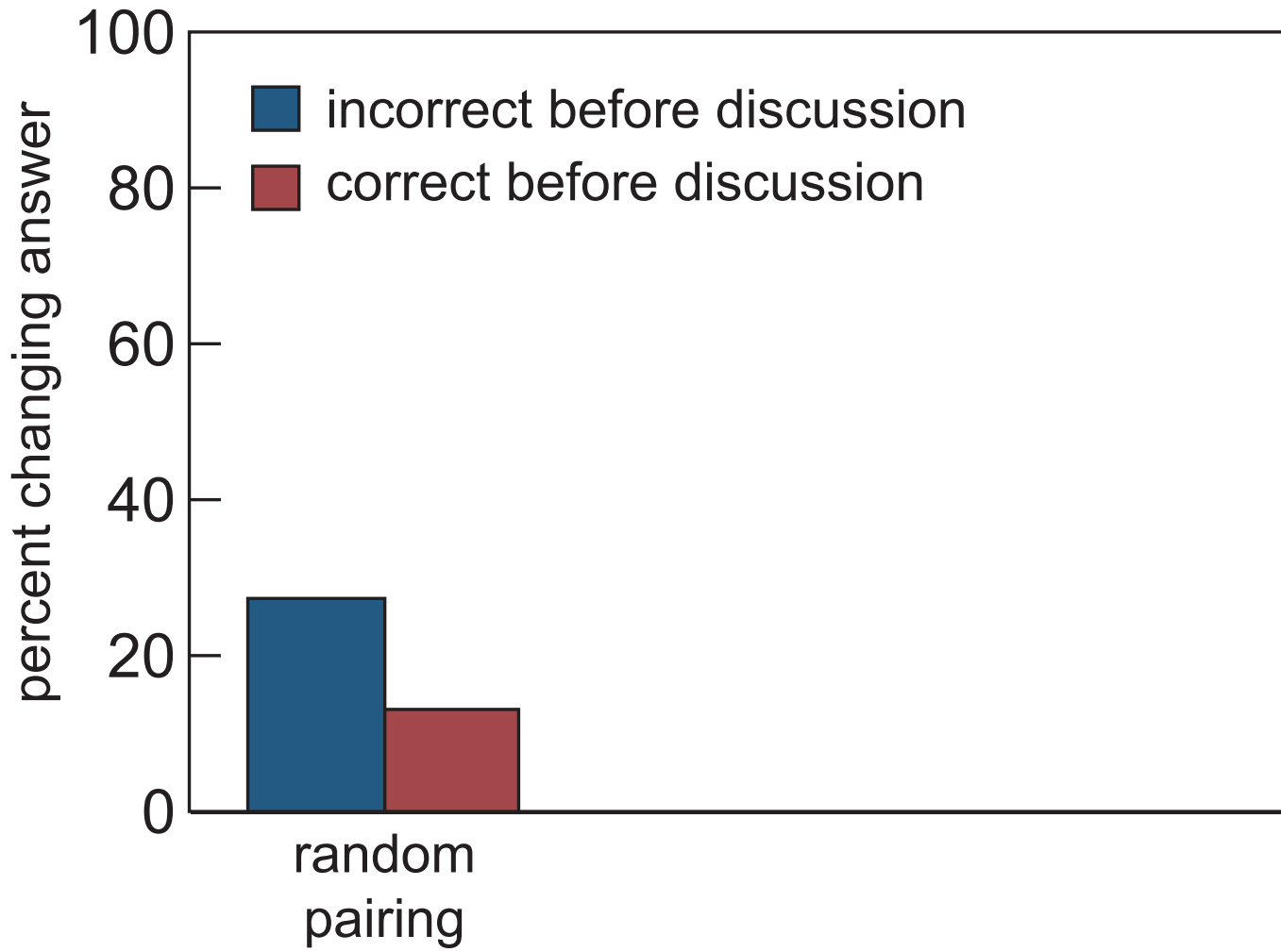
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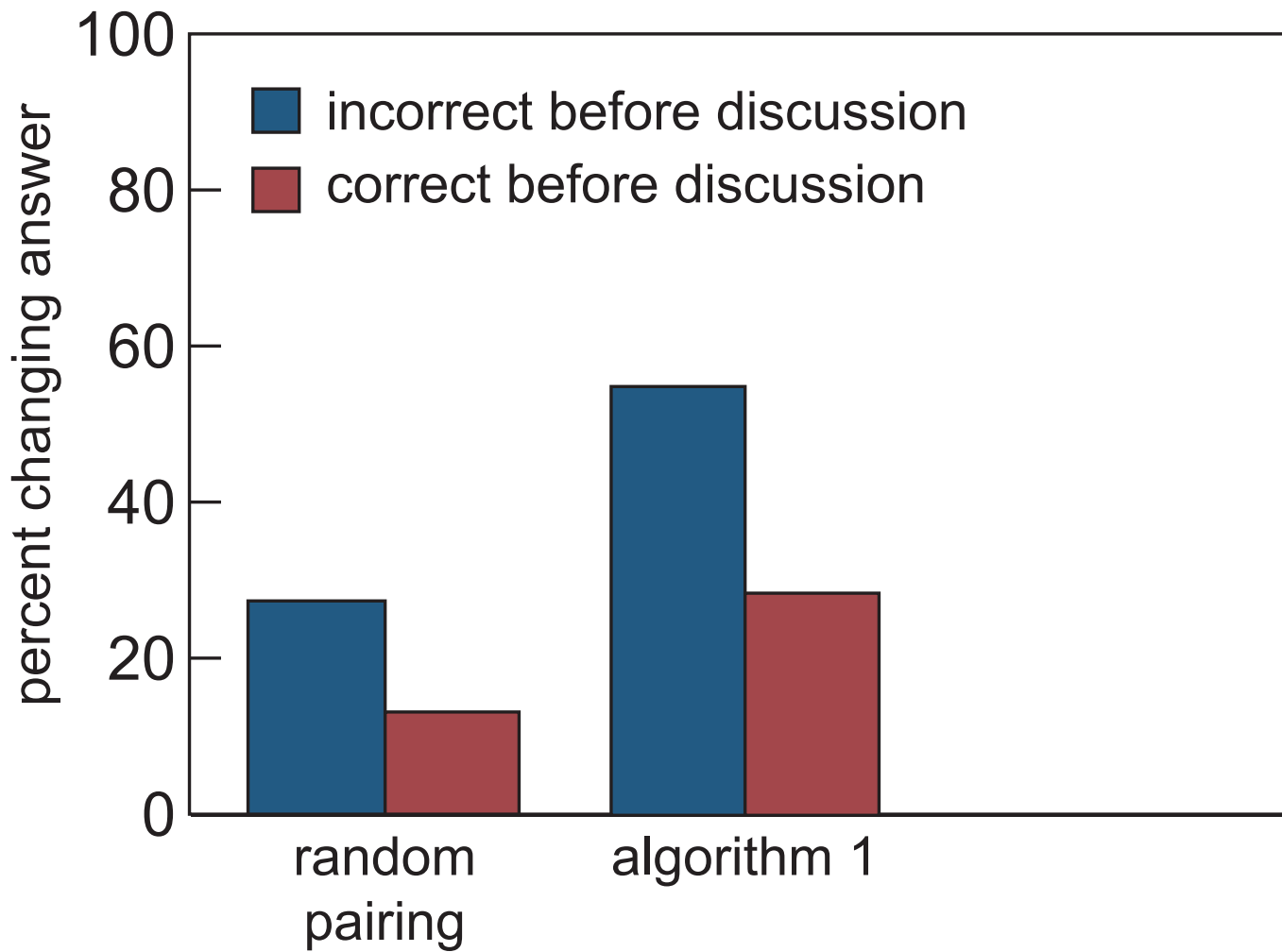


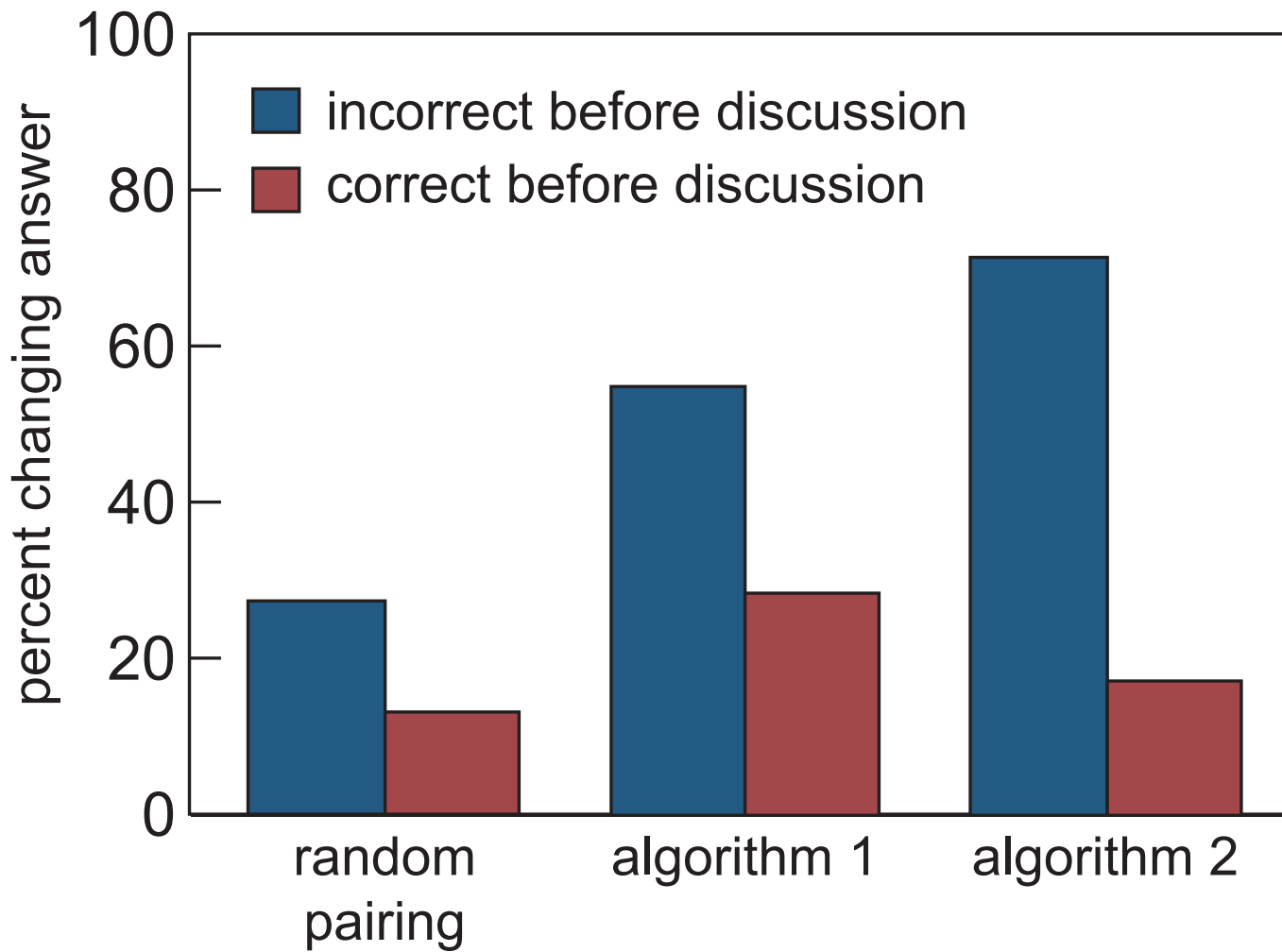
Please discuss your response with:

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1 lecture

2 PI

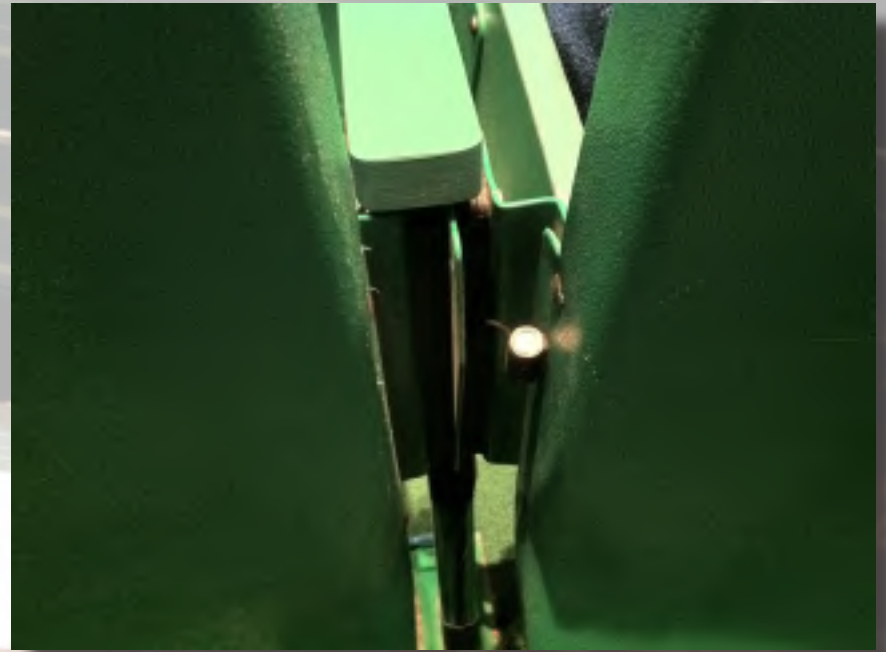
3 PI 2.0



1 lecture

2 PI

3 PI 2.0

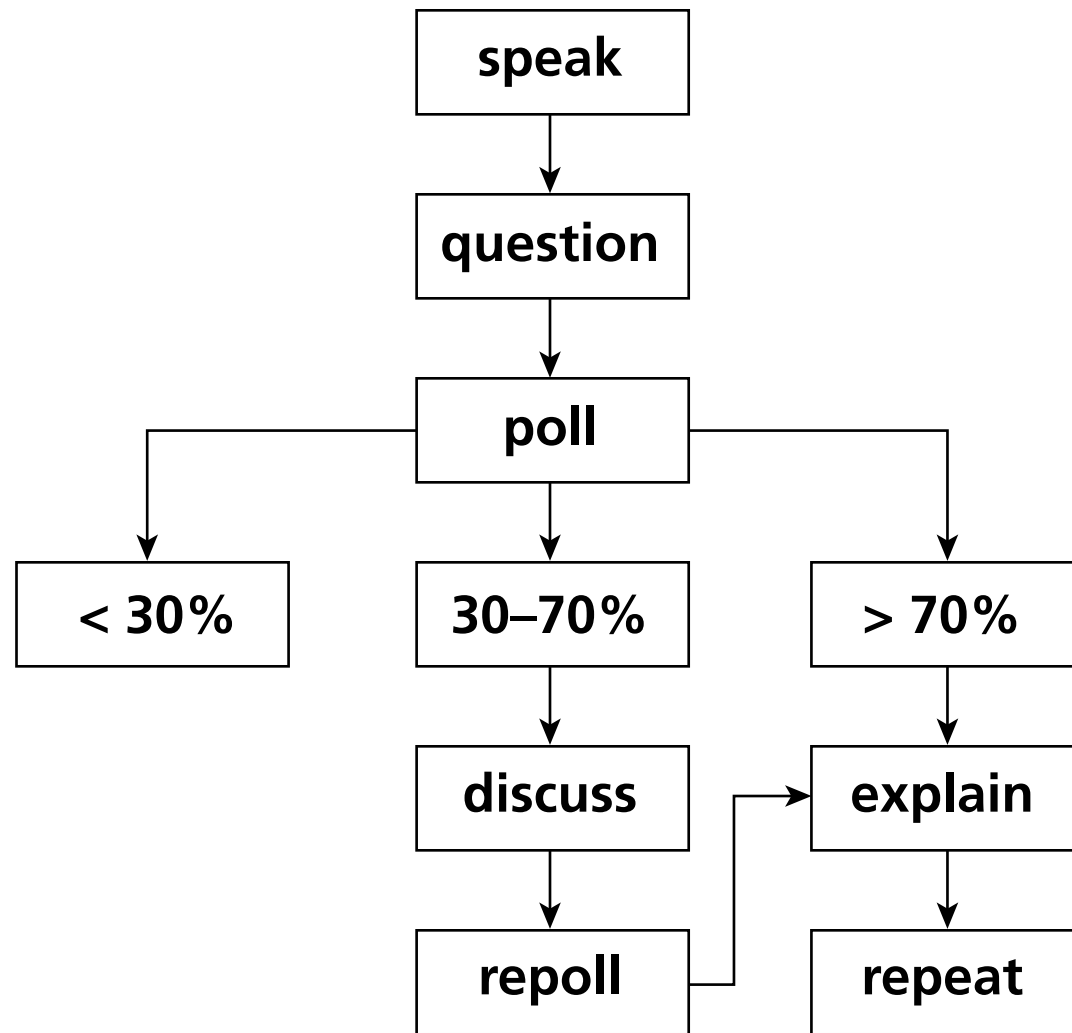


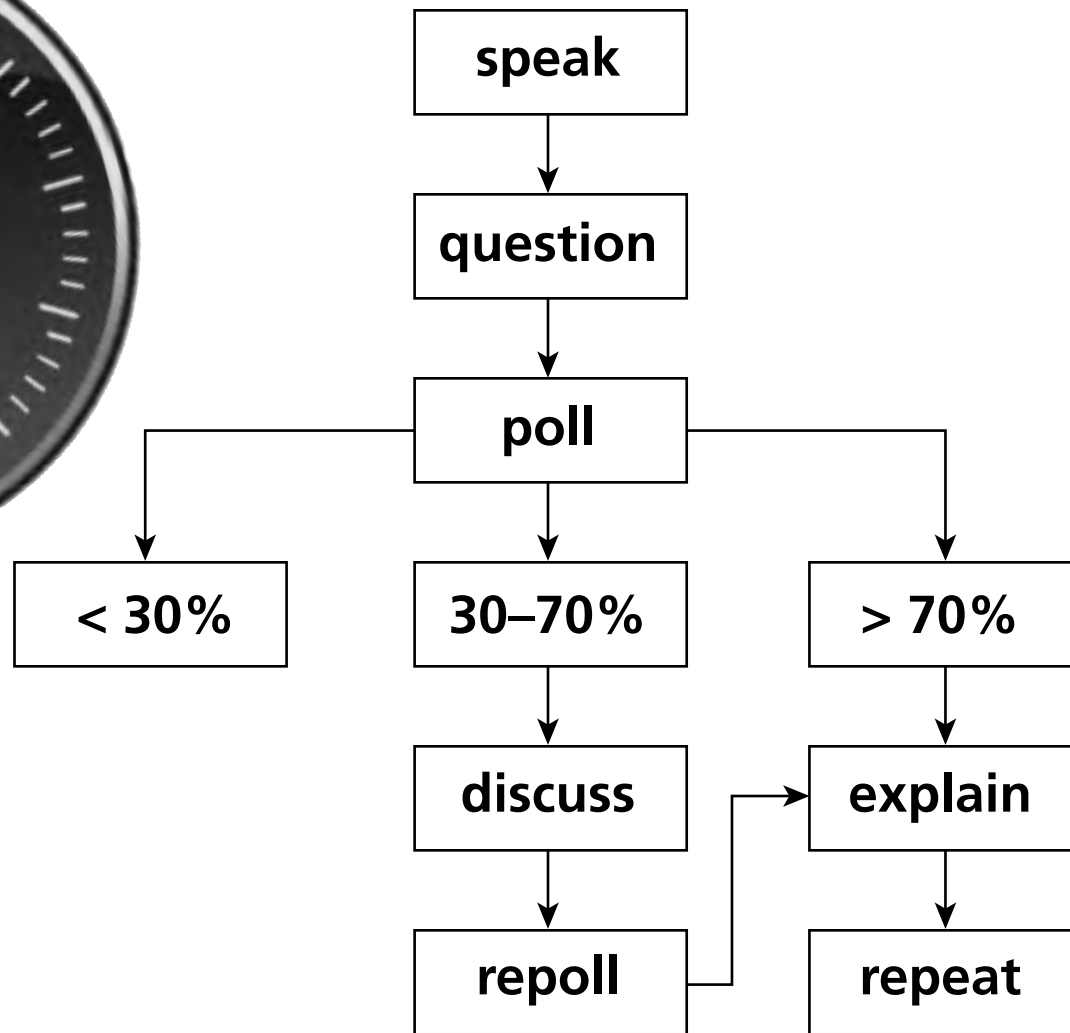
1 lecture

2 PI

3 PI 2.0









1 lecture

2 PI

3 PI 2.0



Education is not just about:

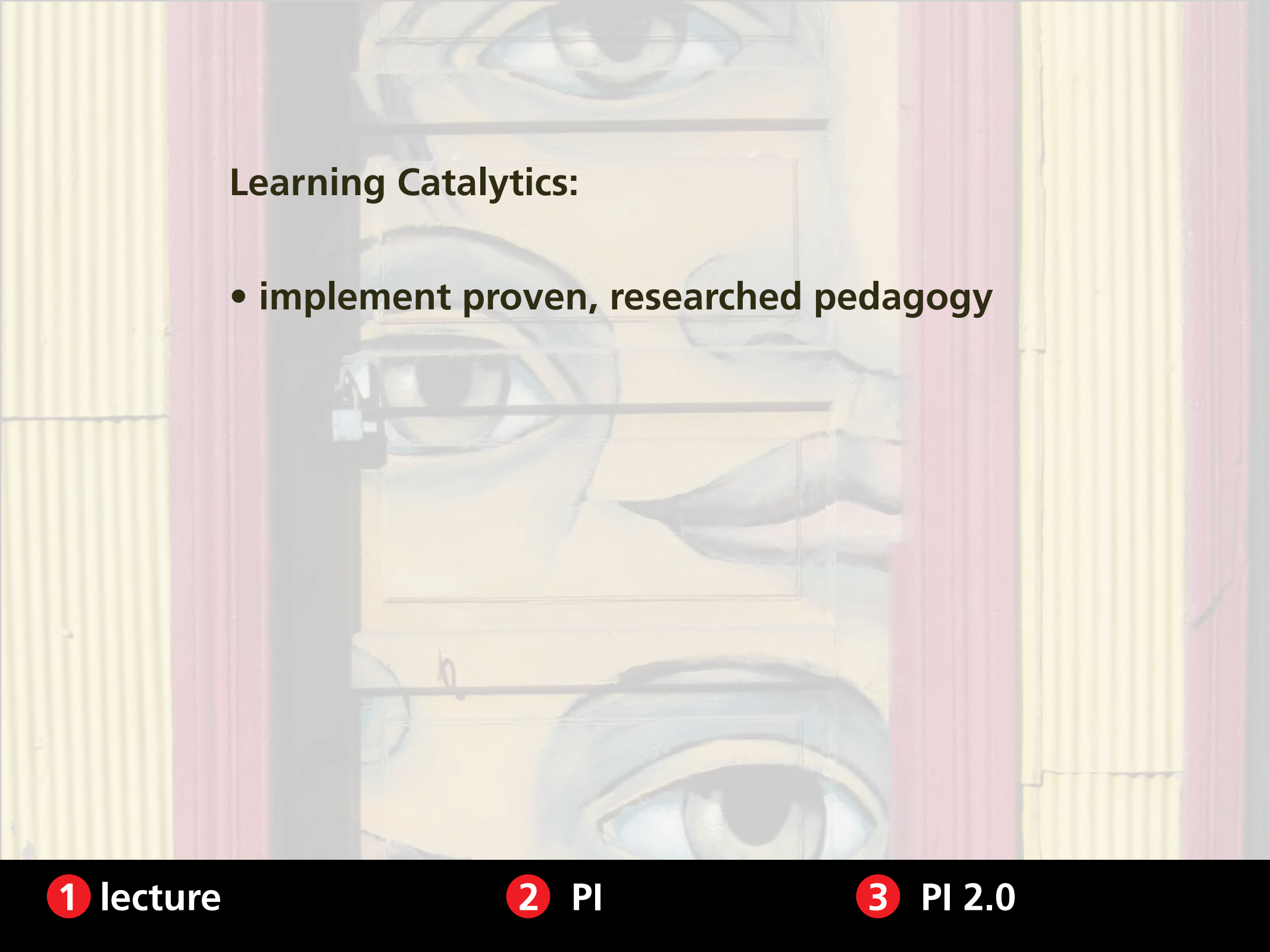
- **transferring information**
- **getting students to do what we do**

The background of the slide is a faded, artistic illustration of a book cover. The cover is yellow with red vertical stripes. A large, stylized face is visible, with prominent eyes and a nose. The face appears to be looking forward. The overall style is somewhat abstract and painterly.

Education is not just about:

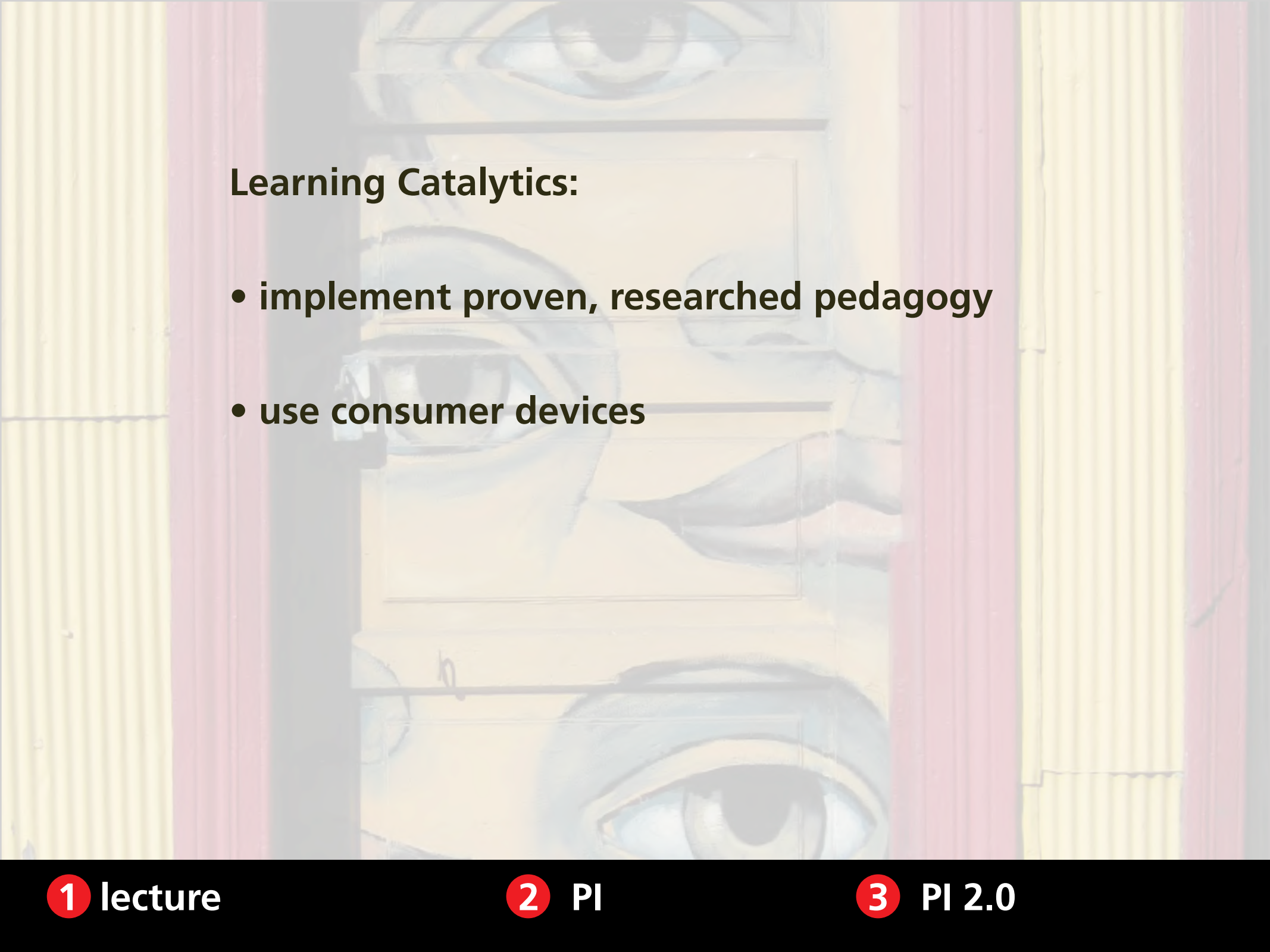
- **transferring information**
- **getting students to do what we do**

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*

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