

Interactive learning: Technology in the classroom



ADVIS Event
Malvern Preparatory School
Malvern, PA, January 19, 2012



Interactive learning: Technology in the classroom



Interactive learning: Technology in the classroom



1 LCatalytics.com 2 sign up code DEMO

Interactive learning: Technology in the classroom



1 LCatalytics.com 2 sign up code DEMO 3 ID 1234567

Interactive learning: Technology in the classroom



@eric_mazur



1 LCatalytics.com 2 sign up code DEMO 3 ID 1234567

EDUCACION

Think of something you are really good at

EDUCACION

Think of something you are really good at



1 LCatalytics.com 2 sign up code DEMO 3 ID 1234567

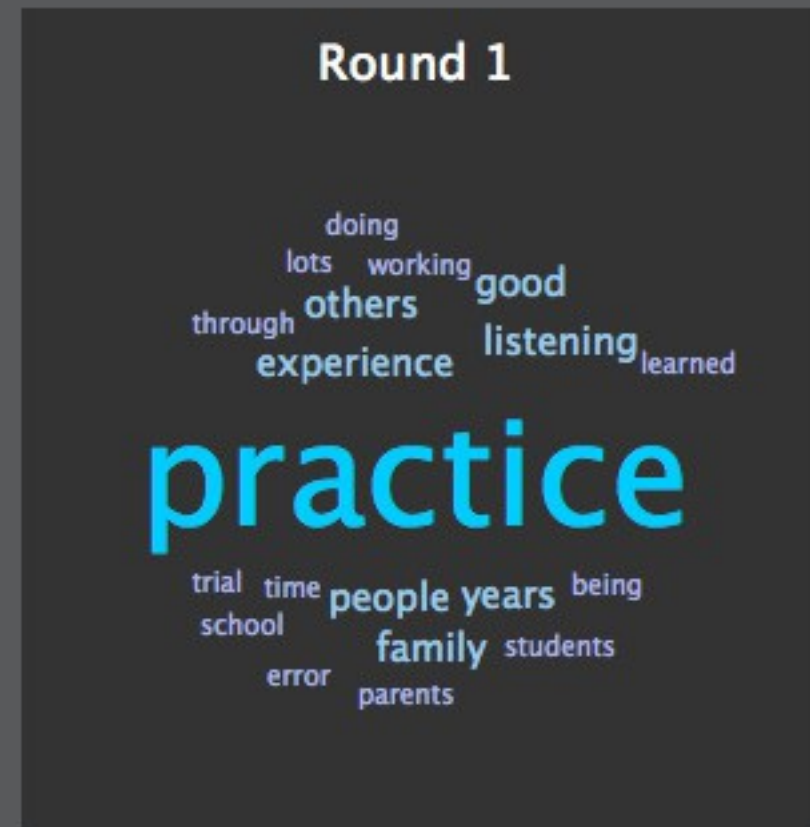
Now think how you became good at it



1 LCatalytics.com 2 sign up code DEMO 3 ID 1234567

Class session: 123456

Now describe in a couple of words how you became good at whatever it is you entered in the previous question.





What are the factors that determine the rate of a chemical reaction? How do we measure the rate of a reaction? How do we determine the order of a reaction? How do we determine the activation energy of a reaction?

Rate of reaction = $\frac{1}{V} \frac{d[A]}{dt}$

Blackboard 1: $\text{A} \rightarrow \text{B} + \text{C}$

Blackboard 2: $\text{A} + \text{B} \rightarrow \text{C}$

Blackboard 3: $\text{A} + \text{B} \rightarrow \text{C} + \text{D}$

Text on the stage: $\text{A} \rightarrow \text{B} + \text{C}$





1 education

2 PI



1 education

2 PI

3 PI 2.0



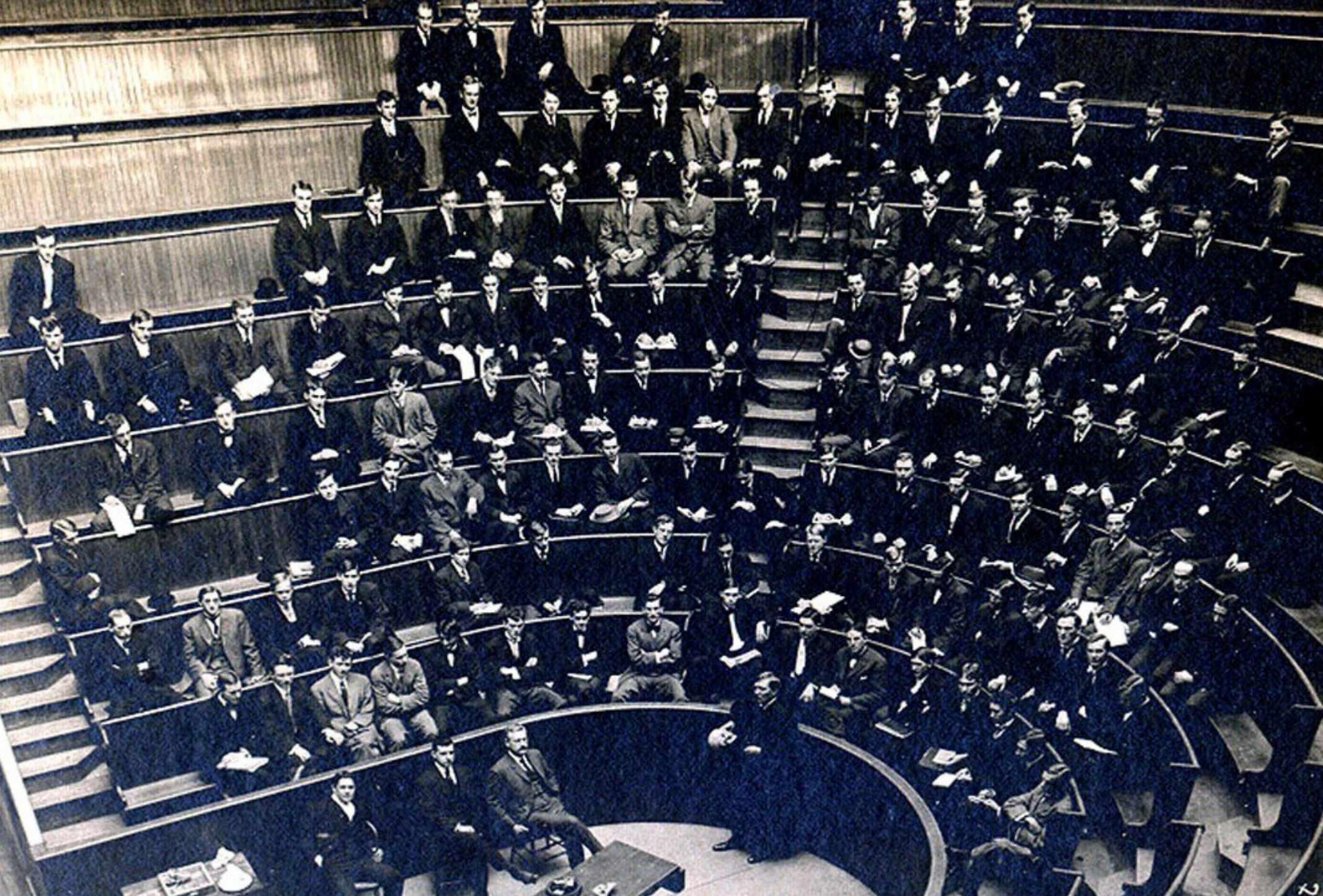
**EXCITING
stuff!**

1 education


2 PI

3 PI 2.0



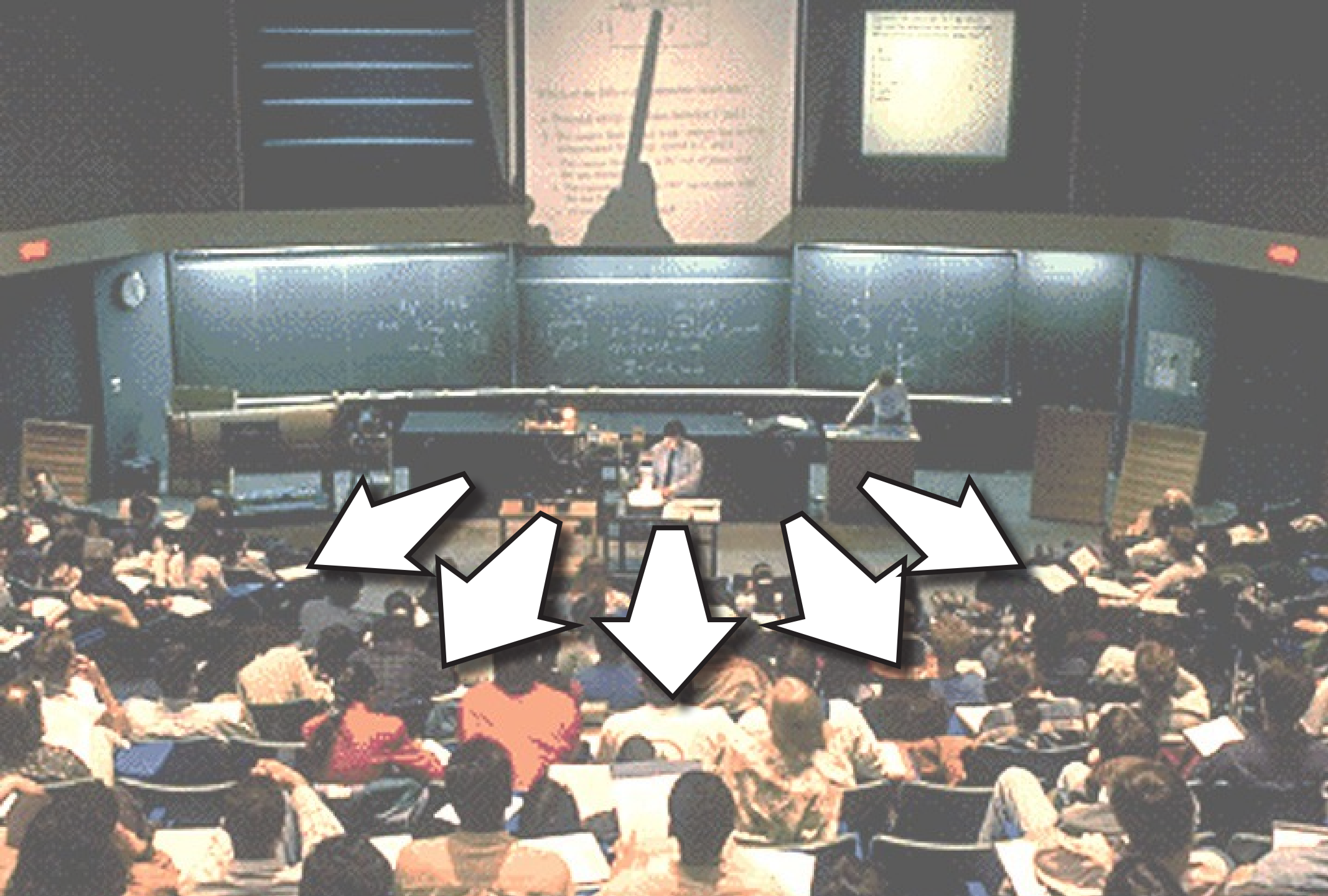






**What happens
in a lecture?**





The result?

EDUCACION

Lack of learning

EDUCACION

Lack of learning

Lack of retention



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



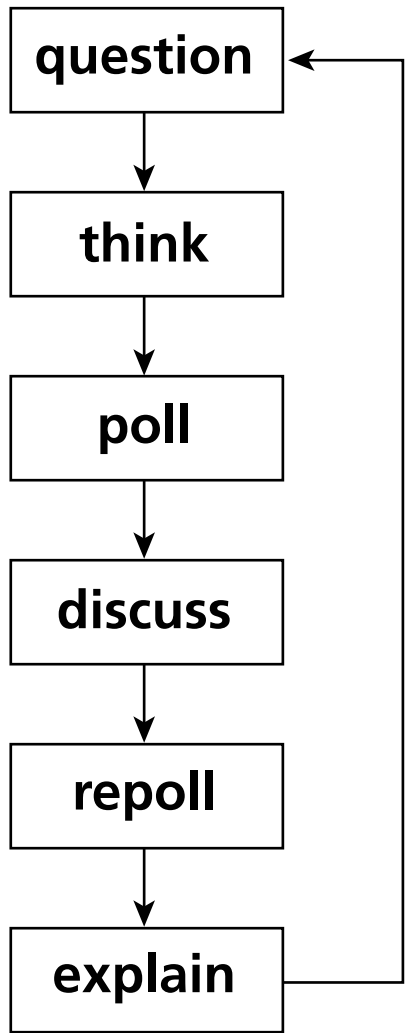
discuss

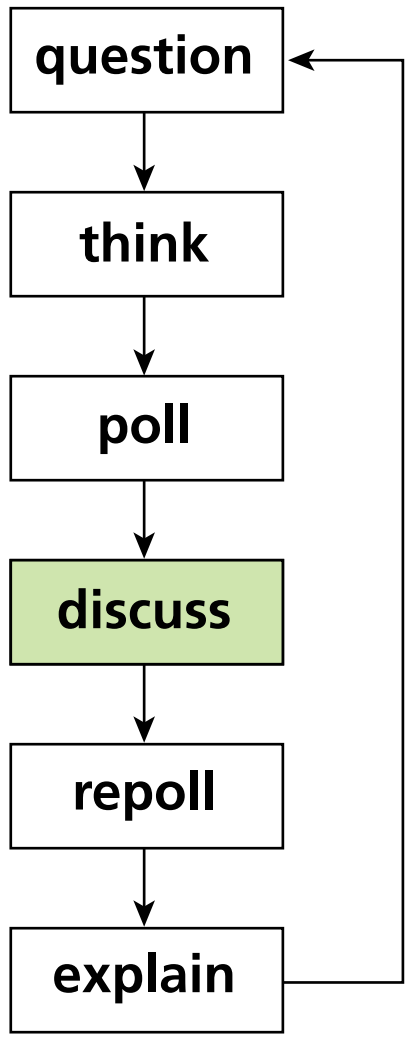


repoll



explain

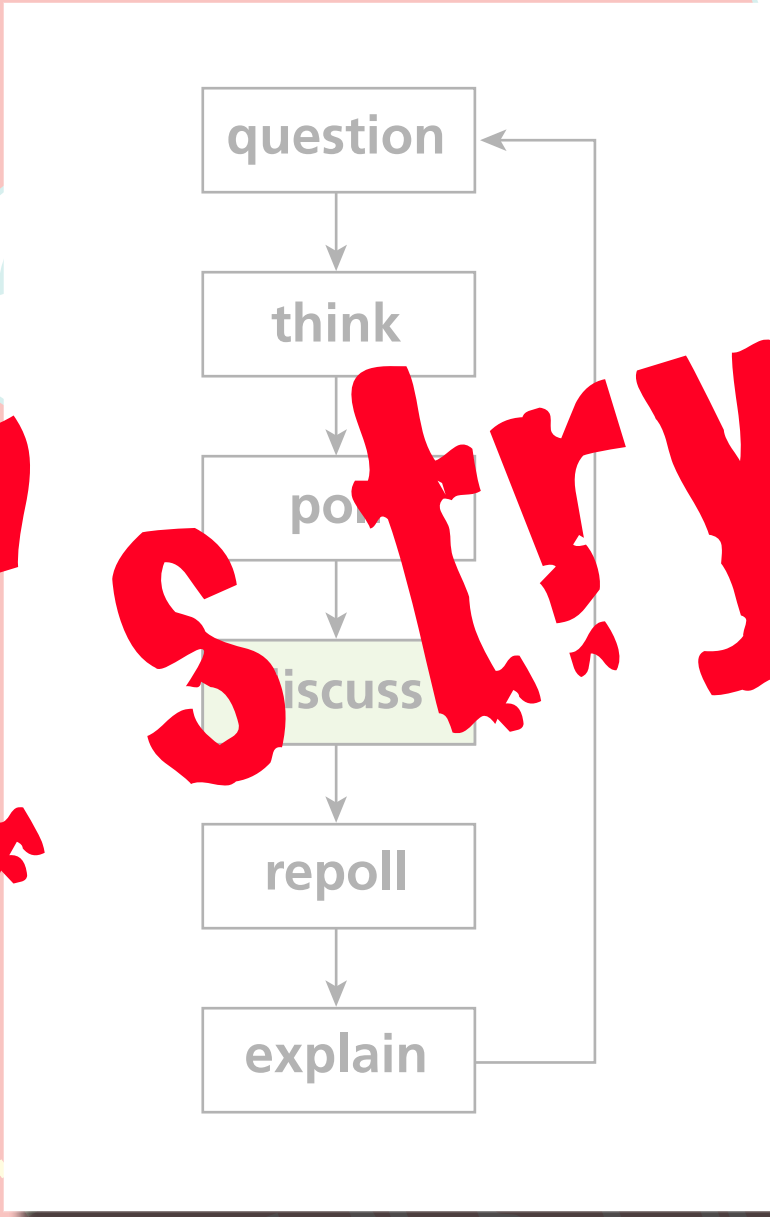




1 lecture

2 PI

Let's try it!



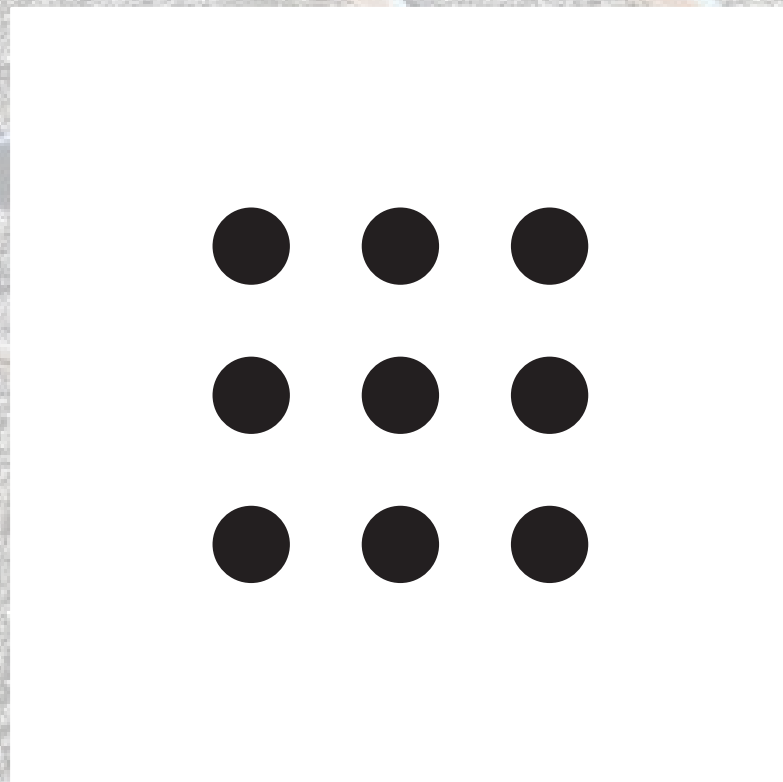
1 education

2 PI

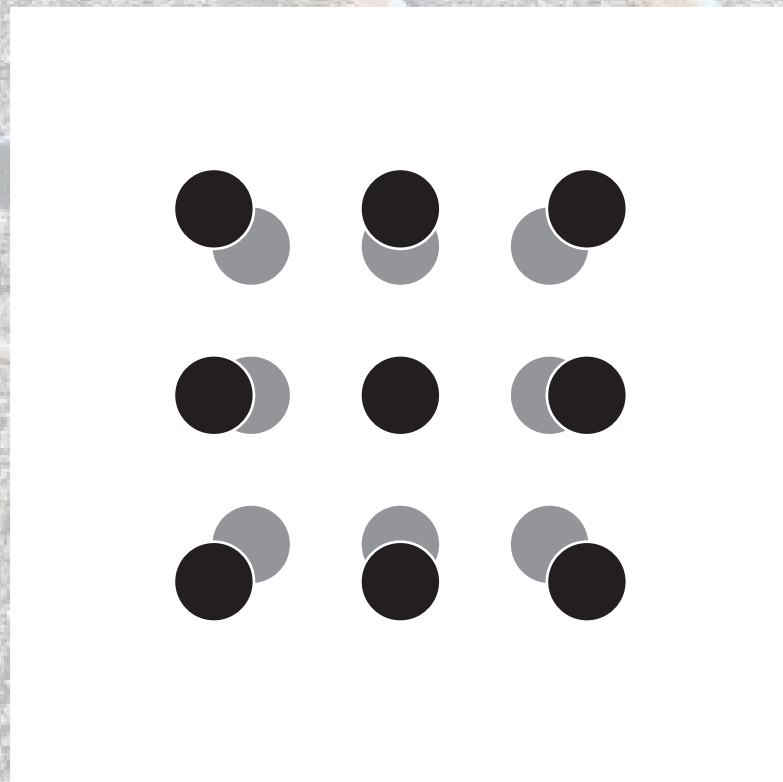


thermal expansion

1 LCatalytics.com **2** sign up code DEMO **3** ID 1234567



1 LCatalytics.com **2** sign up code DEMO **3** ID 1234567

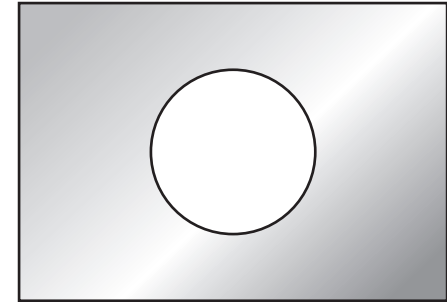


1 LCatalytics.com 2 sign up code DEMO 3 ID 1234567

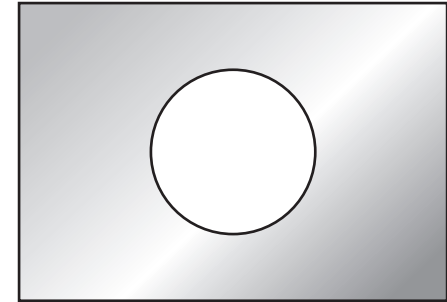
all of them

1 LCatalytics.com **2** sign up code DEMO **3** ID 1234567

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



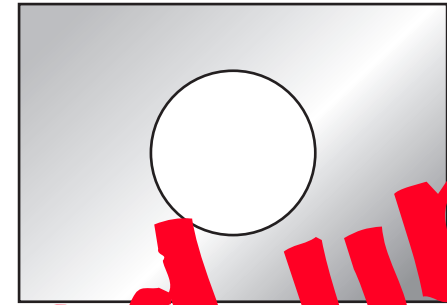
Consider a rectangular metal plate with a circular hole in it.



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.

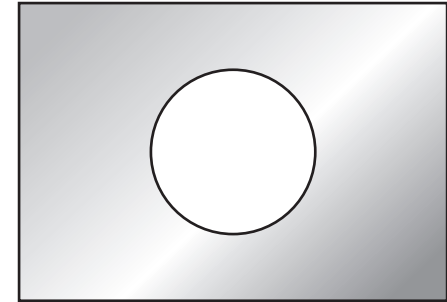


When the plate is uniformly heated, the diameter of the hole

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

you got all fired up!

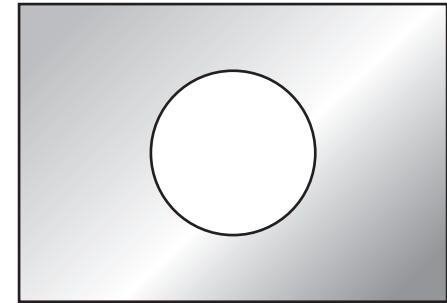
Consider a rectangular metal plate with a circular hole in it.



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

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

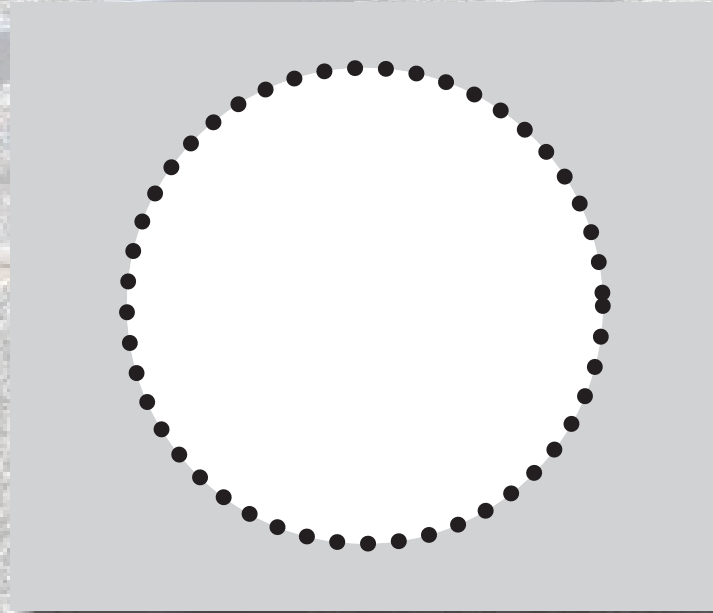
Consider a rectangular metal plate with a circular hole in it.



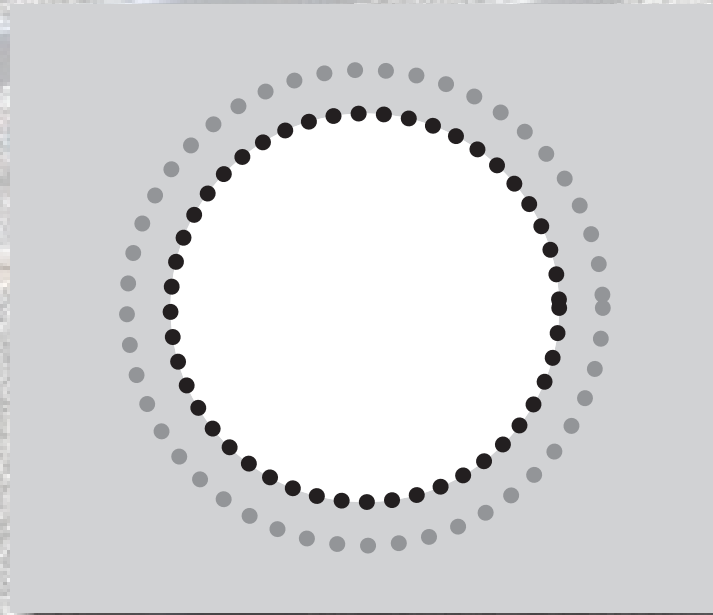
When the plate is uniformly heated, the diameter of the hole

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

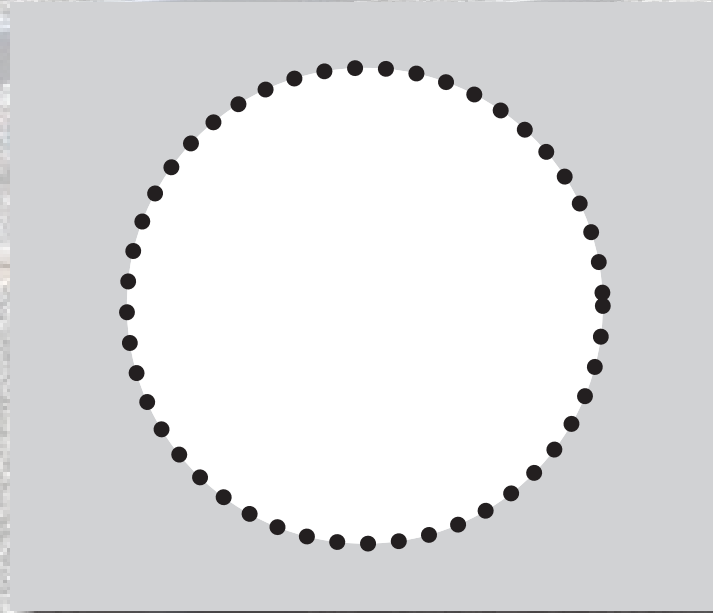
consider atoms at rim of hole



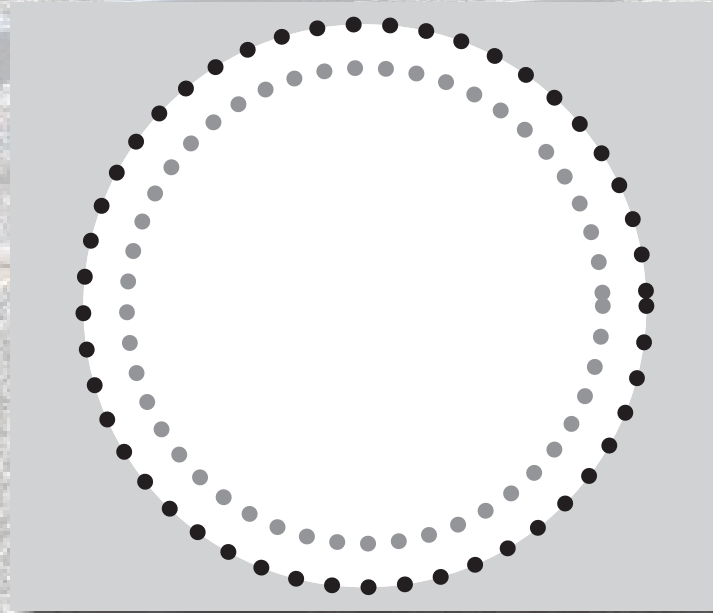
consider atoms at rim of hole



consider atoms at rim of hole



consider atoms at rim of hole



consider atoms at rim of hole

you won't forget this



Peer

back to PI

INSTRUCTION

1 education

2 PI

Peer
INSTRUCTION

1 education

2 PI

Peer
Higher learning & gains

INSTRUCTION

1 education

2 PI

Higher learning gains

Better retention

INSTRUCTION



1 education

2 PI

3 PI 2.0

feedback

1 education

2 PI

3 PI 2.0



1991



1 education

2 PI

3 PI 2.0



1993

1 education

2 PI

3 PI 2.0



1998

1 education

2 PI

3 PI 2.0



1 education

2 PI

3 PI 2.0



technology

1 education

2 PI

3 PI 2.0



How do I...

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

Use intelligent algorithms and data analytics to...

- improve questioning
- manage discussions
- facilitate time management/flow

- 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. $\text{Assets} = \text{Liabilities} + \text{Owners' equity}$
 - b. $\text{Liabilities} = \text{Assets} + \text{Owners' equity}$
 - c. $\text{Owner's equity} = \text{Assets} + \text{Liabilities}$
 - d. $\text{Revenue} = \text{Assets} - \text{Liabilities}$
4. In order to present a business plan to a group of potential investors, a businessperson would most likely use which of the following?
- 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. depreciation?

extensible plug-in architecture for question types

- 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 over India 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 should 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
 - appreciation?

Sample question types:

- direction
- expression
- long answer, short answer, word cloud (fill in text)
- multiple-choice, many-choice
- numerical (enter a number)
- ranking
- region (select point on image)
- sketch
- highlight passage

Sample question types:

- direction

- expression

- long answer, short answer, word cloud (fill in text)

- multiple-choice, many-choice

- numerical (enter a number)

- ranking

- region (select point on image)

- sketch


- highlight passage

learning | catalytics

[Courses](#) [Participate](#) [Review](#) [Classrooms](#) [Account](#) [Institutions](#) [Purchases](#) [Users](#) [Tour](#) [Help](#)

2. **word cloud** Now describe in a couple of words how you became good at whatever it is you entered in the previous question.

 [Deliver](#)

 [Show all results](#)

1 education



2 PI

3 PI 2.0

learning | catalytics

[Courses](#) [Participate](#) [Review](#) [Classroom](#) [Institutions](#) [Purchases](#) [Users](#) [Tour](#) [Help](#)

2. word of
question. e good at whatever it is you entered in the previous

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



1 educa

3 PI 2.0

learning | catalytics

[Courses](#) [Participate](#) [Review](#) [Classroom](#) [Institutions](#) [Purchases](#) [Users](#) [Tour](#) [Help](#)

2. word of
question. ... e good at whatever it is you entered in the previous

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

Round 1
● 123 responses

experiences
learning observing
reading people being
experience time
practice
work others school
working through family
good watching many
listening

✓ 61 get it now
✗ 4 still don't get it





Sample question types:

- direction
- expression
- long answer, short answer, word cloud (fill in text)
- multiple-choice, many-choice
- numerical (enter a number)
- ranking
- region (select point on image)
- sketch
- highlight passage

learning | catalytics

[Courses](#) [Participate](#) [Review](#) [Classrooms](#) [Account](#) [Institutions](#) [Purchases](#) [Users](#) [Tour](#) [Help](#)

6. short answer What is the most important nongenetic predictor of health?

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

1 education

2 PI

3 PI 2.0

learning | catalytics

[Courses](#) [Participate](#) [Review](#) [Classroom](#) [Institutions](#) [Purchases](#) [Users](#) [Tour](#) [Help](#)

6. short

of health?

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



1 educa

3 PI 2.0

learning | catalytics

[Courses](#) [Participate](#) [Review](#) [Classroom](#) [Institutions](#) [Purchases](#) [Users](#) [Tour](#) [Help](#)

6. short

of health?

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

Round 1



● 9 responses

- behavior
- environment
- smoking
- socioeconomic status
- unhealthy life style
- lifestyle behaviors (exercise, diet, etc.)
- behavior
- public health
- environment



1 educa

3 PI 2.0

Sample question types:

- direction
- expression
- long answer, short answer, word cloud (fill in text)
- multiple-choice, many-choice
- numerical (enter a number)
- ranking
- region (select point on image)
- sketch
- highlight passage





1 blc.learningcatalytics.com **2** sign up **3** ID 1234567

learning | catalytics

[Courses](#) [Participate](#) [Review](#) [Classrooms](#) [Account](#) [Institutions](#) [Purchases](#) [Users](#) [Tour](#) [Help](#)

4. **direction** This image shows Oahu as seen from the Space Shuttle. The image provides several clues about the direction of prevailing winds in Oahu. Indicate this direction by drawing an arrow on your screen.

 [Deliver](#)

 [Show all results](#)

1 education

2 PI



3 PI 2.0

learning | catalytics

[Courses](#) [Participate](#) [Review](#) [Classroom](#) [Institutions](#) [Purchases](#) [Users](#) [Tour](#) [Help](#)

4. direction
prevailing

...le. The image provides several clues about the direction of
...on your screen.

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



1 educa

3 PI 2.0

learning | catalytics

[Courses](#) [Participate](#) [Review](#) [Classroom](#) [Institutions](#) [Purchases](#) [Users](#) [Tour](#) [Help](#)

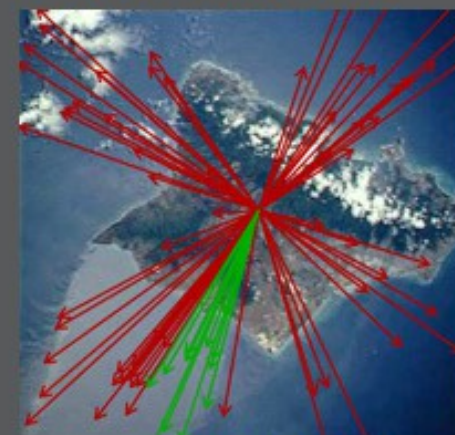
4. direction
prevailing

...le. The image provides several clues about the direction of
...on your screen.

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

Round 1

77 responses, 16% correct



✓ 17 get it now
✗ 3 still don't get it



learning | catalytics

[Courses](#) [Participate](#) [Review](#) [Classrooms](#) [Account](#) [Institutions](#) [Purchases](#) [Users](#) [Tour](#) [Help](#)

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 education

2 PI

3 PI 2.0

learning | catalytics

[Courses](#) [Participate](#) [Review](#) [Classifications](#) [Purchases](#) [Users](#) [Tour](#) [Help](#)

current session: **766079** | 69 students

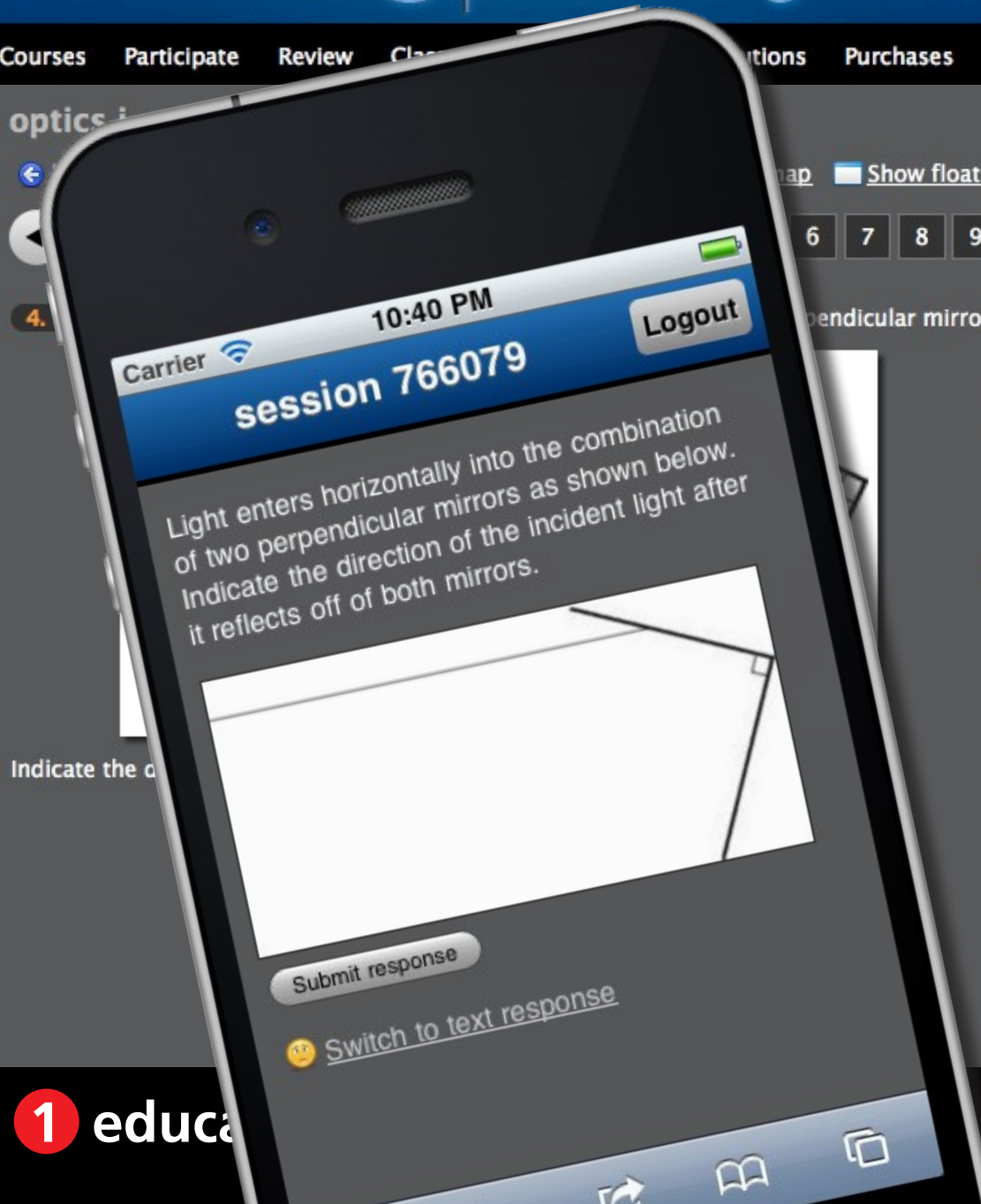
[Map](#) [Show floating session ID](#) [Edit](#) [Delete](#)

6 7 8 9 10 11 12 13 14 15

perpendicular mirrors as shown below.

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

[feedback & support](#)



learning | catalytics

[Courses](#) [Participate](#) [Review](#) [Classifications](#) [Purchases](#) [Users](#) [Tour](#) [Help](#)

current session: **766079** | 69 students

[Map](#) [Show floating session ID](#) [Edit](#) [Delete](#)

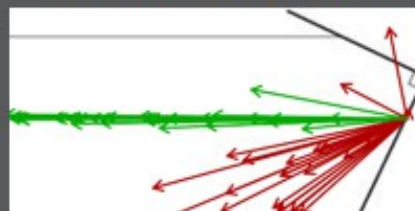
6 7 8 9 10 11 12 13 14 15



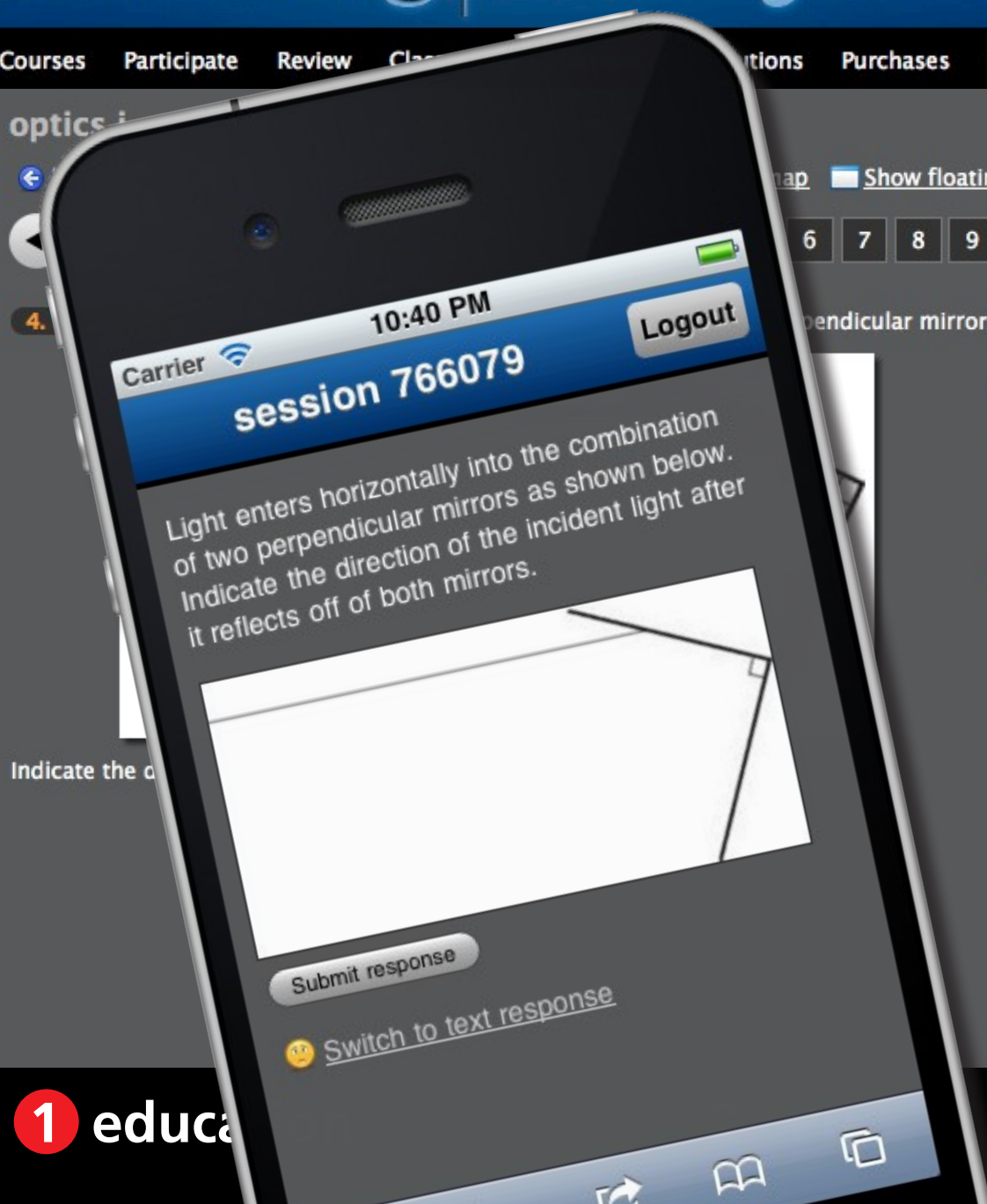
perpendicular mirrors as shown below.

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

Round 1
● 57 responses, 58% correct



[feedback & support](#)



learning | catalytics

Courses Participate Review Classifications Purchases Users Tour Help

current session: **766079** | 69 students

Map Show floating session ID Edit Delete

6 7 8 9 10 11 12 13 14 15

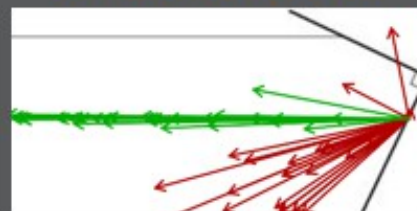


perpendicular mirrors as shown below.

Deliver Show all results

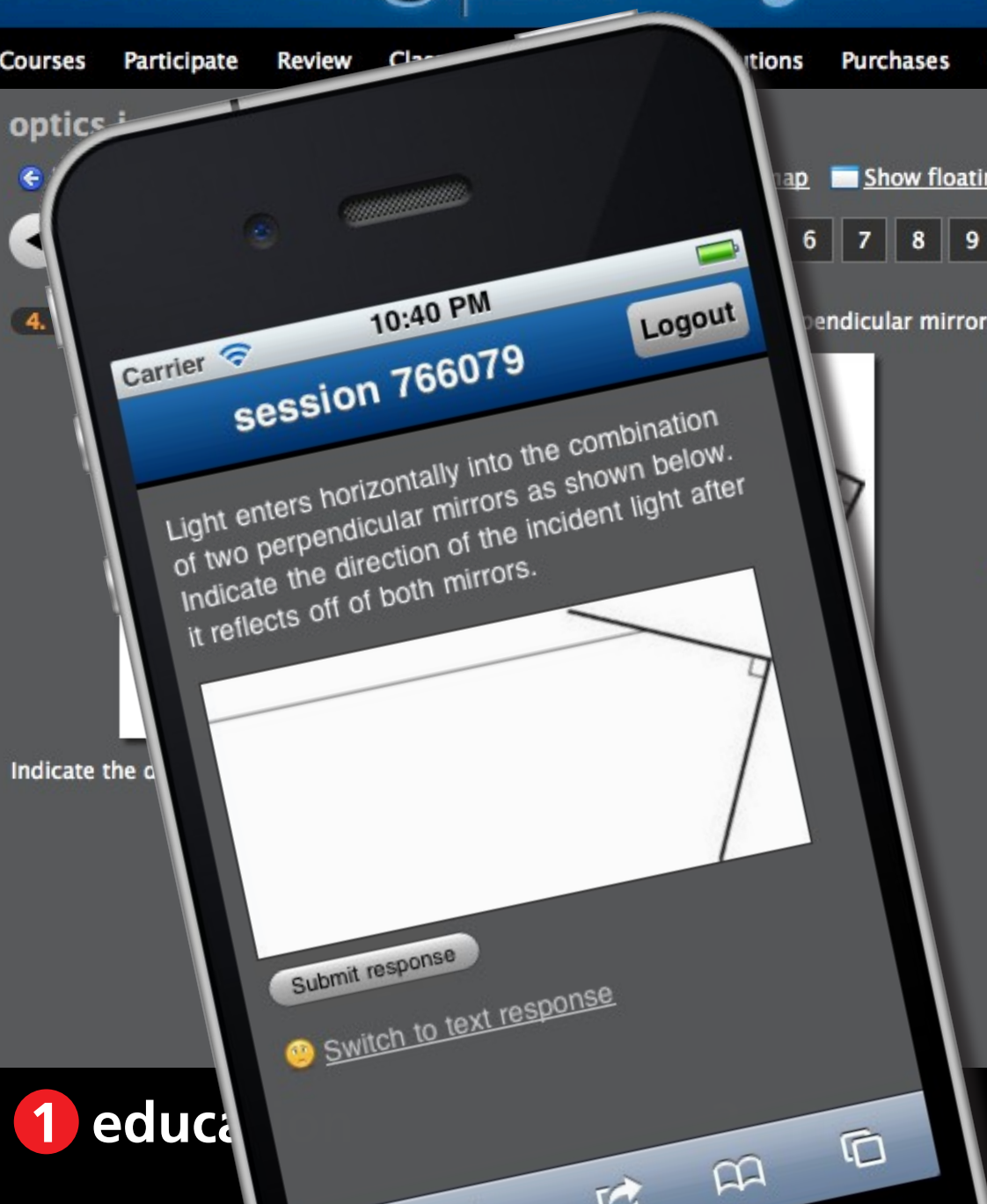
Round 1
● 57 responses, 58% correct

Round 2
● 51 responses, 73% correct



✓ 8 get it now
✗ 0 still don't get it

feedback & support



Sample question types:

- direction

- expression

- long answer, short answer, word cloud (fill in text)

- multiple-choice, many-choice

- numerical (enter a number)

- ranking

- region (select point on image)

- sketch

- highlight passage

learning | catalytics

[Courses](#) [Participate](#) [Review](#) [Classrooms](#) [Account](#) [Institutions](#) [Purchases](#) [Users](#) [Tour](#) [Help](#)

arlington school district

current session: **48222** | 24 students

[← Back to all lectures](#) [■ Stop session](#) [📊 Review results](#) [📄 Show floating session ID](#) [⚙ Edit](#) [✖ Delete](#)



Jump to ▾

1

2

3

4

5



5. region Where is Tanzania?

[✖ Stop delivery](#) [🔄 Deliver again](#) [👥 Assign groups](#) [📊 Show all results](#)



feedback & support

1 education

2 PI

3 PI 2.0

learning | catalytics

[Courses](#) [Participate](#) [Review](#) [Classrooms](#) [Account](#) [Institutions](#) [Purchases](#) [Users](#) [Tour](#) [Help](#)

arlington school district

current session: **48222** | 24 students

[Back to all lectures](#) [Stop session](#) [Review results](#) [Show floating session ID](#) [Edit](#) [Delete](#)



Jump to 1 2 3 4 5

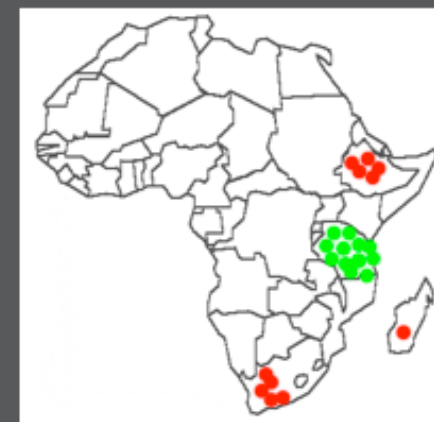


5. region Where is Tanzania?

[Stop delivery](#) [Deliver again](#) [Assign groups](#) [Show all results](#)



Round 1 ✕
● 24 responses, 75% correct



feedback & support

1 education

2 PI

3 PI 2.0

Sample question types:

- direction

- expression

- long answer, short answer, word cloud (fill in text)

- multiple-choice, many-choice

- numerical (enter a number)

- ranking

- region (select point on image)

- sketch

- highlight passage

learning | catalytics

[Courses](#) [Participate](#) [Review](#) [Classrooms](#) [Account](#) [Institutions](#) [Purchases](#) [Users](#) [Tour](#) [Help](#)

arlington school district

current session: **123456** | 31 students

[Back to all lectures](#) [Stop session](#) [Review results](#) [Show floating session ID](#) [Edit](#) [Delete](#)



Jump to ▾

1

2

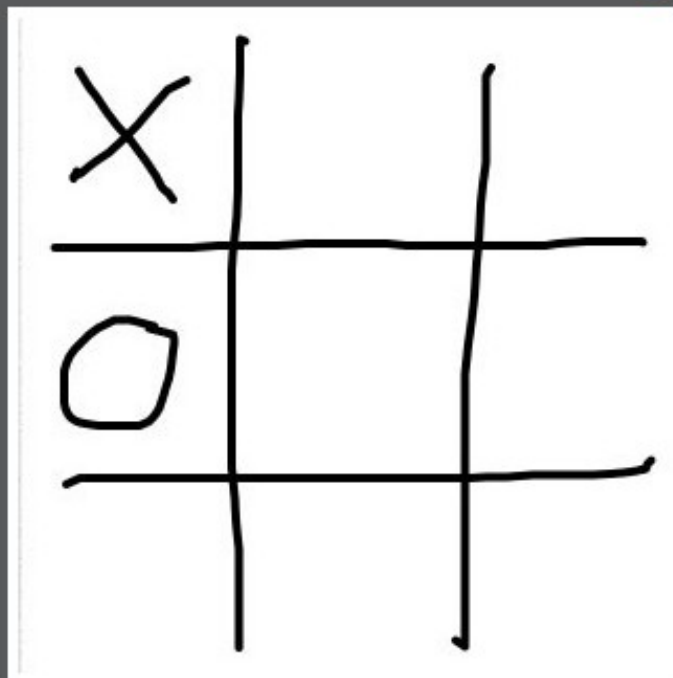
3

4



4. region It's X's turn -- what's the best next move?

[Stop delivery](#) [Deliver again](#) [Assign groups](#) [Show all results](#)



feedback & support

1 education

2 PI

3 PI 2.0

learning | catalytics

[Courses](#) [Participate](#) [Review](#) [Classrooms](#) [Account](#) [Institutions](#) [Purchases](#) [Users](#) [Tour](#) [Help](#)

arlington school district

current session: **123456** | 31 students

[Back to all lectures](#) [Stop session](#) [Review results](#) [Show floating session ID](#) [Edit](#) [Delete](#)

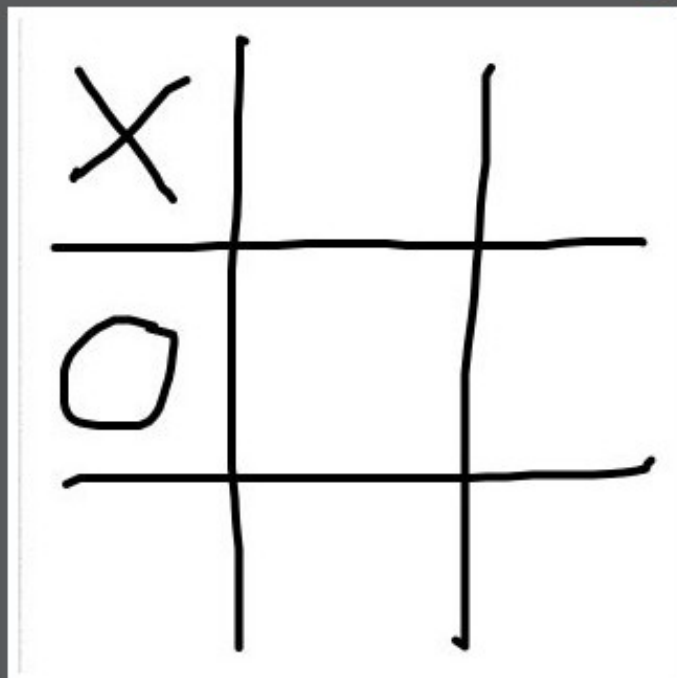


Jump to 1 2 3 4

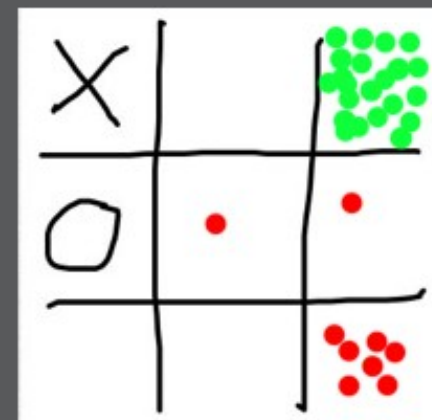


4. region It's X's turn -- what's the best next move?

[Stop delivery](#) [Deliver again](#) [Assign groups](#) [Show all results](#)



Round 1 [X](#) [Bar Chart](#)
31 responses, 71% correct



[feedback & support](#)

1 education

2 PI

3 PI 2.0

Sample question types:

- direction

- expression

- long answer, short answer, word cloud (fill in text)

- multiple-choice, many-choice

- numerical (enter a number)

- ranking

- region (select point on image)

- sketch

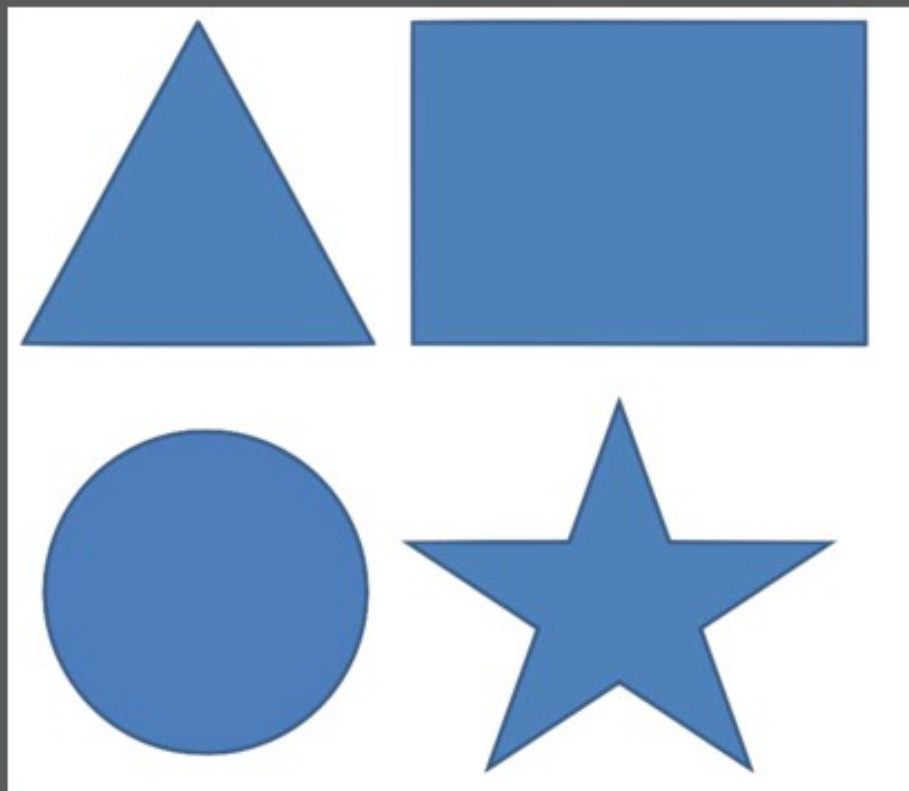
- highlight passage

learning | catalytics

[Courses](#) [Participate](#) [Review](#) [Classrooms](#) [Account](#) [Institutions](#) [Purchases](#) [Users](#) [Tour](#) [Help](#)

5. region **circle**

[Stop delivery](#) [Deliver again](#) [Assign groups](#) [Show all results](#)



1 education

2 PI

3 PI 2.0

learning | catalytics

[Courses](#) [Participate](#) [Review](#) [Classroom](#) [Institutions](#) [Purchases](#) [Users](#) [Tour](#) [Help](#)

5. region

[Stop delivery](#) [Deliver again](#) [Assign groups](#) [Show all results](#)



1 educa

3 PI 2.0

learning | catalytics

[Courses](#) [Participate](#) [Review](#) [Classroom](#) [Institutions](#) [Purchases](#) [Users](#) [Tour](#) [Help](#)

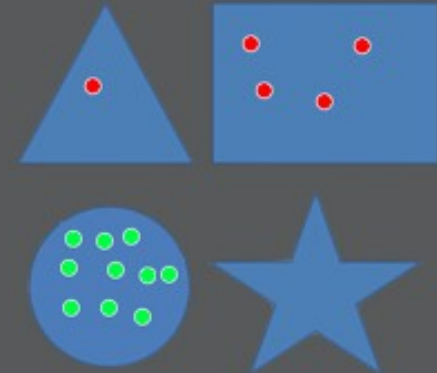
5. region

[Stop delivery](#) [Deliver again](#) [Assign groups](#) [Show all results](#)



Round 1

15 responses, 67% correct



1 educa

3 PI 2.0

Sample question types:

- direction

- expression

- long answer, short answer, word cloud (fill in text)

- multiple-choice, many-choice

- numerical (enter a number)

- ranking

- region (select point on image)

- sketch

- highlight passage

learning | catalytics

[Courses](#) [Participate](#) [Review](#) [Classrooms](#) [Account](#) [Institutions](#) [Purchases](#) [Users](#) [Tour](#) [Help](#)

arlington school district

current session: **48222** | 28 students

[← Back to all lectures](#) [Stop session](#) [Review results](#) [Show floating session ID](#) [Edit](#) [Delete](#)



Jump to ▾

1

2

3

4

5

6



6. numerical 7 + 13 = ?

[Stop delivery](#)

[Deliver again](#)

[Assign groups](#)

[Show all results](#)

© 2011 Learning Catalytics LLC | [Contact us](#)



feedback & support

1 education

2 PI

3 PI 2.0

learning | catalytics

[Courses](#) [Participate](#) [Review](#) [Classrooms](#) [Account](#) [Institutions](#) [Tours](#) [Help](#)

arlington school district

current session: **48222** | 28 students

[Back to all lectures](#) [Stop session](#)

[Delete](#)



6. numerical 7 + 13 = ?

[Deliver again](#) [Assign groups](#) [Show all results](#)



Carrier 6:37 PM session 48222 Logout

7 + 13 = ?

20

Submit response

Done

Previous

Next

AutoFill



[feedback & support](#)

learning | catalytics

[Courses](#) [Participate](#) [Review](#) [Classrooms](#) [Account](#) [Institutions](#) [Tours](#) [Help](#)

arlington school district

current session: **48222** | 28 students

[Back to all lectures](#) [Stop session](#)

[Delete](#)

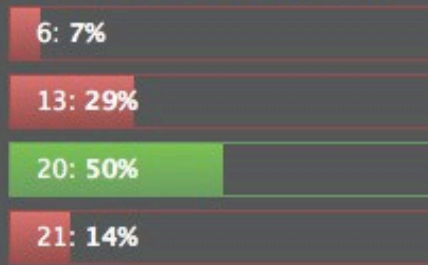


6. numerical 7 + 13 = ?

[Deliver again](#) [Assign groups](#) [Show all results](#)



Round 1
● 28 responses, 50% correct



[feedback & support](#)

Sample question types:

- direction
- expression
- long answer, short answer, word cloud (fill in text)
- multiple-choice, many-choice
- numerical (enter a number)
- ranking
- region (select point on image)
- sketch
- highlight passage

learning | catalytics

[Courses](#) [Participate](#) [Review](#) [Classrooms](#) [Account](#) [Institutions](#) [Purchases](#) [Users](#) [Tour](#) [Help](#)

transformations of parabolas

current session: **773885** | 9 students

[Back to all lectures](#) [Stop session](#) [Review results](#) [Show floating session ID](#) [Edit](#) [PDF](#) [Delete](#)



Jump to ▼

1

2

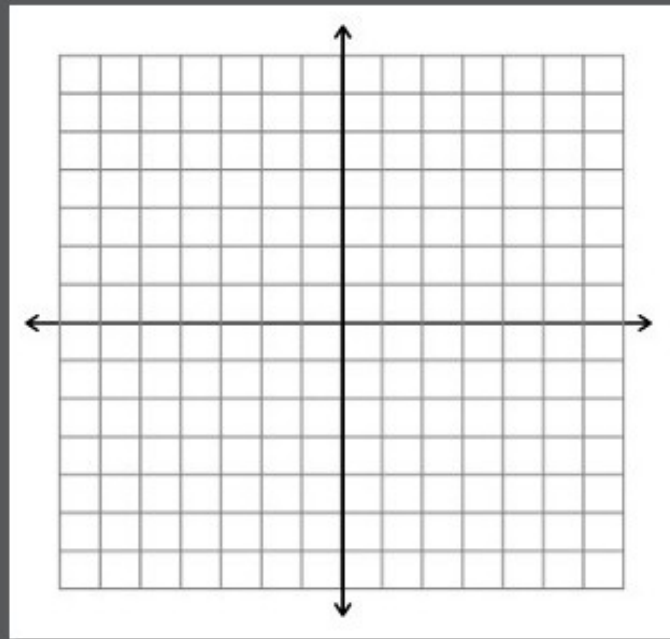
3

4



4. sketch Sketch a graph of the function $f(x) = (x - 3)^2 + 2$.

[Stop delivery](#) [Deliver again](#) [Assign groups](#) [Show all results](#)



1 education

2 PI

3 PI 2.0

learning | catalytics

[Courses](#) [Participate](#) [Review](#) [Classrooms](#) [Account](#) [Institutions](#) [Purchases](#) [Users](#) [Tour](#) [Help](#)

transformations of parabolas

current session: **773885** | 9 students

[Back to all lectures](#) [Stop session](#) [Review results](#) [Show floating session ID](#) [Edit](#) [PDF](#) [Delete](#)



Jump to ▾

1

2

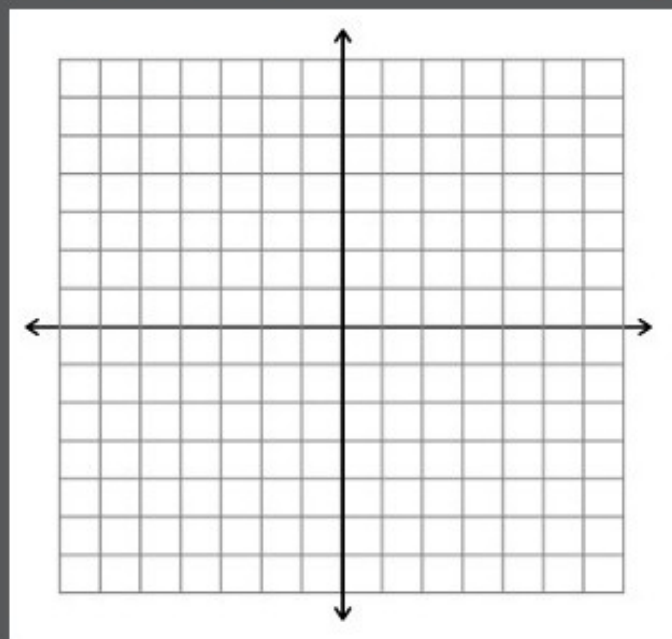
3

4



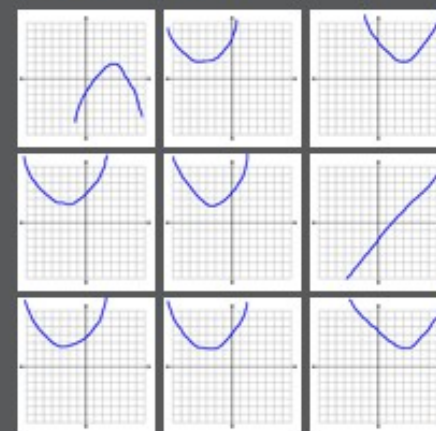
4. sketch Sketch a graph of the function $f(x) = (x - 3)^2 + 2$.

[Stop delivery](#) [Deliver again](#) [Assign groups](#) [Show all results](#)



Round 1

9 responses



1 education

2 PI

3 PI 2.0

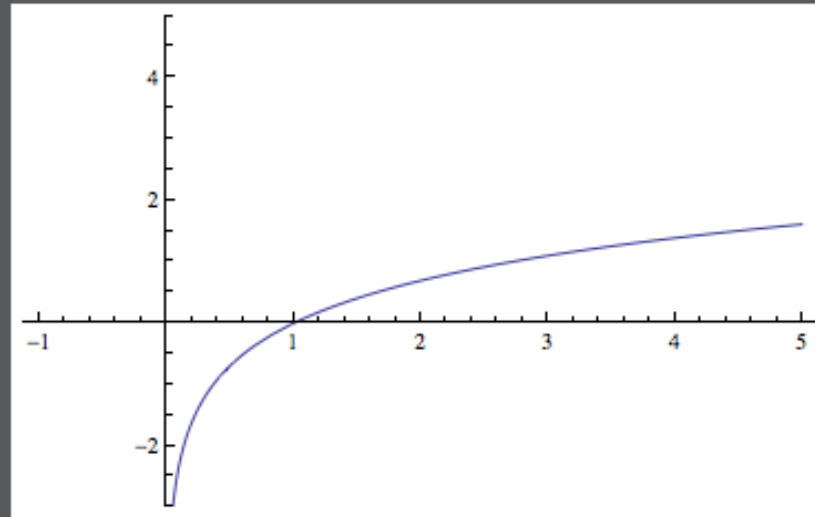
Sample question types:

- direction
- expression
- long answer, short answer, word cloud (fill in text)
- multiple-choice, many-choice
- numerical (enter a number)
- ranking
- region (select point on image)
- sketch
- highlight passage

learning | catalytics

[Courses](#) [Participate](#) [Review](#) [Classrooms](#) [Account](#) [Institutions](#) [Purchases](#) [Users](#) [Tour](#) [Help](#)

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



1 education

2 PI

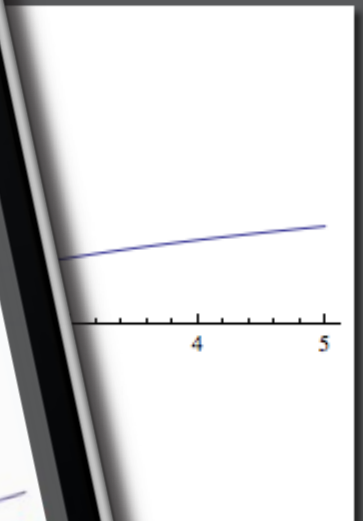
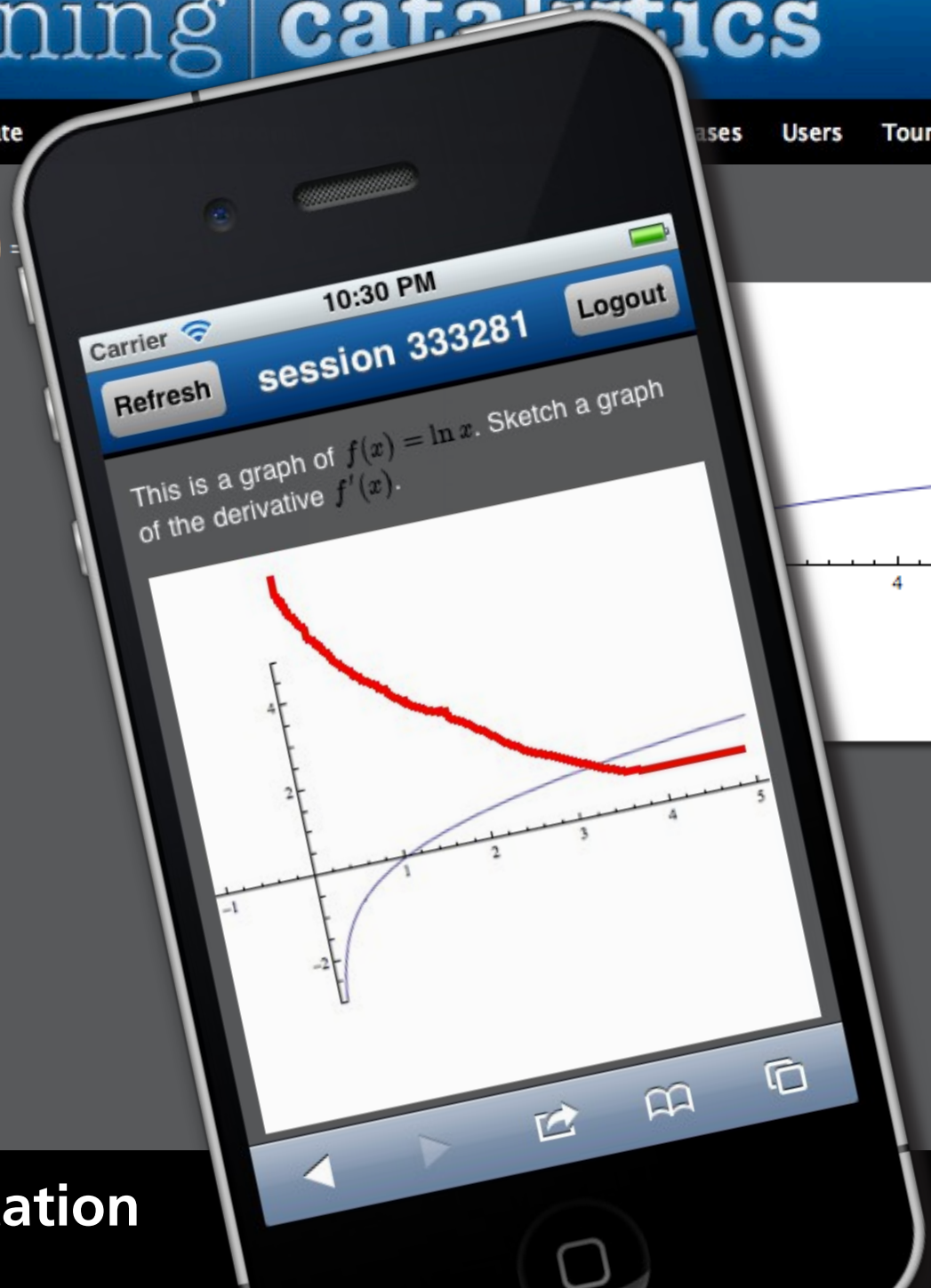
3 PI 2.0

learning | catalytics

Courses Participate

ases Users Tour Help

This is a graph of $f(x) =$



1 education

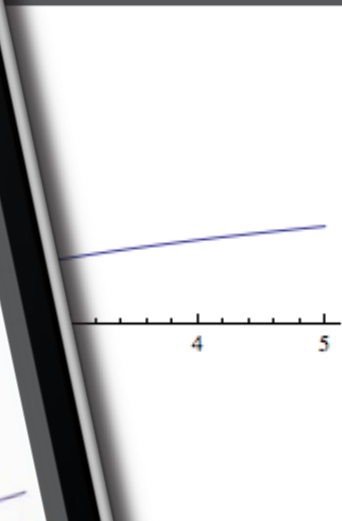
3 PI 2.0

learning | catalytics

Courses Participate

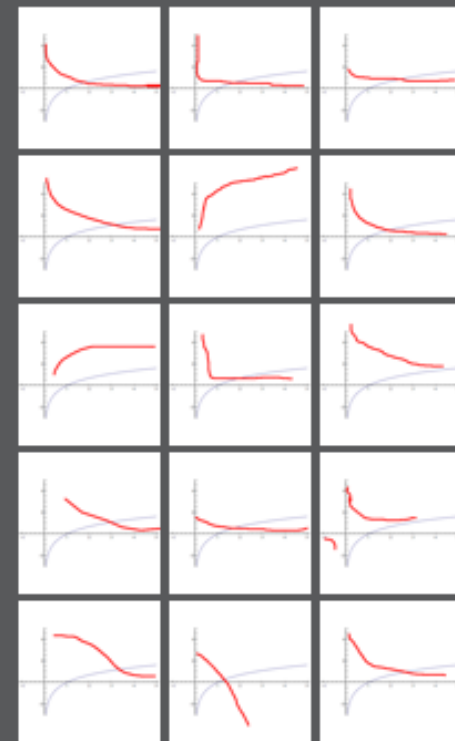
ases Users Tour Help

This is a graph of $f(x) =$



Round 1

15 responses



✓ 6 get it now
 ✗ 0 still don't get it

1 education

3 PI 2.0

Sample question types:

- direction
- expression
- long answer, short answer, word cloud (fill in text)
- multiple-choice, many-choice
- numerical (enter a number)
- ranking
- region (select point on image)
- sketch
- highlight passage

learning | catalytics

[Courses](#) [Participate](#) [Review](#) [Classrooms](#) [Account](#) [Institutions](#) [Purchases](#) [Users](#) [Tour](#) [Help](#)

1. highlighting What do you see as the most important part of this Shakespeare sonnet? [Stop delivery](#) [Deliver again](#) [Assign groups](#) [Show all results](#)

For shame! deny that thou bear'st love to any,
Who for thyself art so unprovident.
Grant, if thou wilt, thou art beloved of many,
But that thou none lovest is most evident;
For thou art so possess'd with murderous hate
That 'gainst thyself thou stick'st not to conspire.
Seeking that beauteous roof to ruinate
Which to repair should be thy chief desire.
O, change thy thought, that I may change my mind!
Shall hate be fairer lodged than gentle love?
Be, as thy presence is, gracious and kind,
Or to thyself at least kind-hearted prove:
Make thee another self, for love of me,
That beauty still may live in thine or thee.

1 education

2 PI

3 PI 2.0

learning | catalytics

[Courses](#) [Participate](#) [Review](#) [Classroom](#) [Institutions](#) [Purchases](#) [Users](#) [Tour](#) [Help](#)

1. highlighting
sonnet?

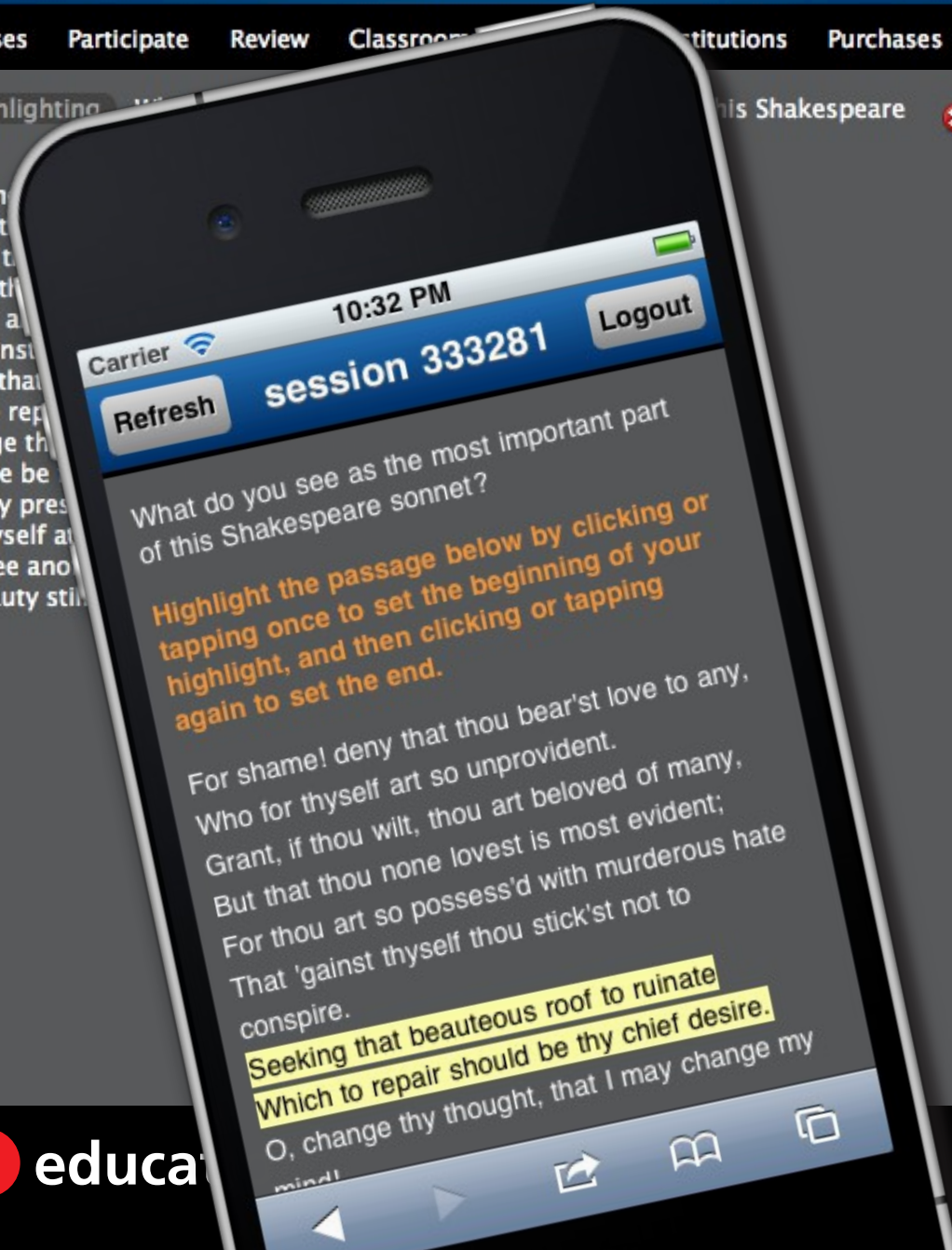
this Shakespeare

[Stop delivery](#)

[Deliver again](#)

[Assign groups](#)

[Show all results](#)



What do you see as the most important part of this Shakespeare sonnet?

Highlight the passage below by clicking or tapping once to set the beginning of your highlight, and then clicking or tapping again to set the end.

For shame! deny that thou bear'st love to any,
Who for thyself art so unprovident.
Grant, if thou wilt, thou art beloved of many,
But that thou none lovest is most evident;
For thou art so possess'd with murderous hate
That 'gainst thyself thou stick'st not to
conspire.

Seeking that beauteous roof to ruinate
Which to repair should be thy chief desire.
O, change thy thought, that I may change my
mind!

1 educa

3 PI 2.0

learning | catalytics

[Courses](#) [Participate](#) [Review](#) [Classroom](#) [Institutions](#) [Purchases](#) [Users](#) [Tour](#) [Help](#)

1. highlighting
sonnet?

[his Shakespeare](#) [Stop delivery](#) [Deliver again](#) [Assign groups](#) [Show all results](#)



Round 1

3 responses

For shame! deny that thou bear'st
love to any,
Who for thyself art so unprovident.
Grant, if thou wilt, thou art beloved of many,
But that thou none lovest is most
evident;
For thou art so possess'd with
murderous hate
That 'gainst thyself thou stick'st
not to conspire.
Seeking that beauteous roof to
ruinate
Which to repair should be thy
chief desire.
O, change thy thought, that I may
change my mind!
Shall hate be fairer lodged than
gentle love?
Be, as thy presence is, gracious
and kind,

Sample question types:

- direction
- expression
- long answer, short answer, word cloud (fill in text)
- multiple choice, many choice
- numerical (enter a number)
- ranking
- region (select point on image)
- sketch
- highlight passage



1 education

2 PI

3 PI 2.0



the future is here!

1 education

2 PI

3 PI 2.0



Education is not just about:

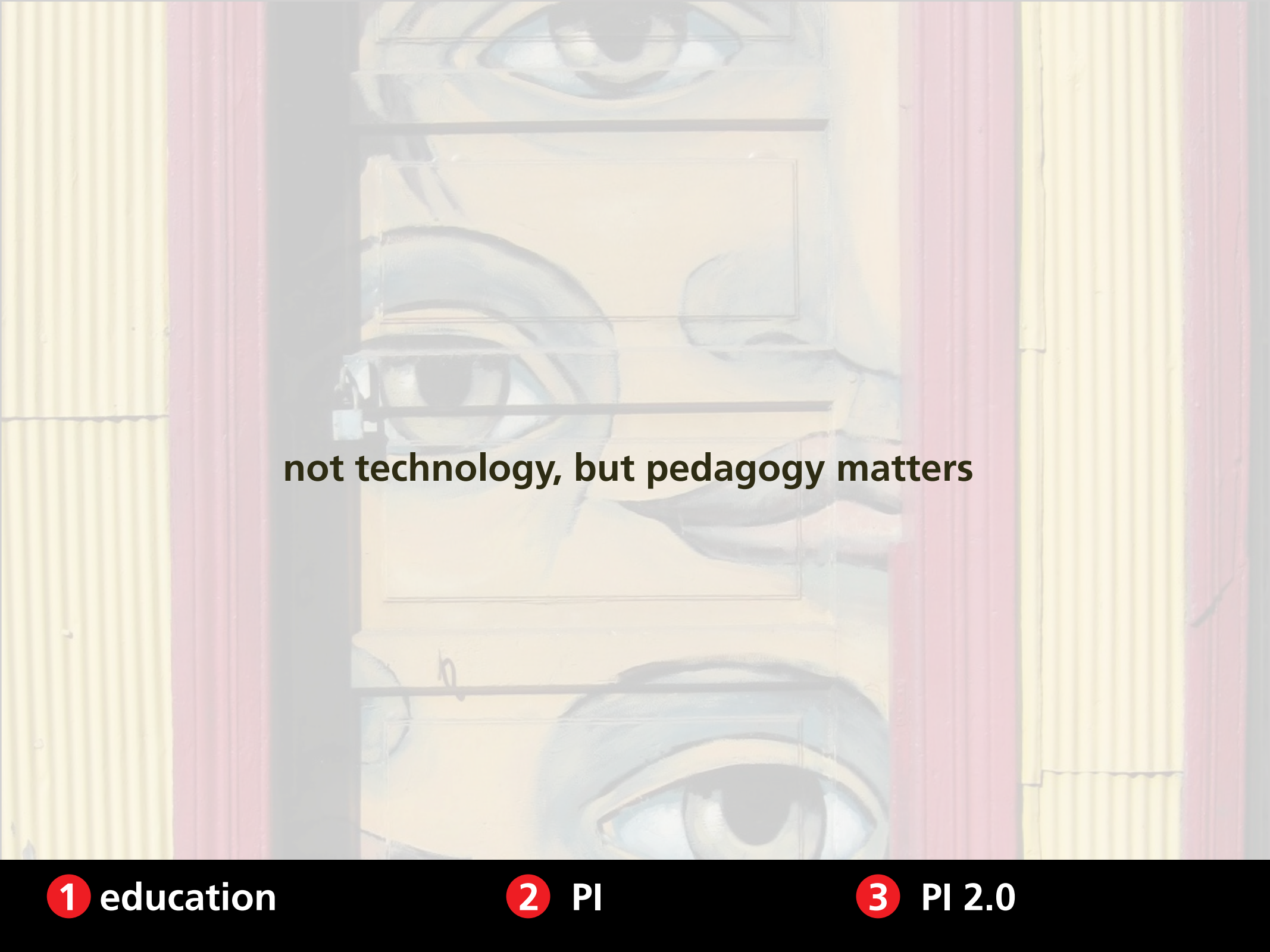
- **transferring information**
- **getting students to do what we do**



Education is not just about:

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

discovery & exploration a must!

A painting of a face with three eyes looking through window blinds. The face is rendered in a soft, painterly style with muted colors. The eyes are positioned behind horizontal slats of a window blind, which are partially open. The background is a mix of light and dark tones, suggesting an interior space. The overall mood is contemplative and somewhat mysterious.

not technology, but pedagogy matters

1 education

2 PI

3 PI 2.0

Funding:

National Science Foundation

for a copy of this presentation:

mazur.harvard.edu

learningcatalytics.com

Follow me!



[eric_mazur](https://twitter.com/eric_mazur)

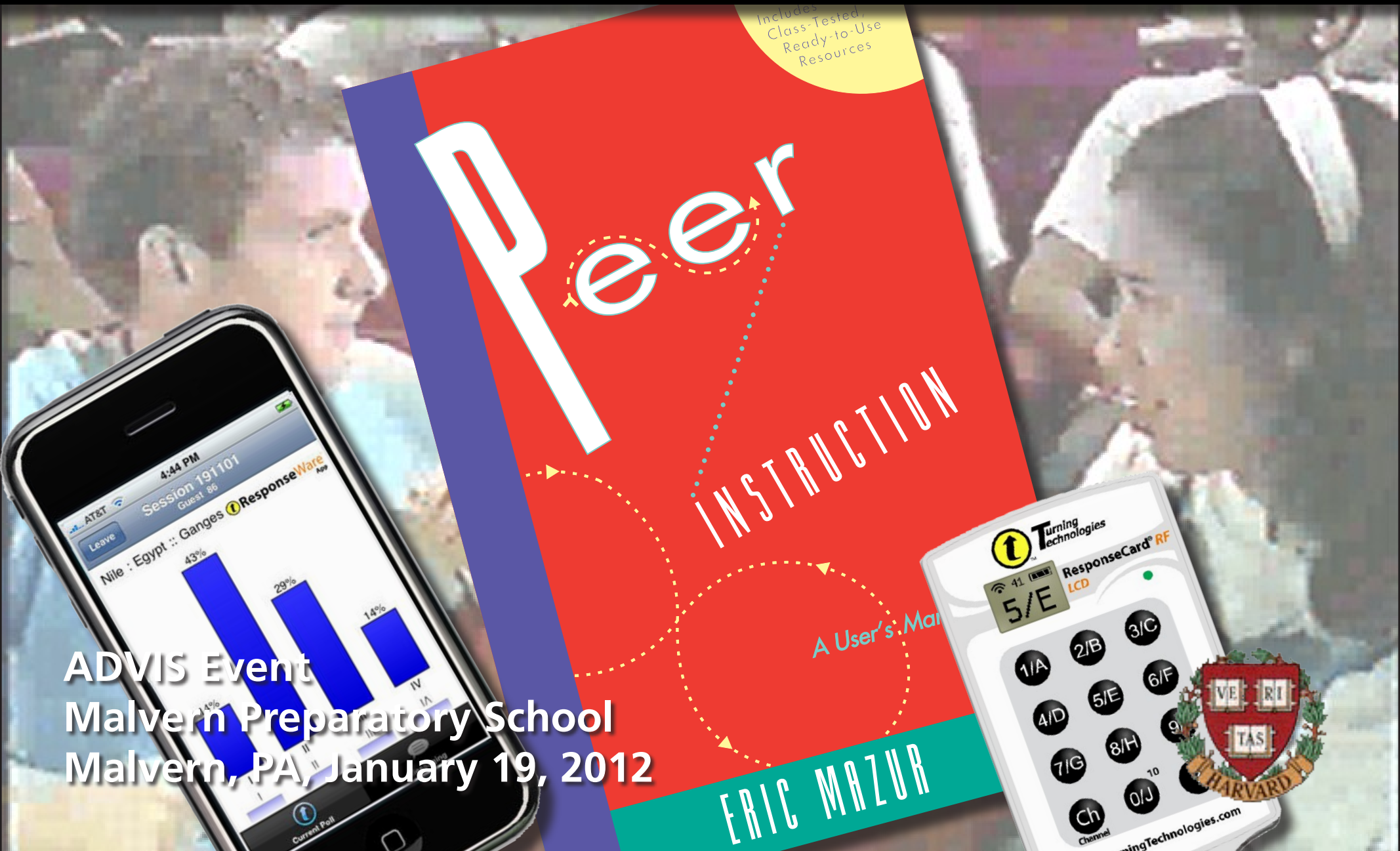
learningcatalytics.com

Follow me!



[eric_mazur](https://twitter.com/eric_mazur)

Interactive learning: Technology in the classroom (part 2)



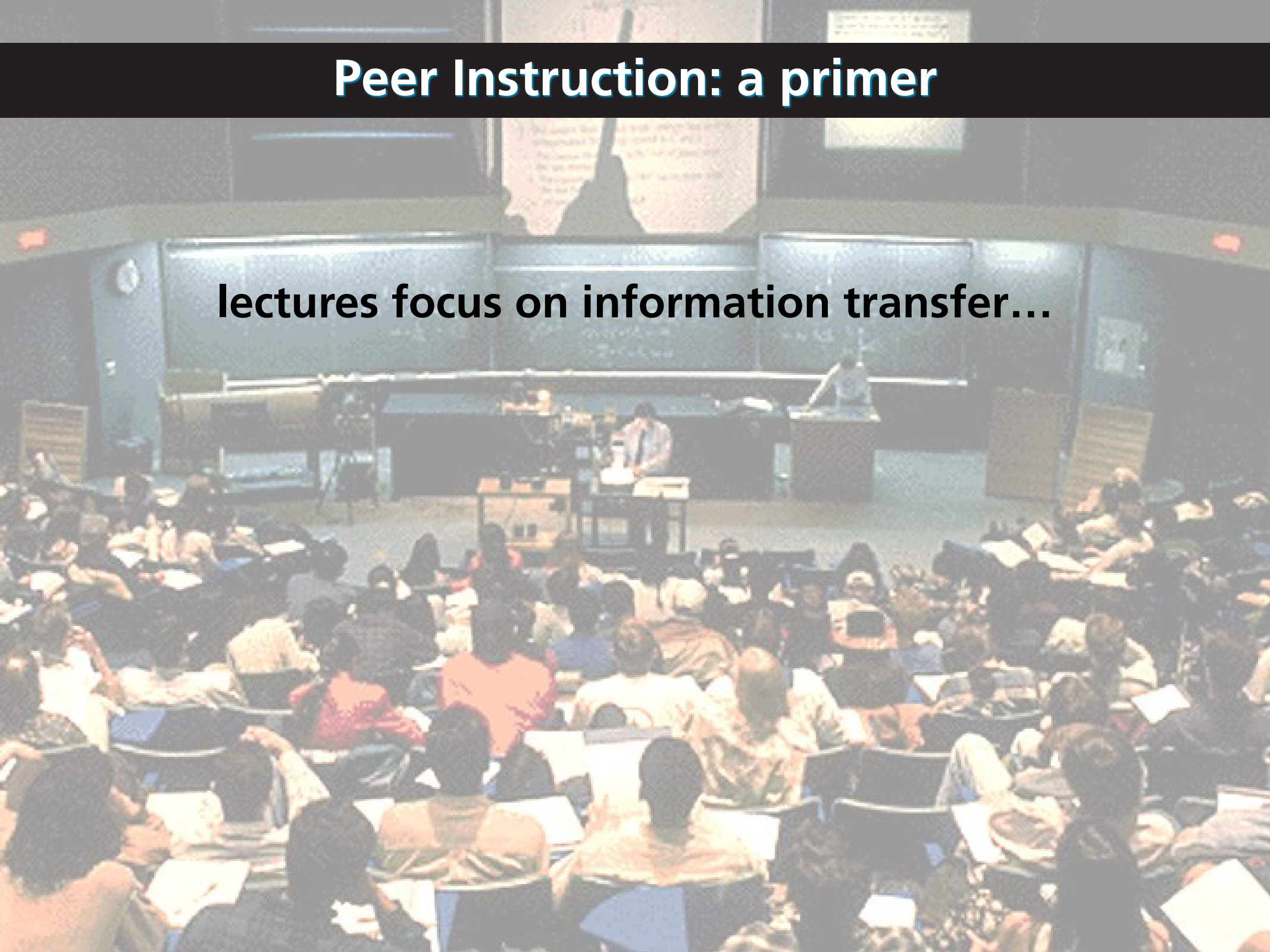
ADVIS Event
Malvern Preparatory School
Malvern, PA, January 19, 2012

...and how do we teach?



Peer Instruction: a primer

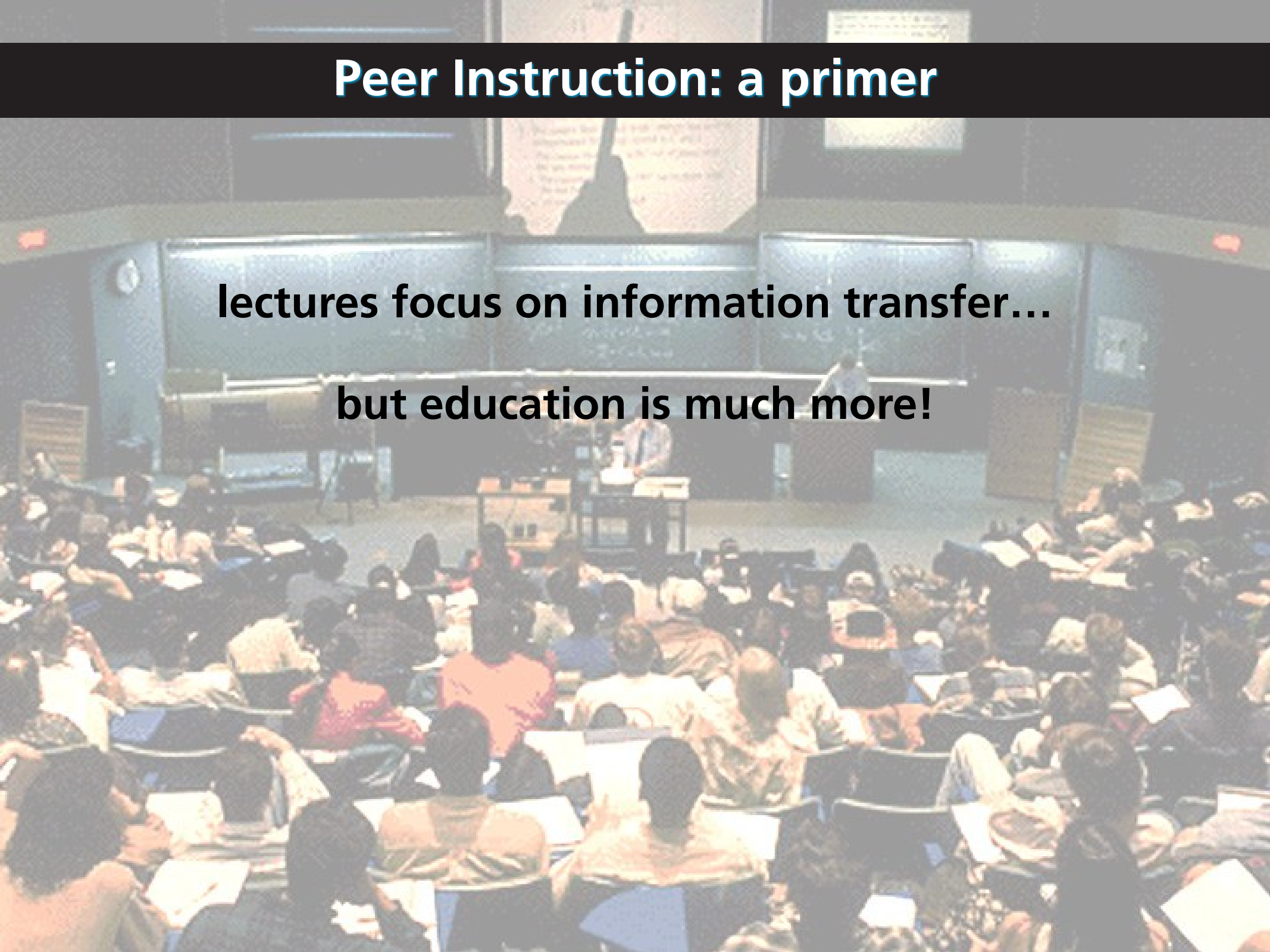
lectures focus on information transfer...



Peer Instruction: a primer

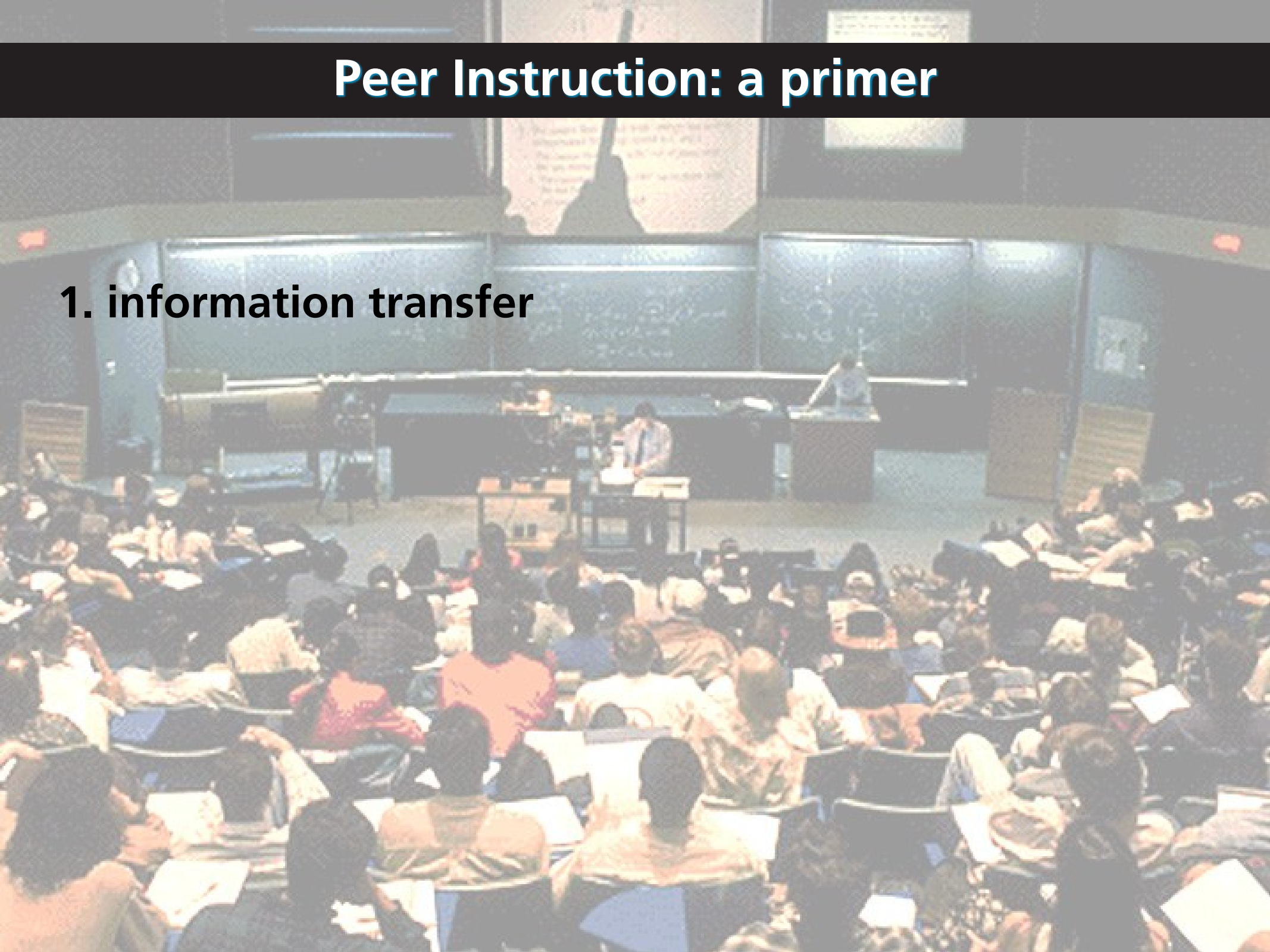
lectures focus on information transfer...

but education is much more!



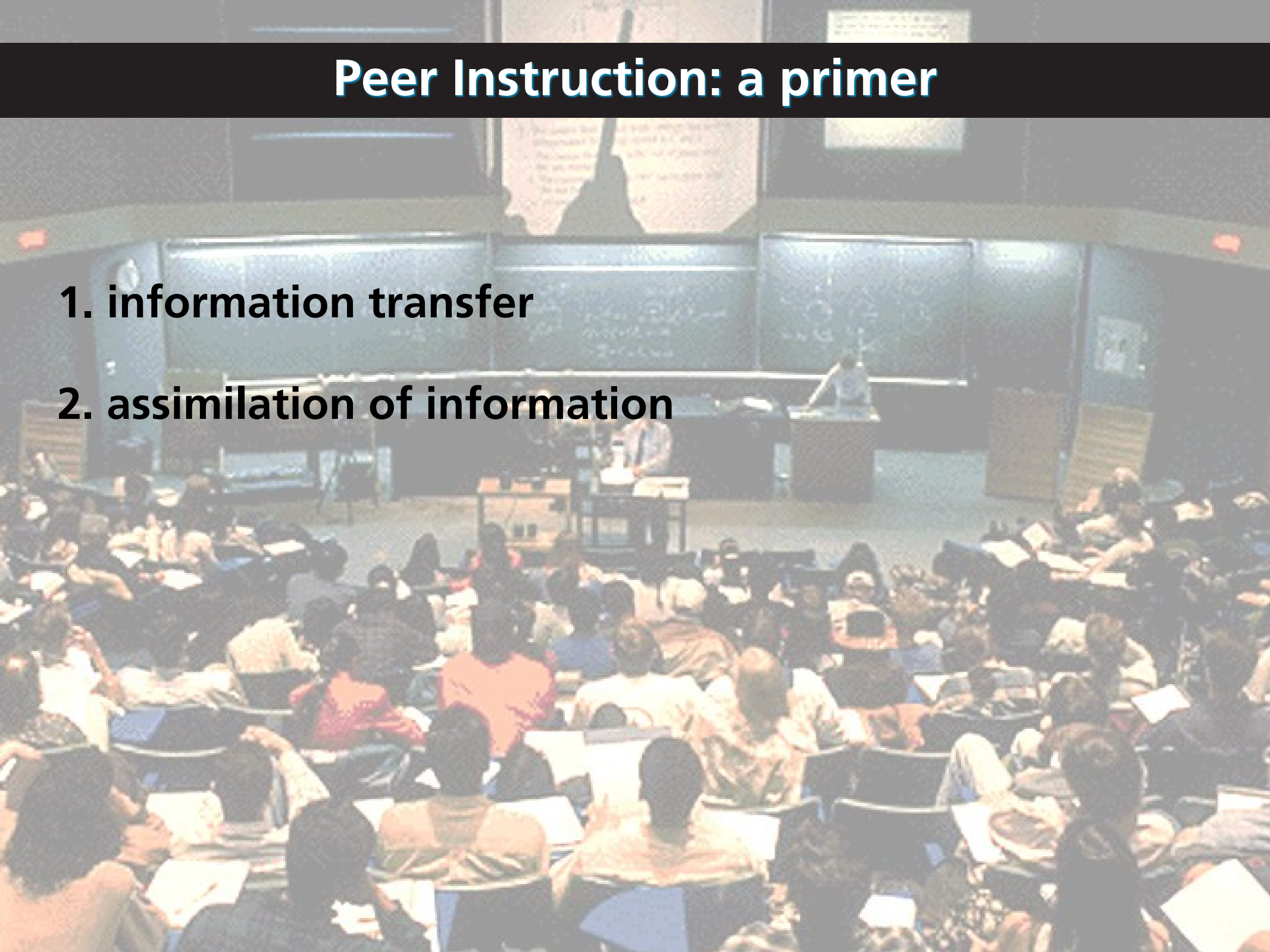
Peer Instruction: a primer

1. information transfer



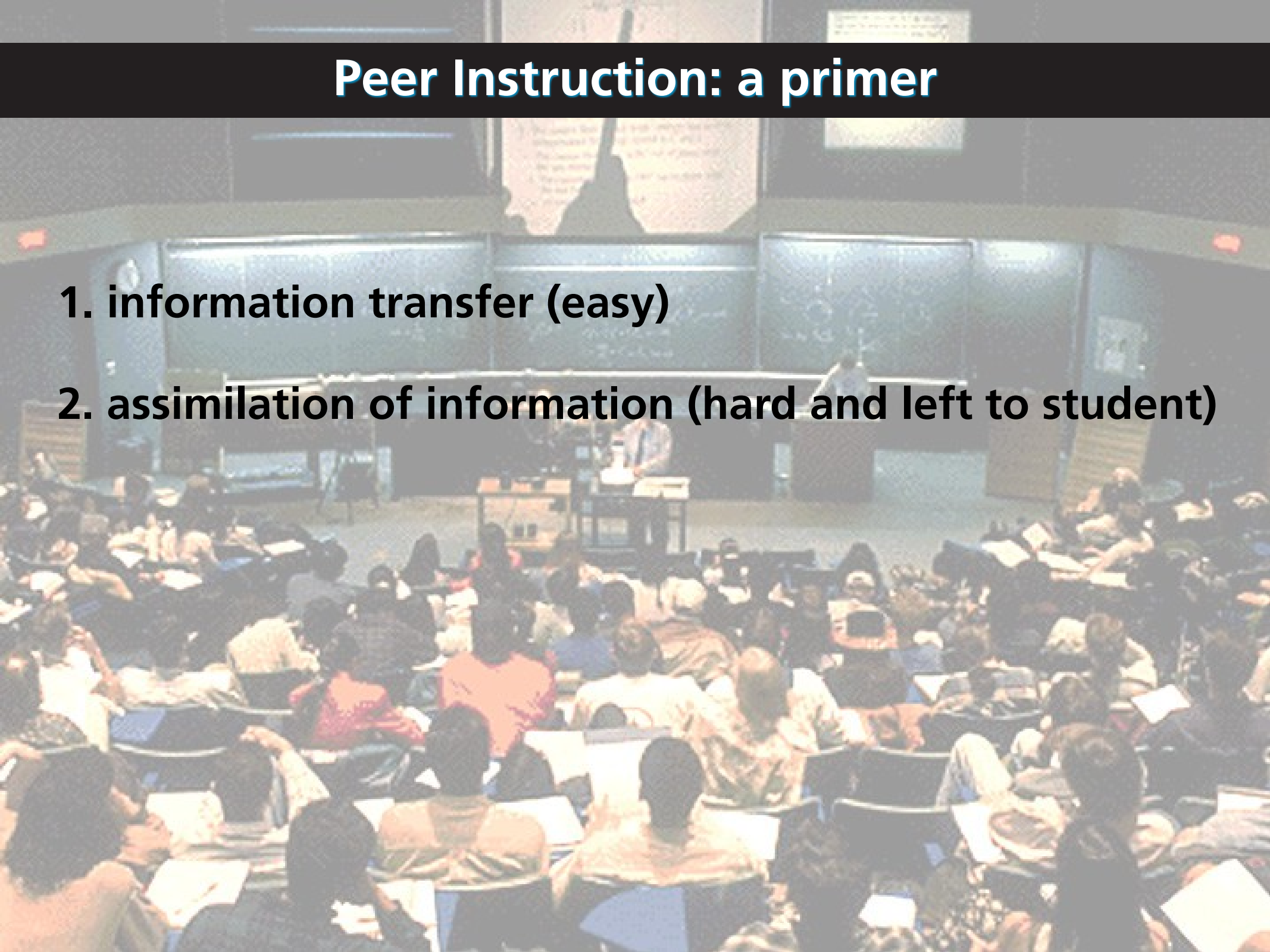
Peer Instruction: a primer

1. information transfer
2. assimilation of information



Peer Instruction: a primer

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



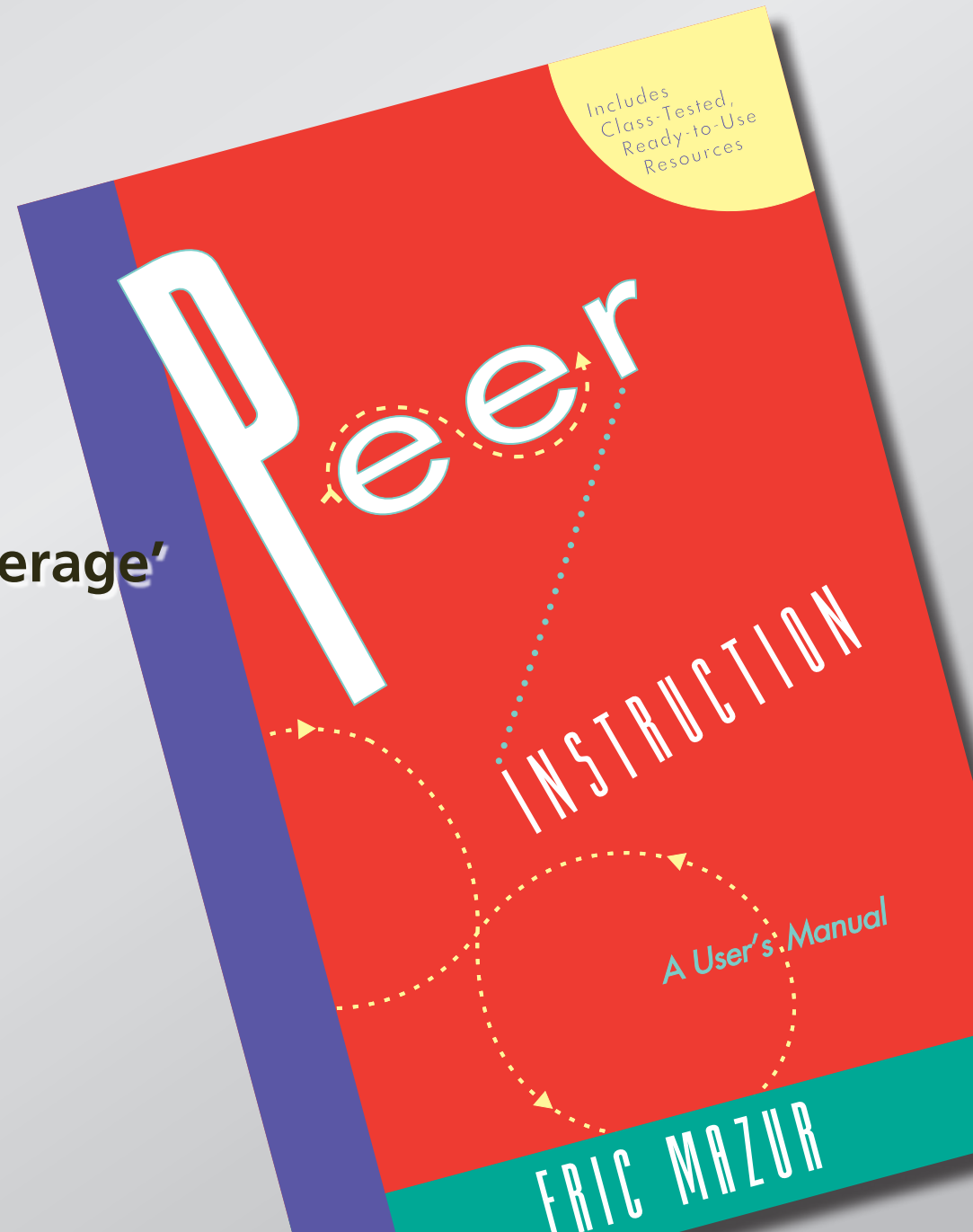
Peer Instruction: a primer

Solution: move information transfer out of classroom!

Peer Instruction: a primer

Main features:

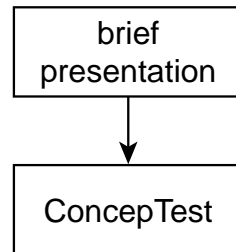
- pre-class reading
- in-class: depth, not 'coverage'
- ConcepTests



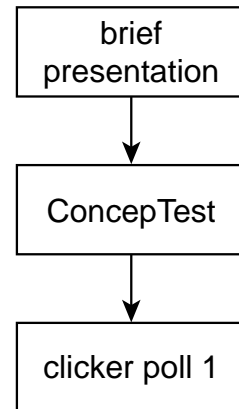
Peer Instruction: a primer

brief
presentation

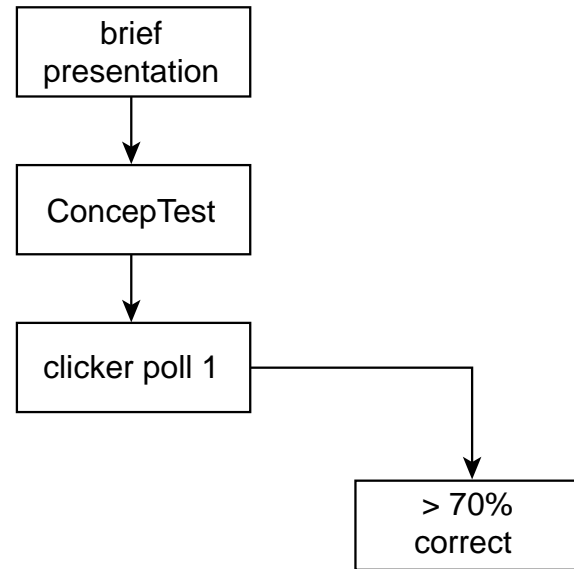
Peer Instruction: a primer



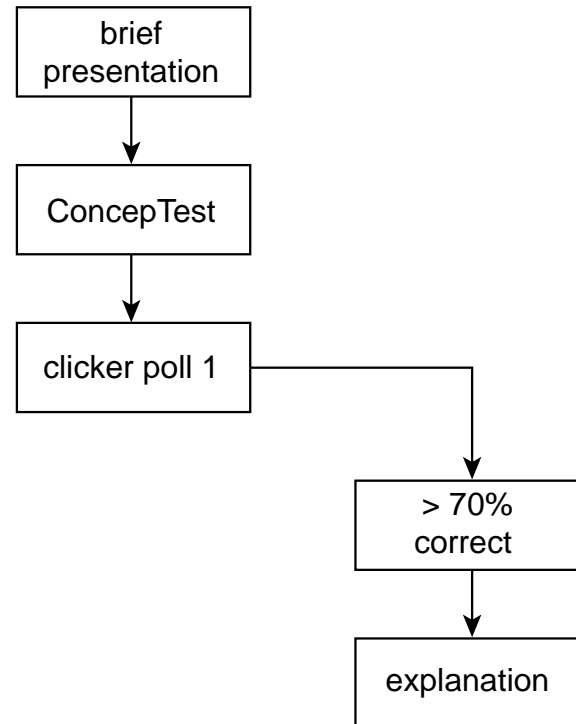
Peer Instruction: a primer



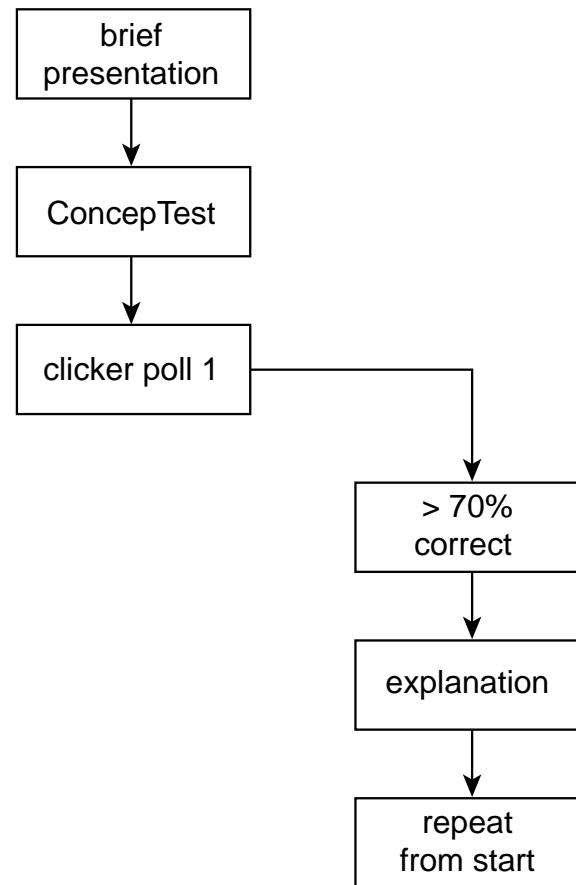
Peer Instruction: a primer



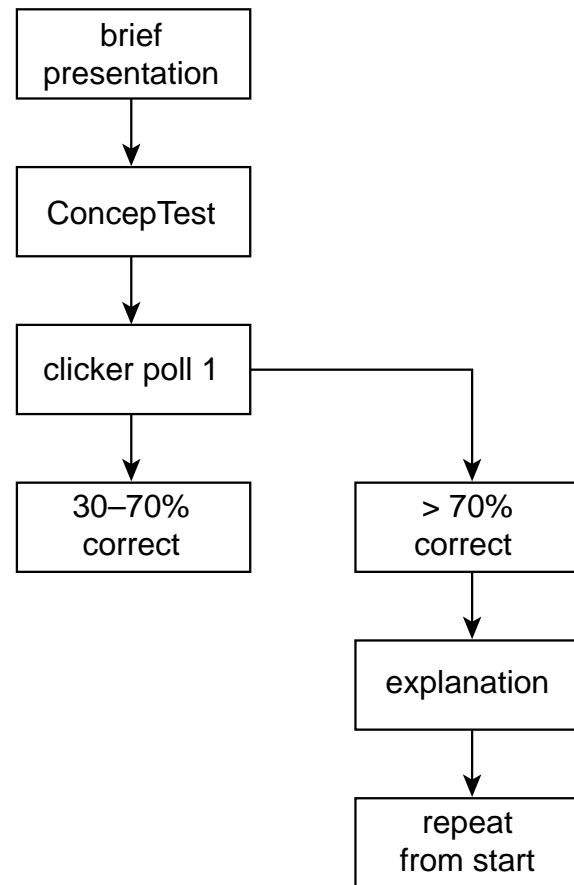
Peer Instruction: a primer



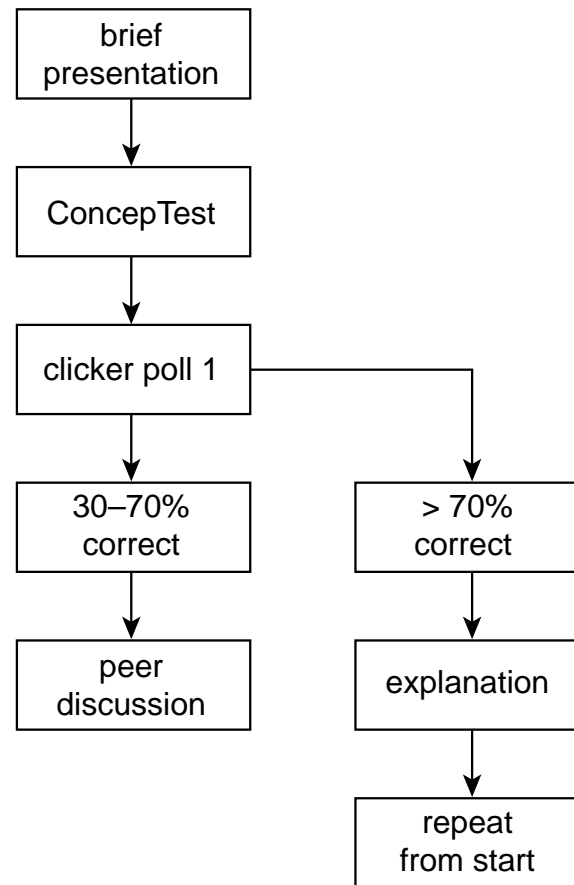
Peer Instruction: a primer



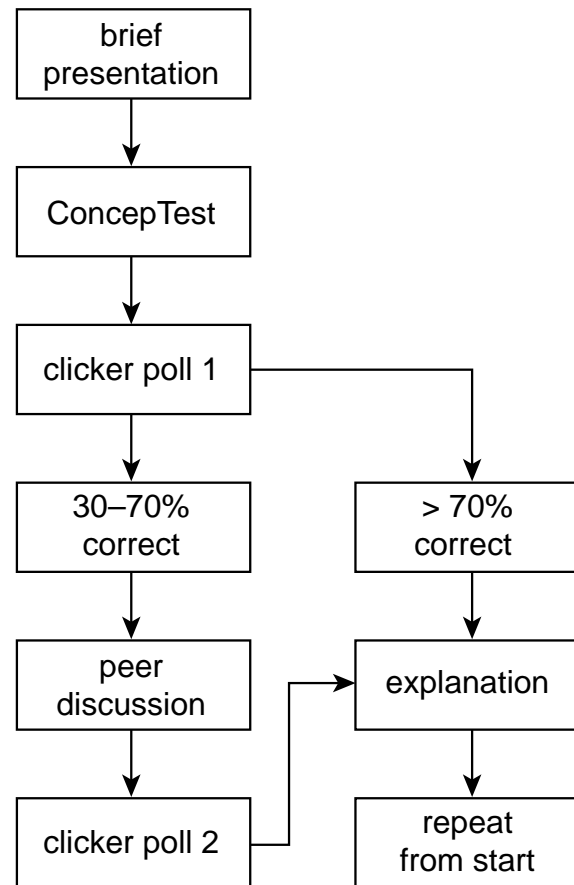
Peer Instruction: a primer



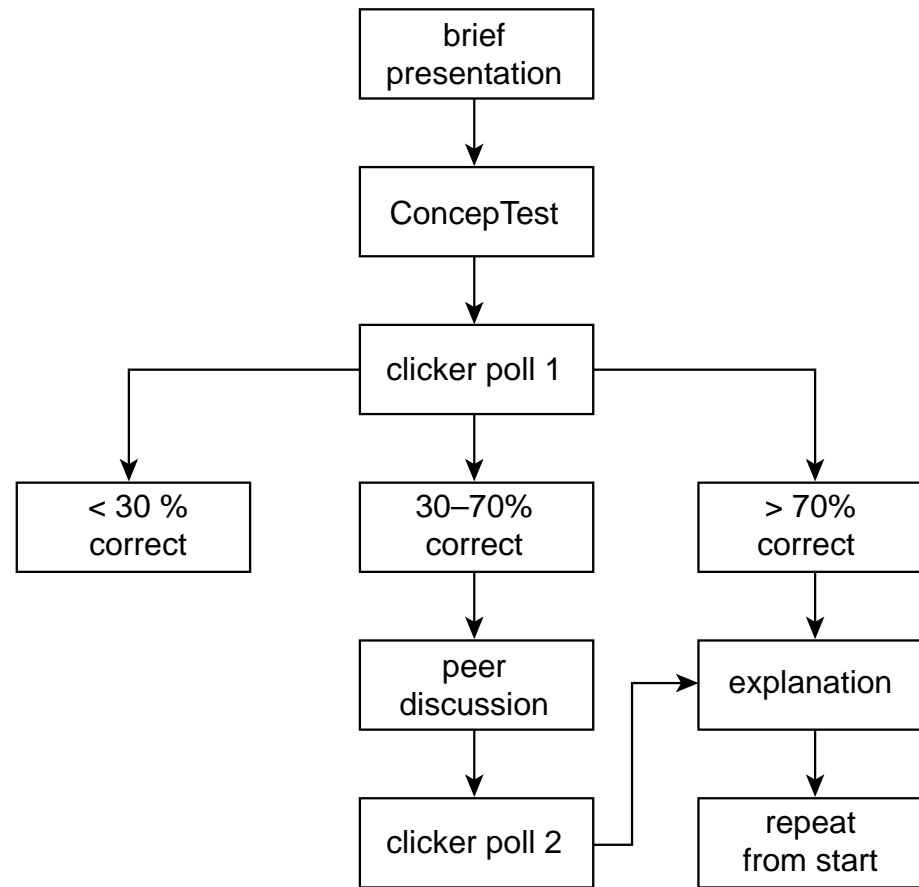
Peer Instruction: a primer



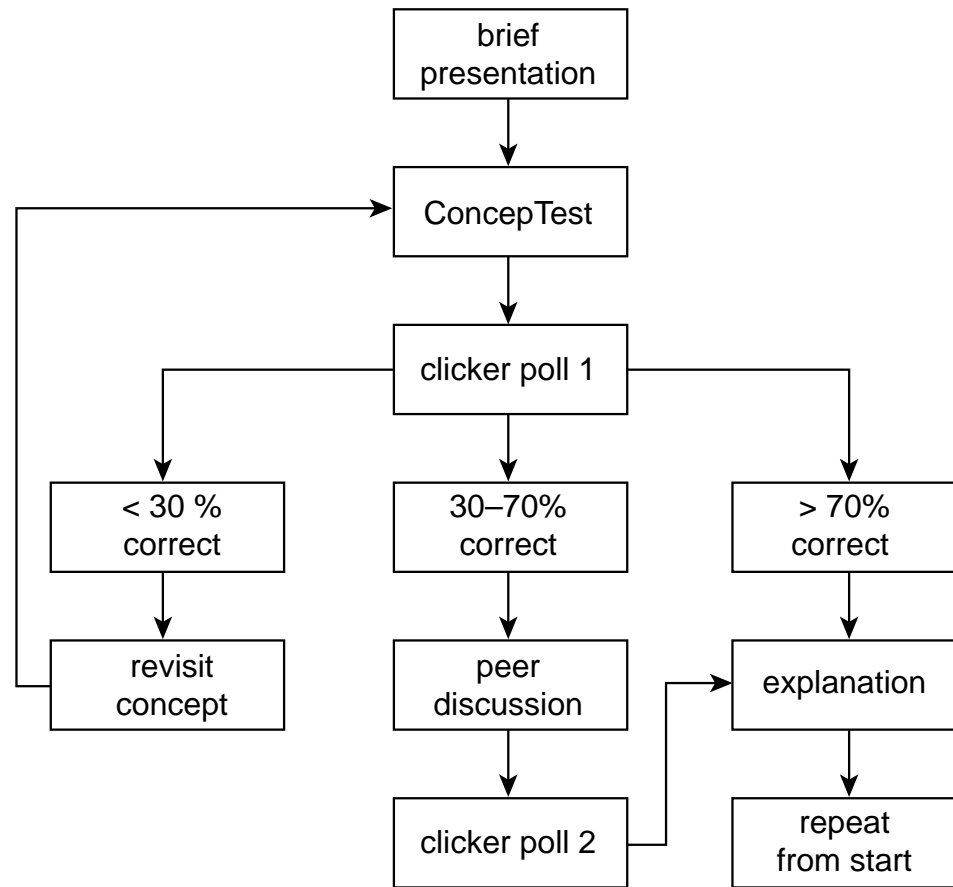
Peer Instruction: a primer



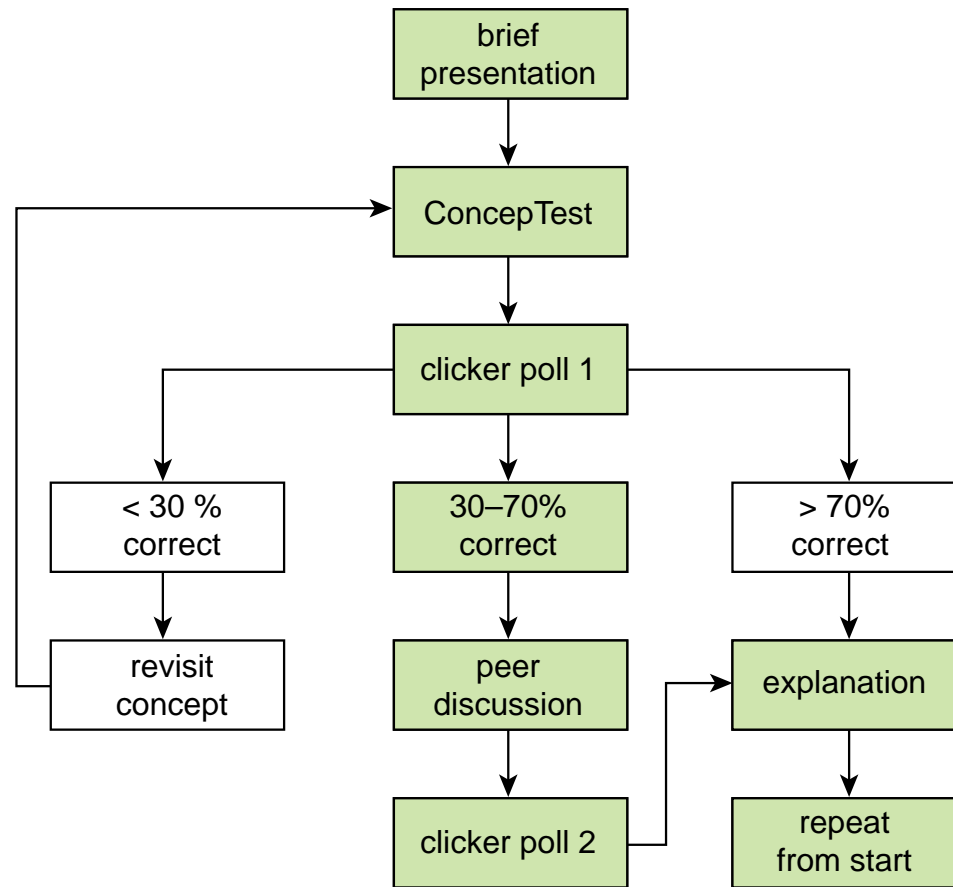
Peer Instruction: a primer



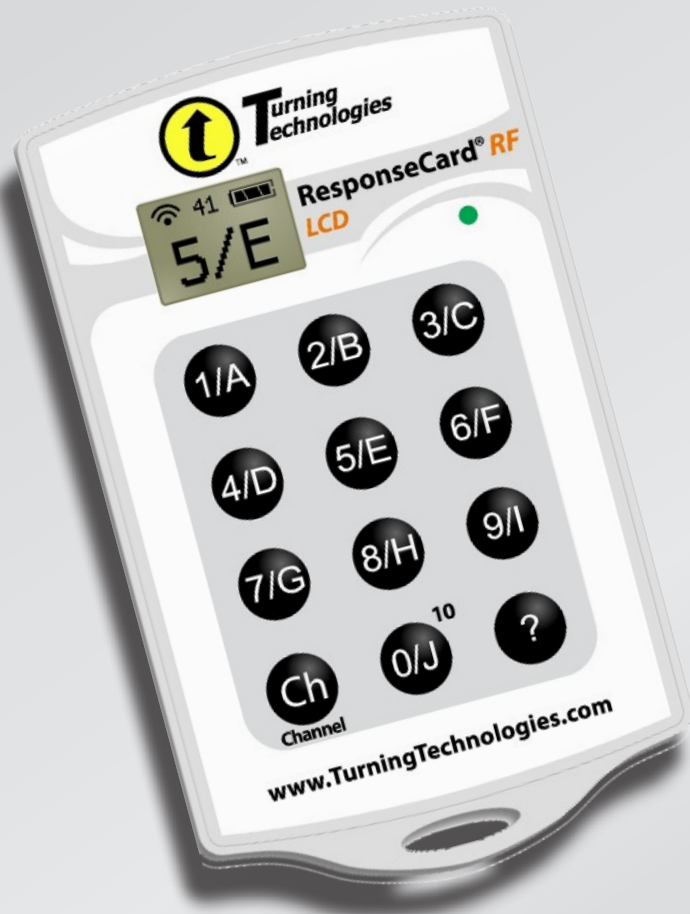
Peer Instruction: a primer



Peer Instruction: a primer

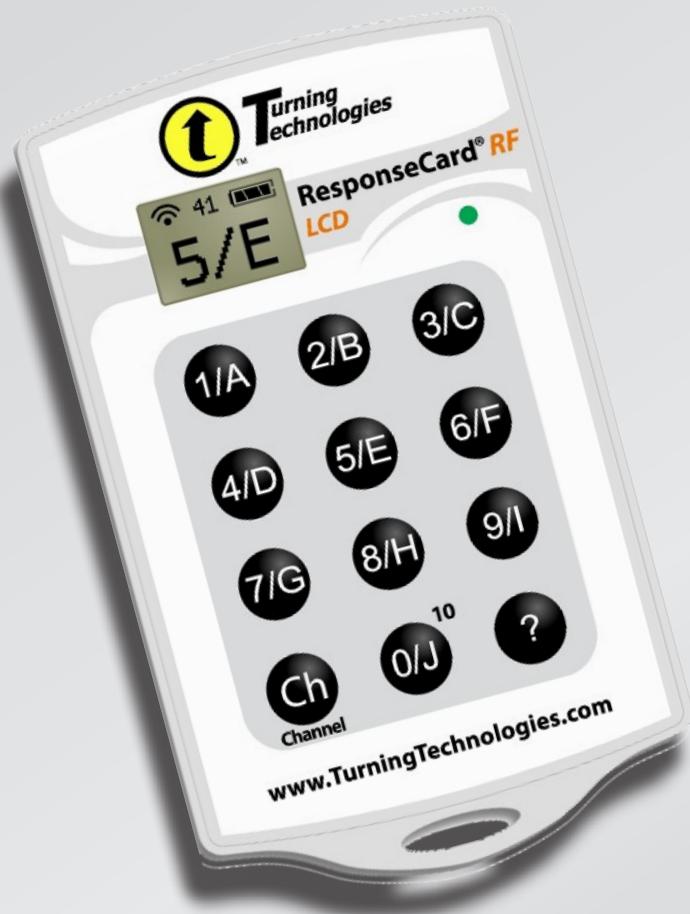


Get your clickers ready!



- no ON/OFF button
- only last “click” counts
- display shows recorded answer

Get your clickers ready!



Or use your web-enabled device!

- go to <http://rwpoll.com>
- enter session ID: **EMAZUR**

rwpoll.com

Get your clickers ready!



www.TurningTechnologies.com

Get your clickers ready!



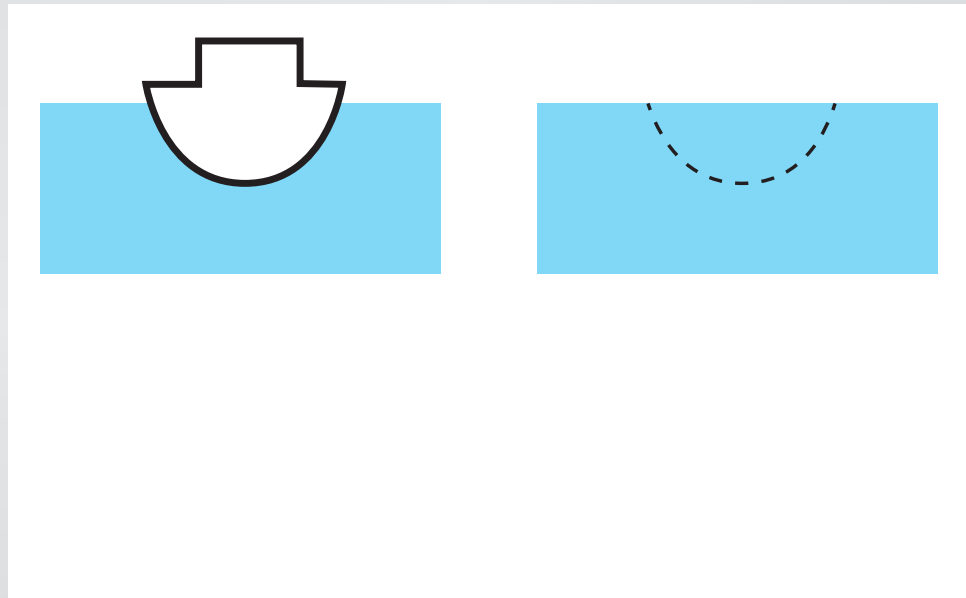
unique ID on back of clicker

Let's try it!

Archimedes Principle

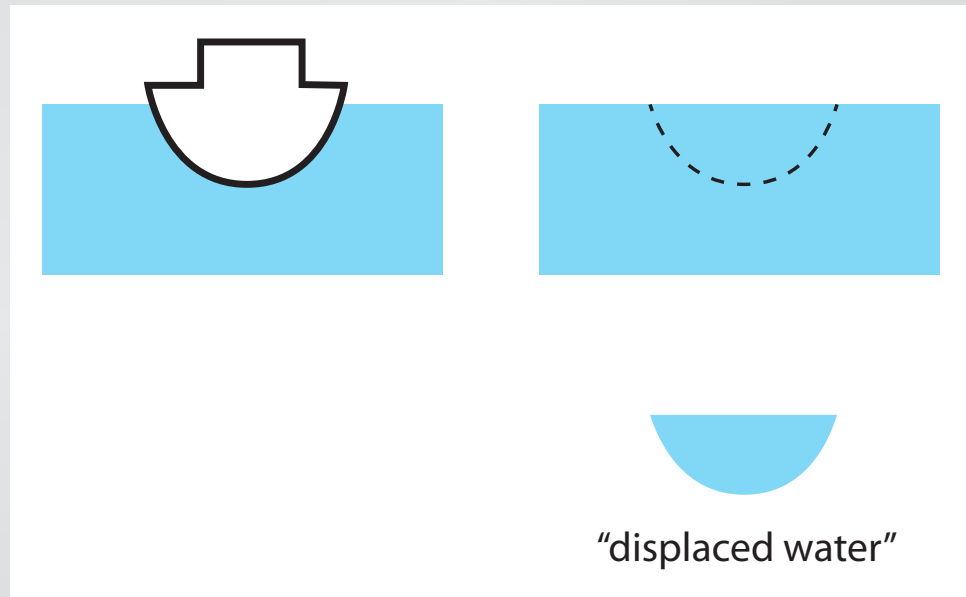
Let's try it!

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.



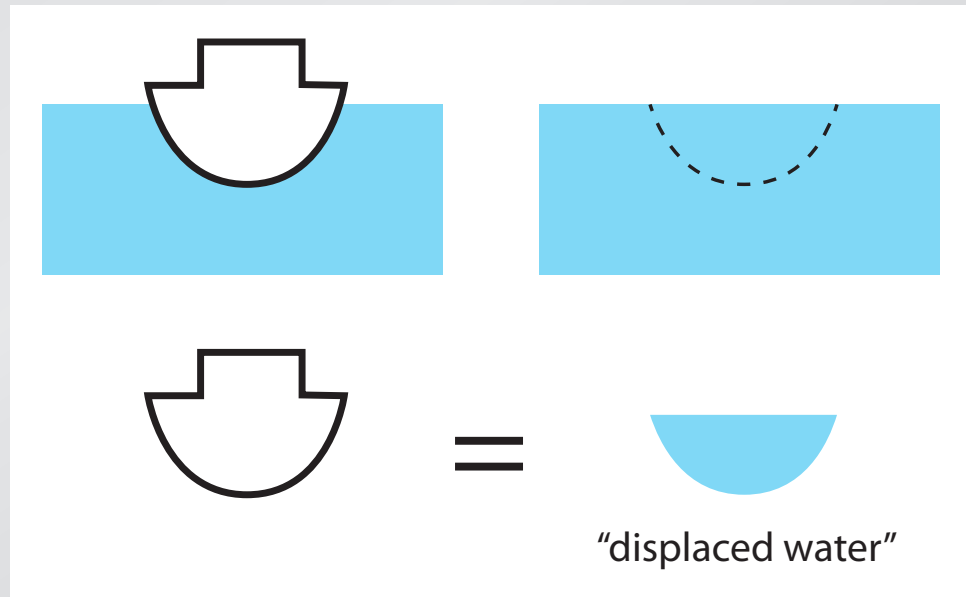
Let's try it!

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.



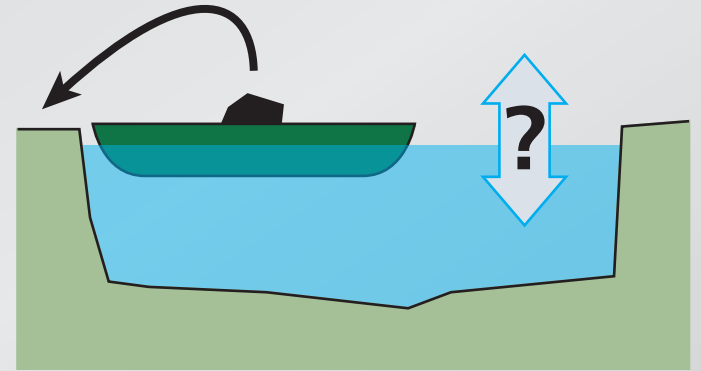
Let's try it!

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.



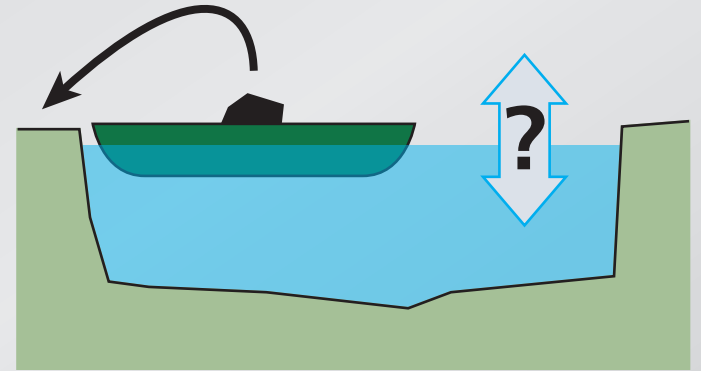
Let's try it!

A boat carrying a large boulder is floating on a small pond. The boulder is removed from the boat.



Let's try it!

A boat carrying a large boulder is floating on a small pond. The boulder is removed from the boat.



After the boulder is removed from the boat, the level of the water in the pond is

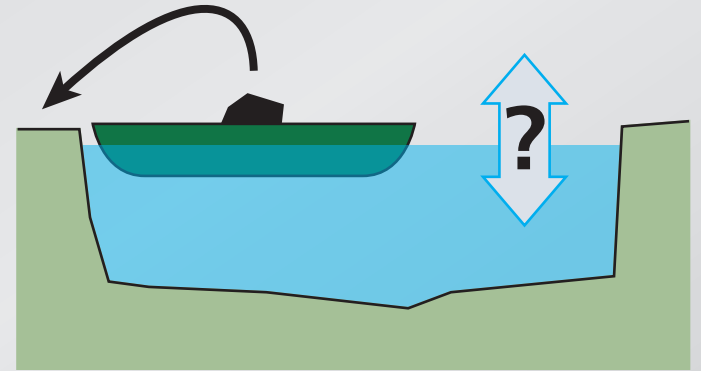
1. higher than
2. the same as
3. lower than

it was when the boulder was in the boat.



Let's try it!

A boat carrying a large boulder is floating on a small pond. The boulder is removed from the boat.



After the boulder is removed from the boat, the level of the water in the pond is

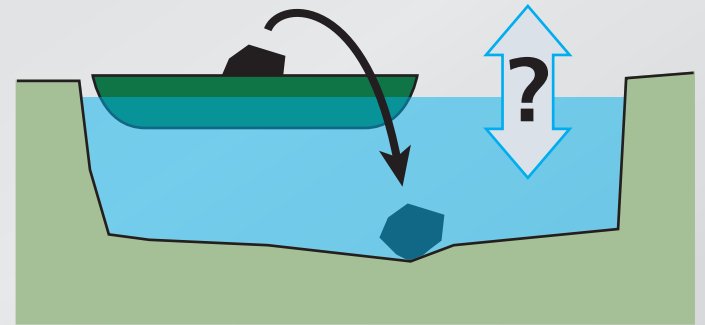
1. higher than ✓
2. the same as
3. lower than

it was when the boulder was in the boat.



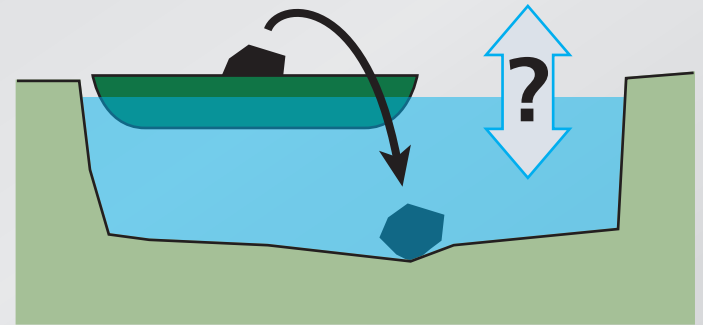
Let's try it!

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.



Let's try it!

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

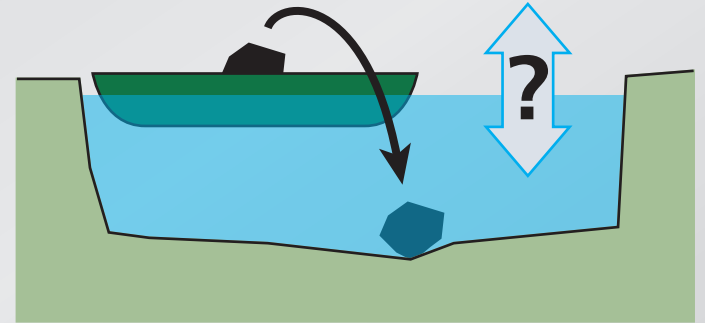
1. higher than
2. the same as
3. lower than

it was when the boulder was in the boat.



Let's try it!

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

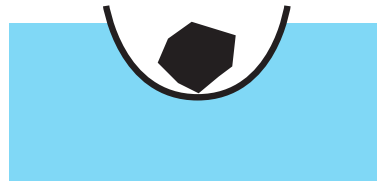
1. higher than
2. the same as
3. lower than ✓

it was when the boulder was in the boat.



Let's try it!

remember: amount of displaced water



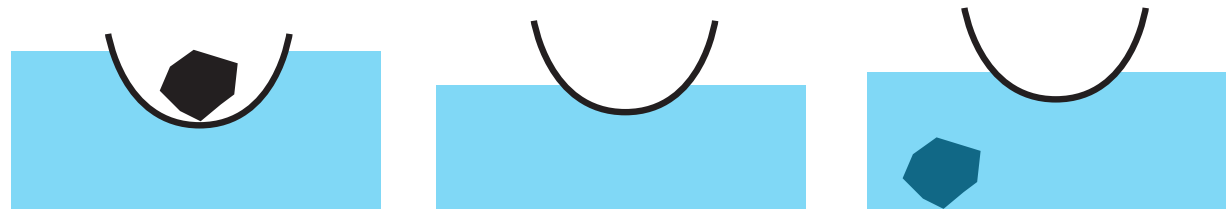
Let's try it!

remember: amount of displaced water



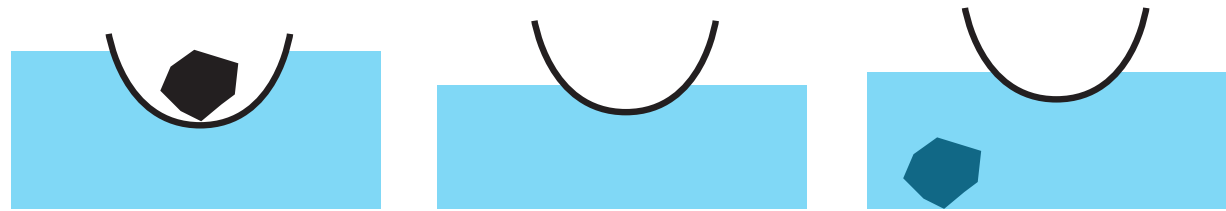
Let's try it!

remember: amount of displaced water



Let's try it!

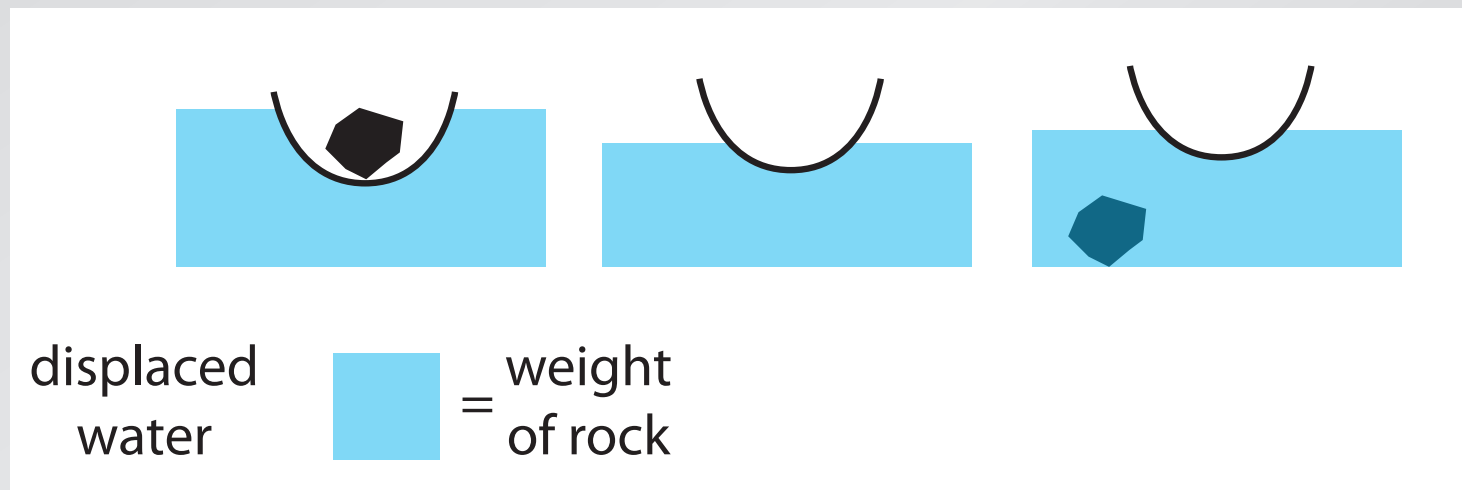
remember: amount of displaced water



displaced
water

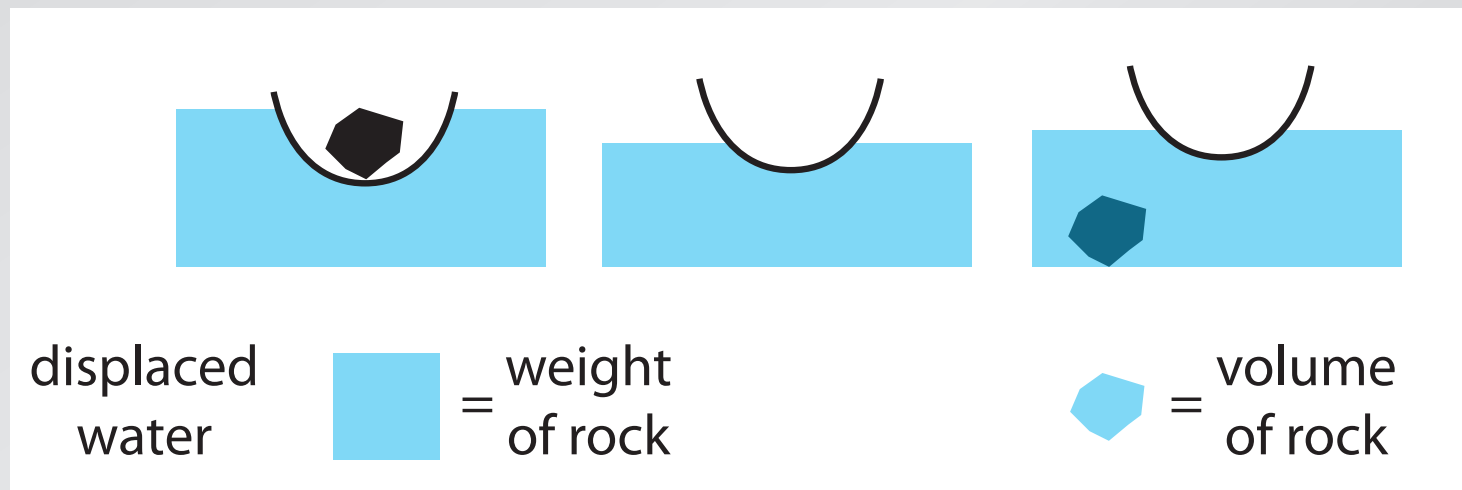
Let's try it!

remember: amount of displaced water



Let's try it!

remember: amount of displaced water



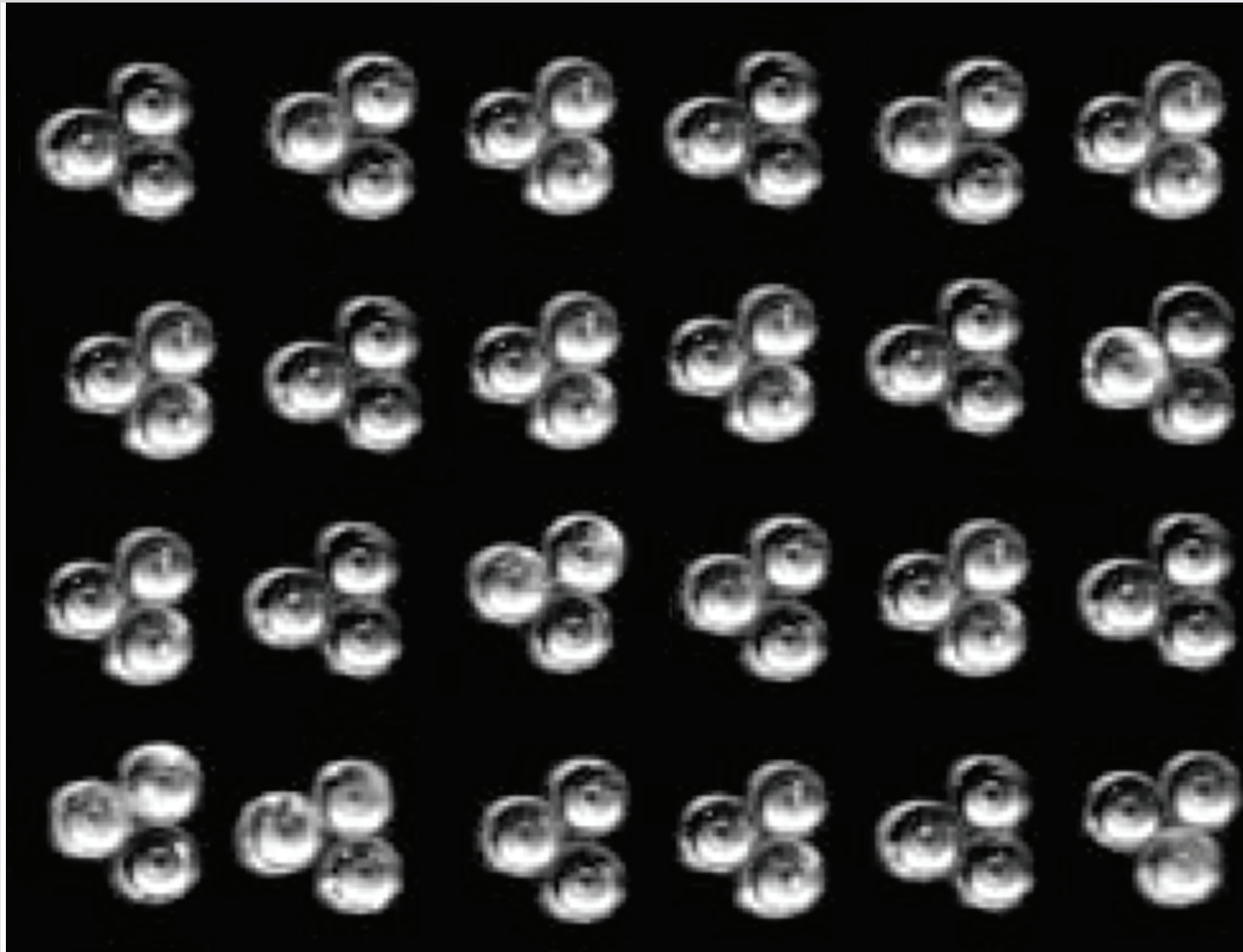
Let's try it!

We all make mistakes!

Let's try it!

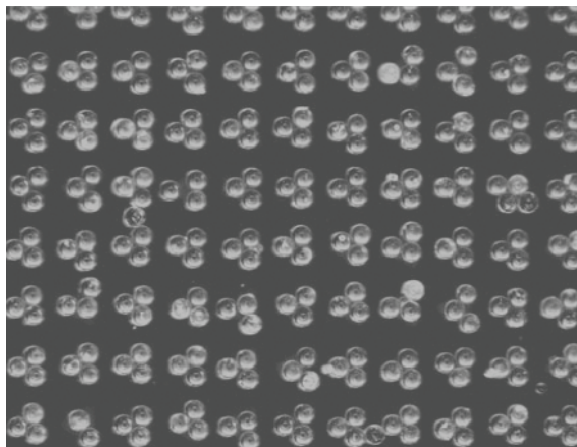
*“Does this method work only with questions
that have a correct answer?”*

Let's try it!

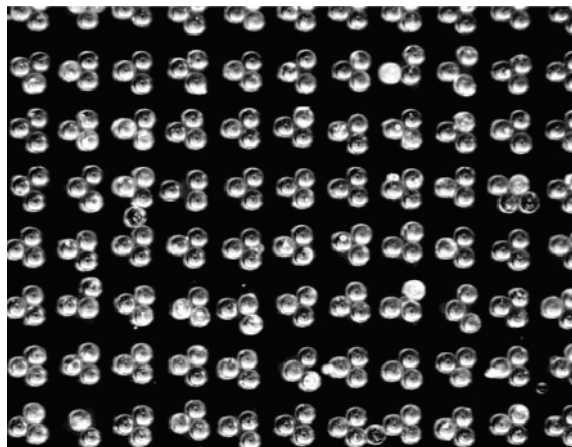


Let's try it!

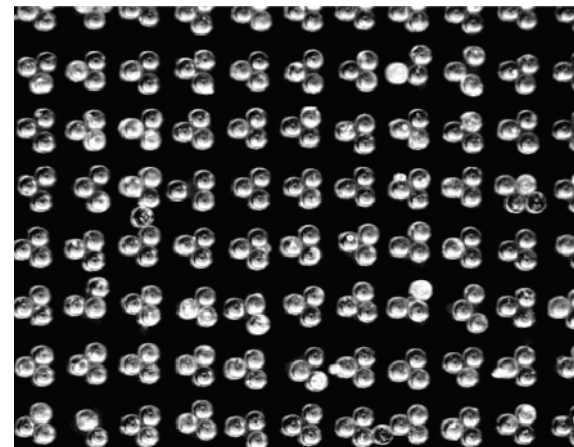
original



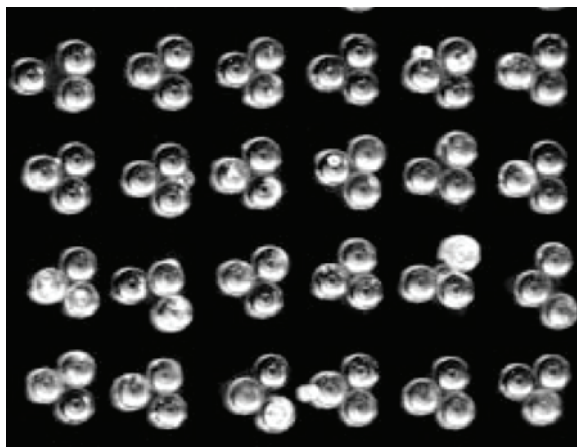
1. adjust contrast



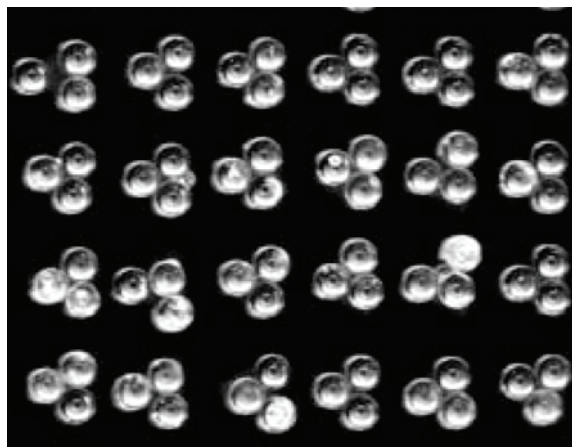
2. remove blemishes



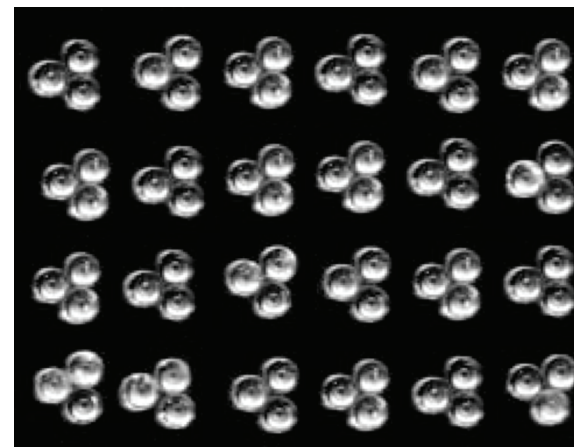
3. crop



4. remove outliers



5. reconstruct



Consider this

a couple of points worth noting:

Consider this

a couple of points worth noting:

- 1. you got engaged**

Consider this

a couple of points worth noting:

- 1. you got engaged**
- 2. no "correct" answer**

Consider this

a couple of points worth noting:

- 1. you got engaged**
- 2. no “correct” answer**
- 3. you got engaged**

Consider this

a couple of points worth noting:

1. you got engaged
2. no "correct" answer
3. you got engaged
4. you don't need a correct answer!

Frequently Asked Questions

“Will it work at my institution?”

Frequently Asked Questions

“Will it work at my institution?”

It works here...

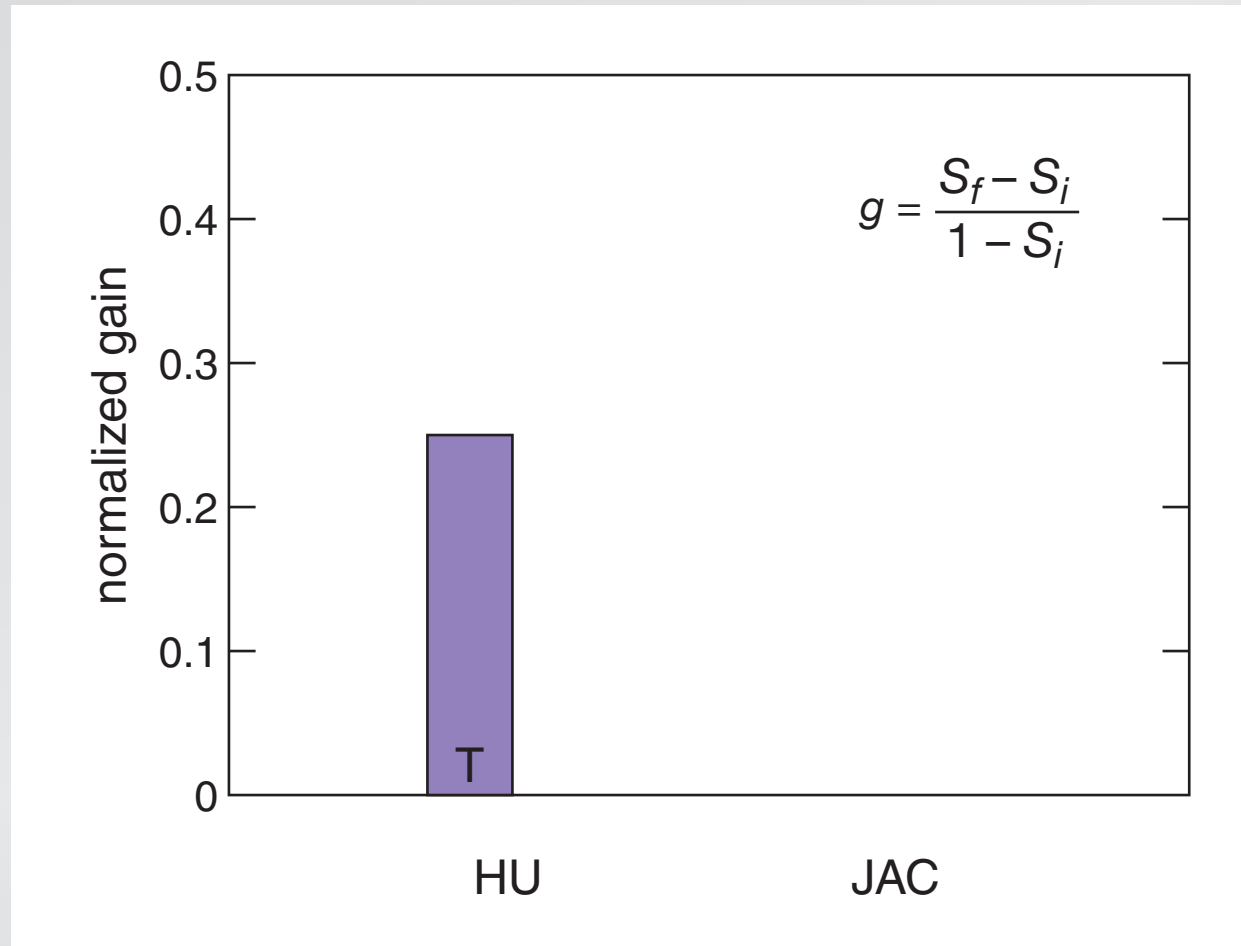


...but will it work here?



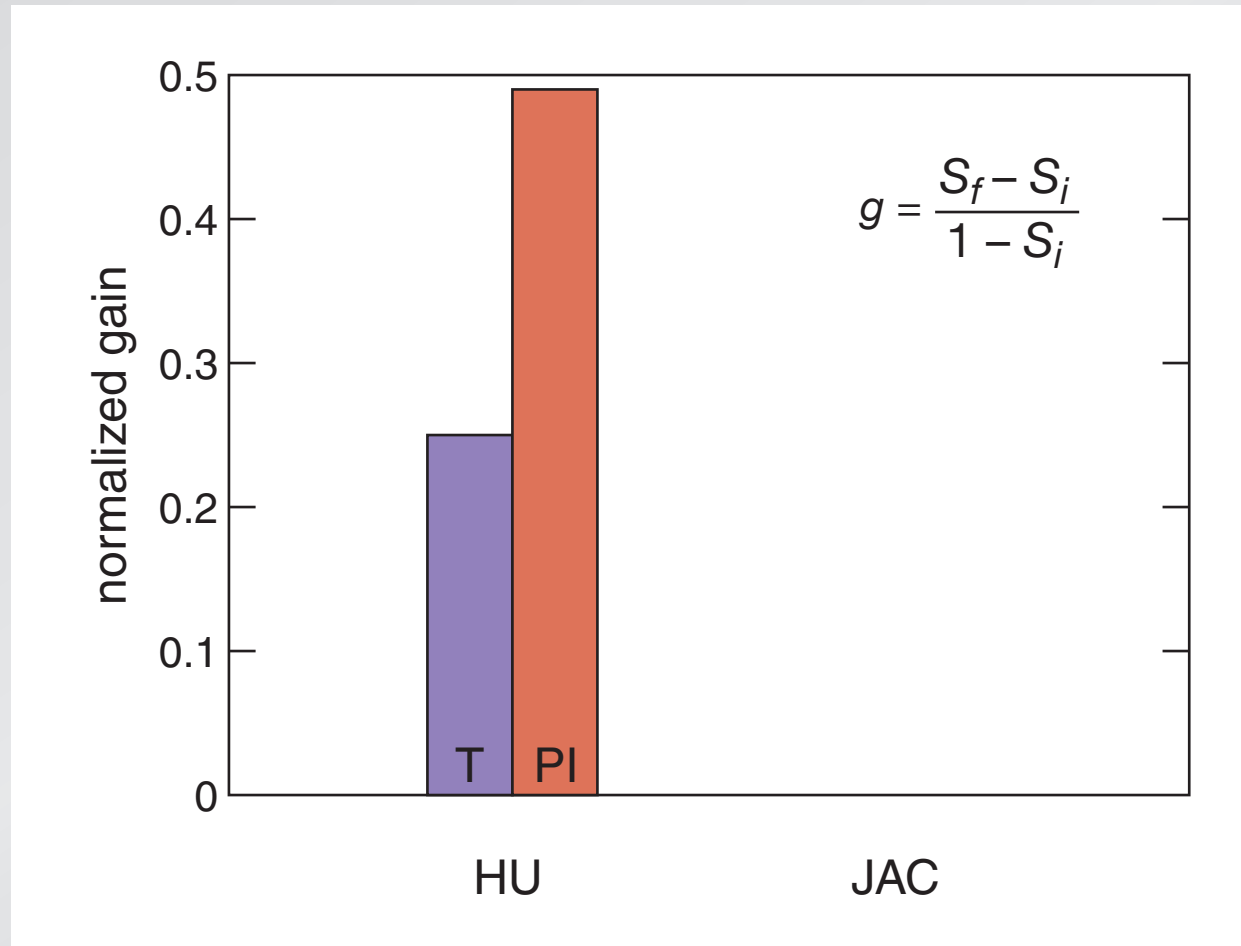
Will it work at my institution?

FCI normalized gain



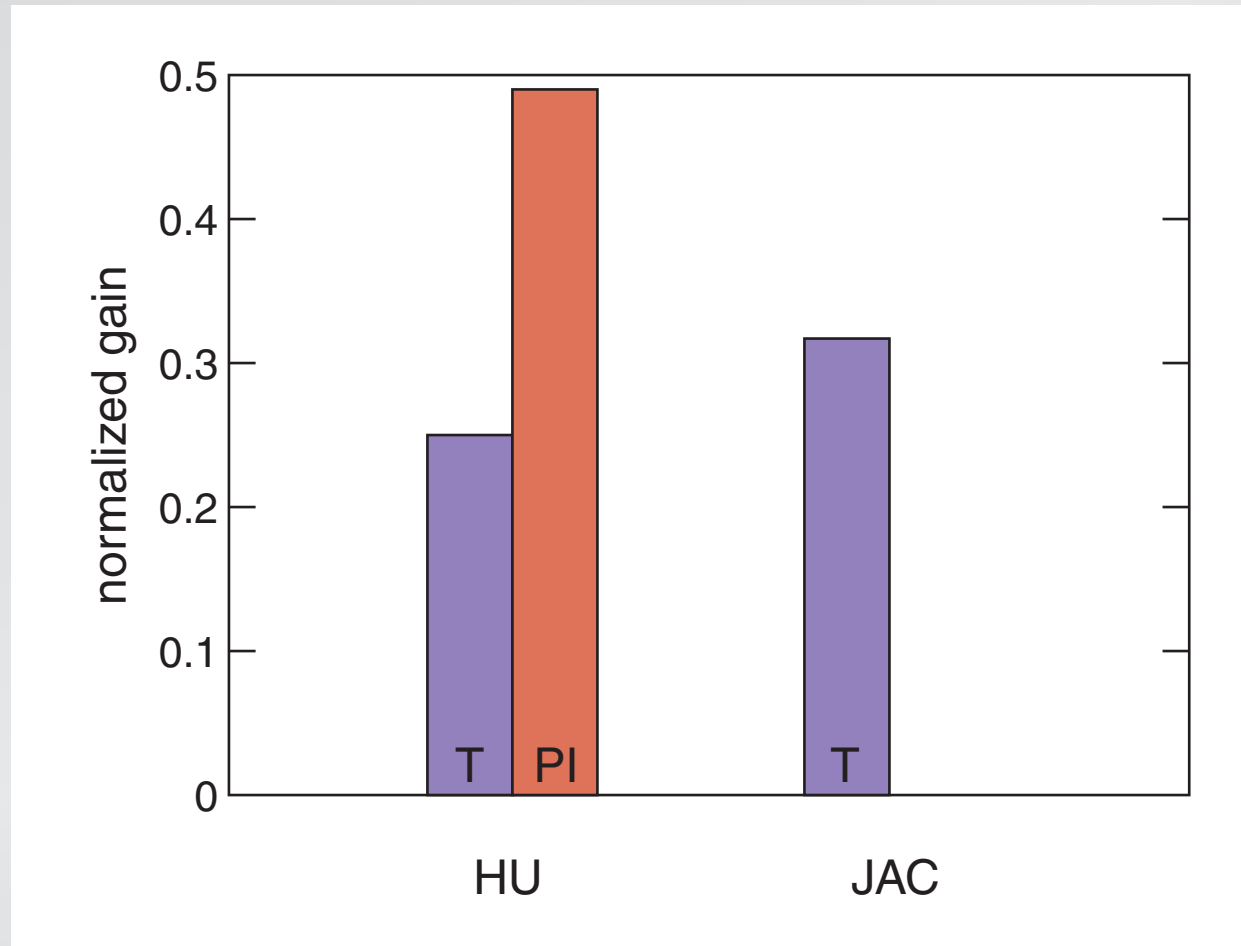
Will it work at my institution?

FCI normalized gain



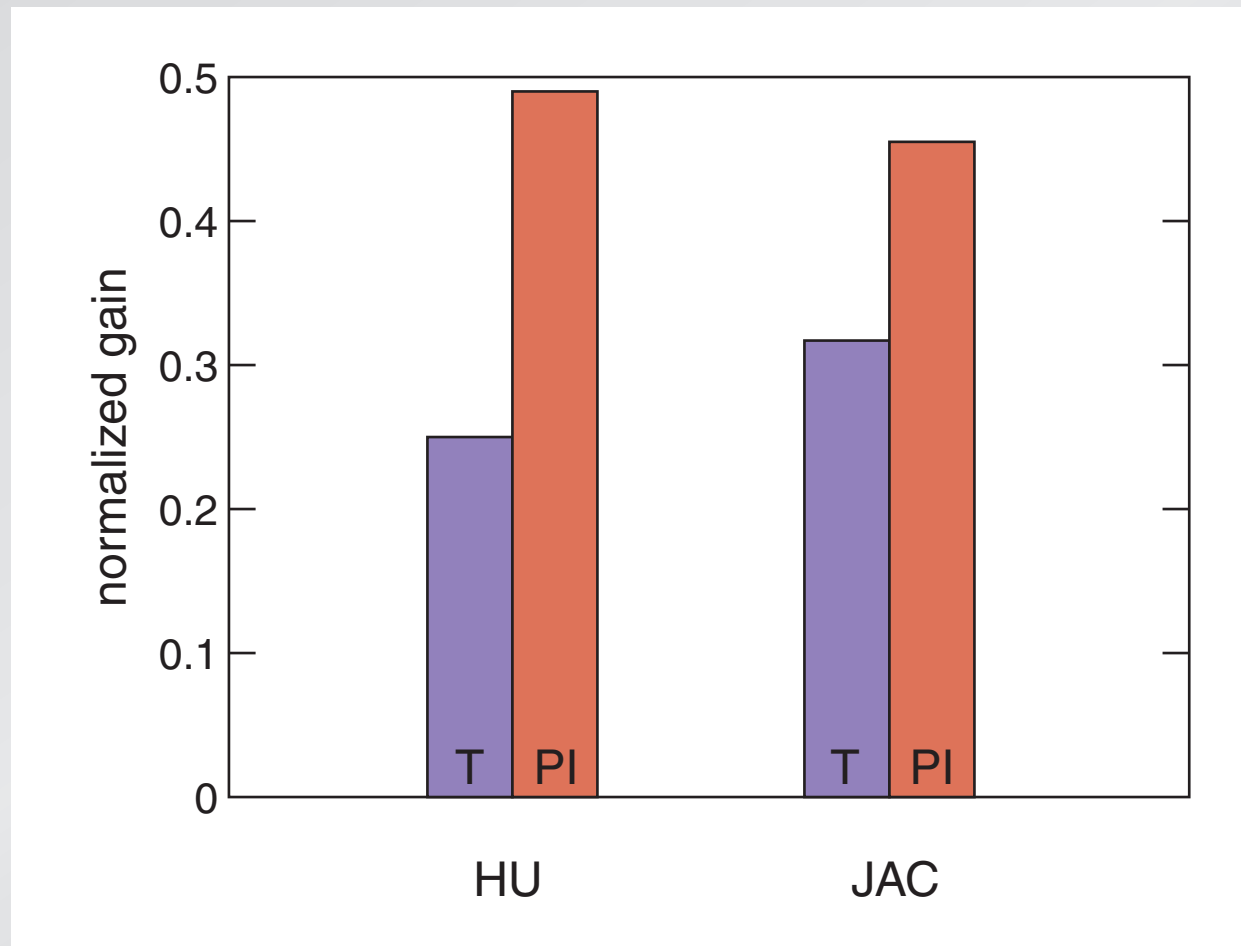
Will it work at my institution?

FCI normalized gain



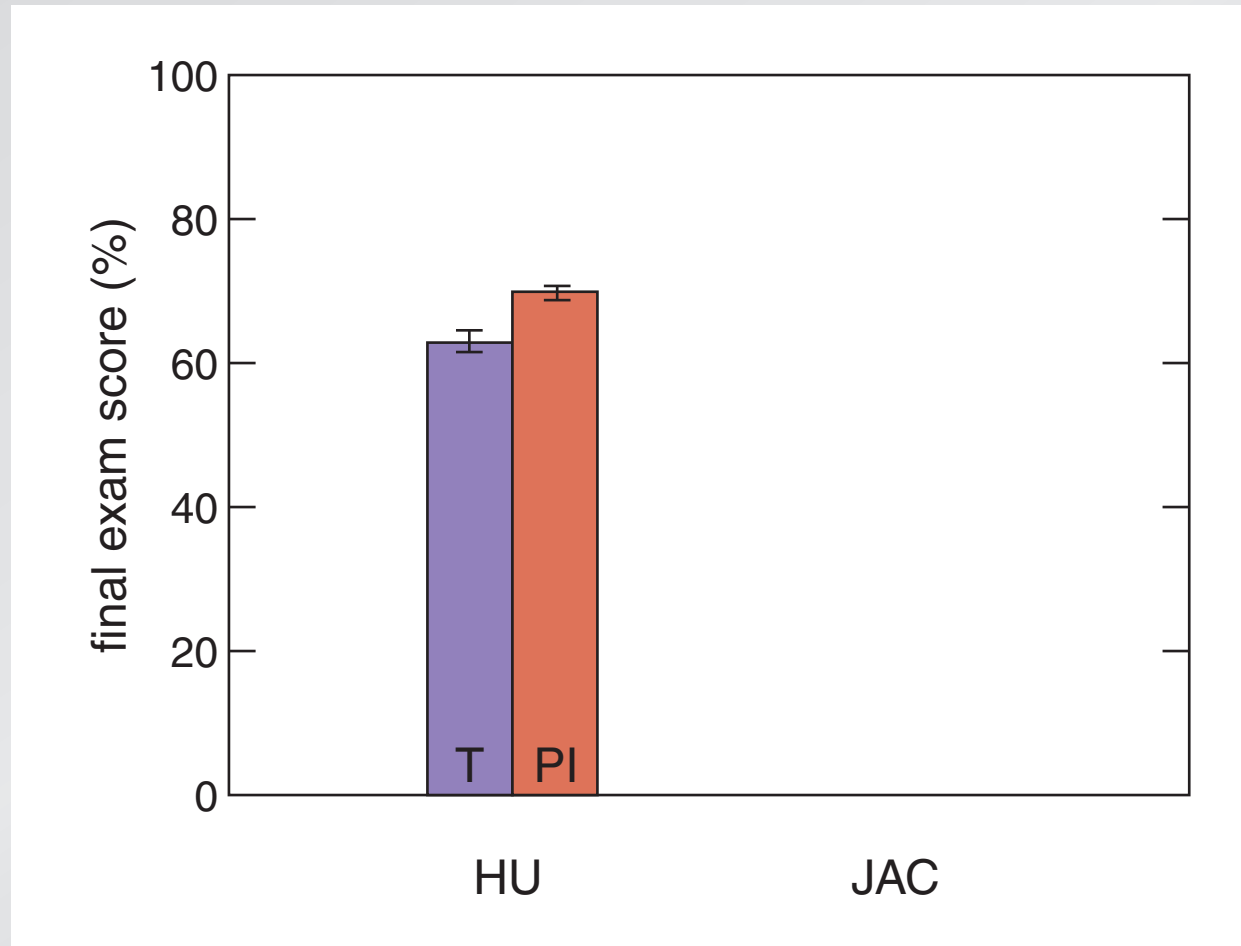
Will it work at my institution?

FCI normalized gain



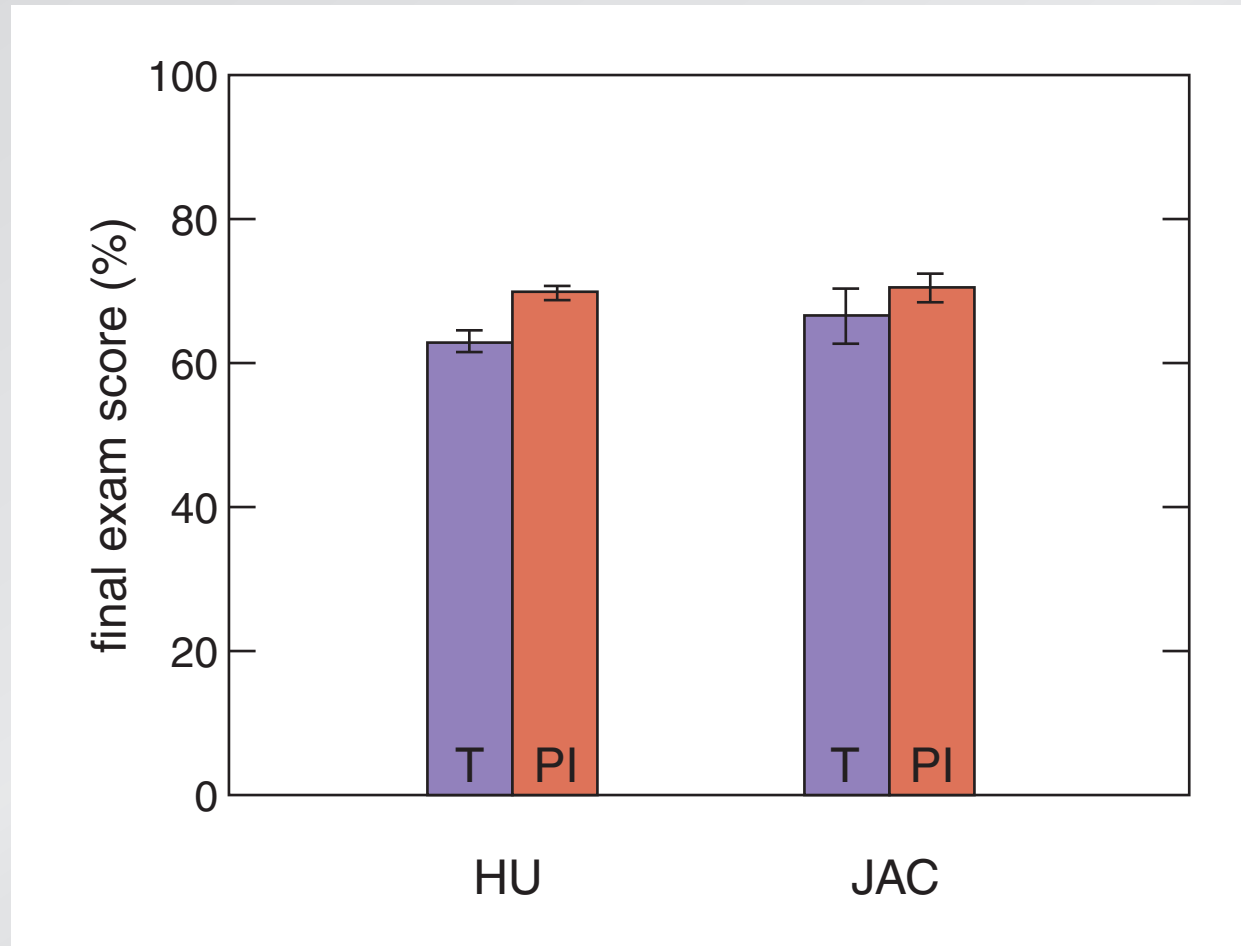
Will it work at my institution?

exam performance



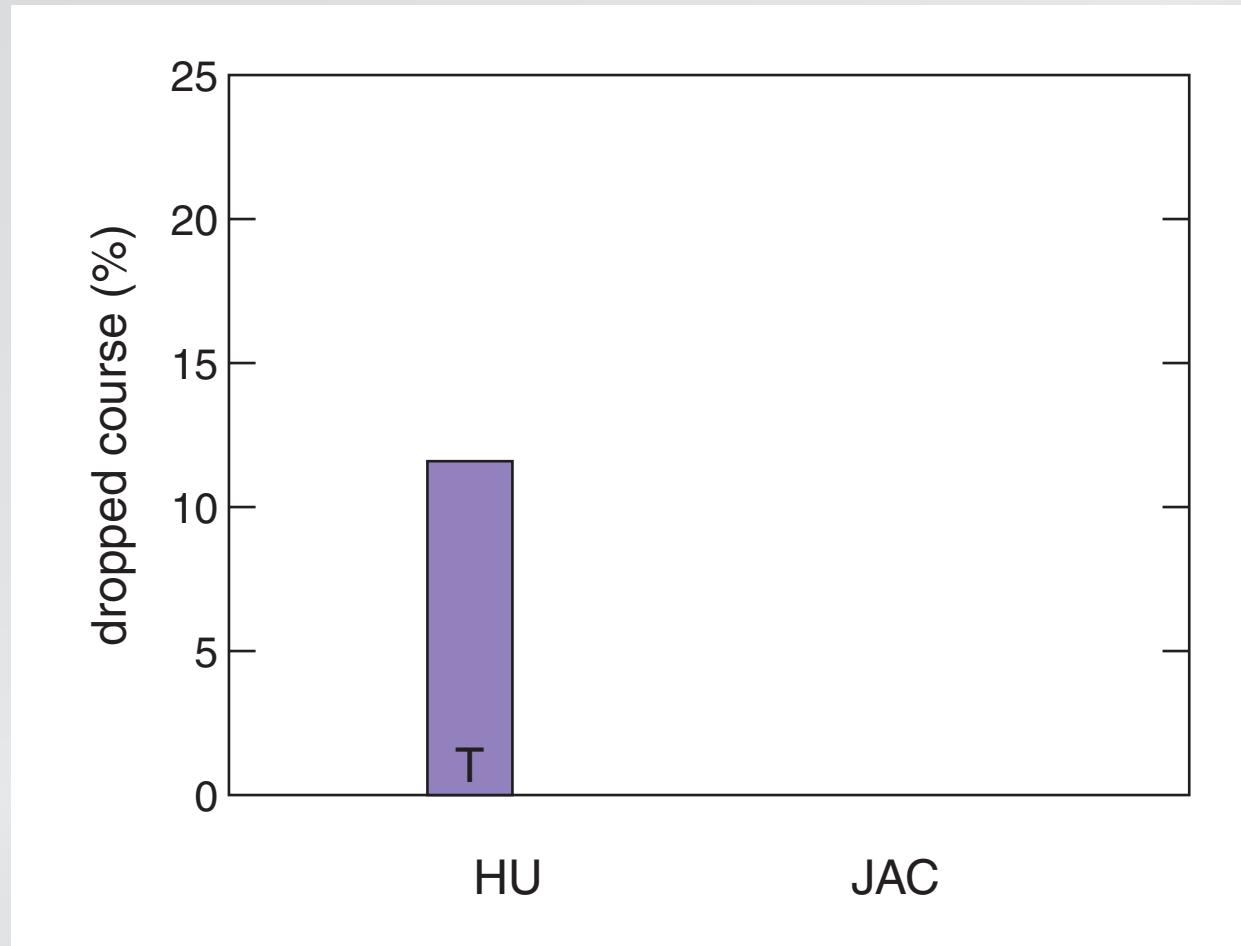
Will it work at my institution?

exam performance



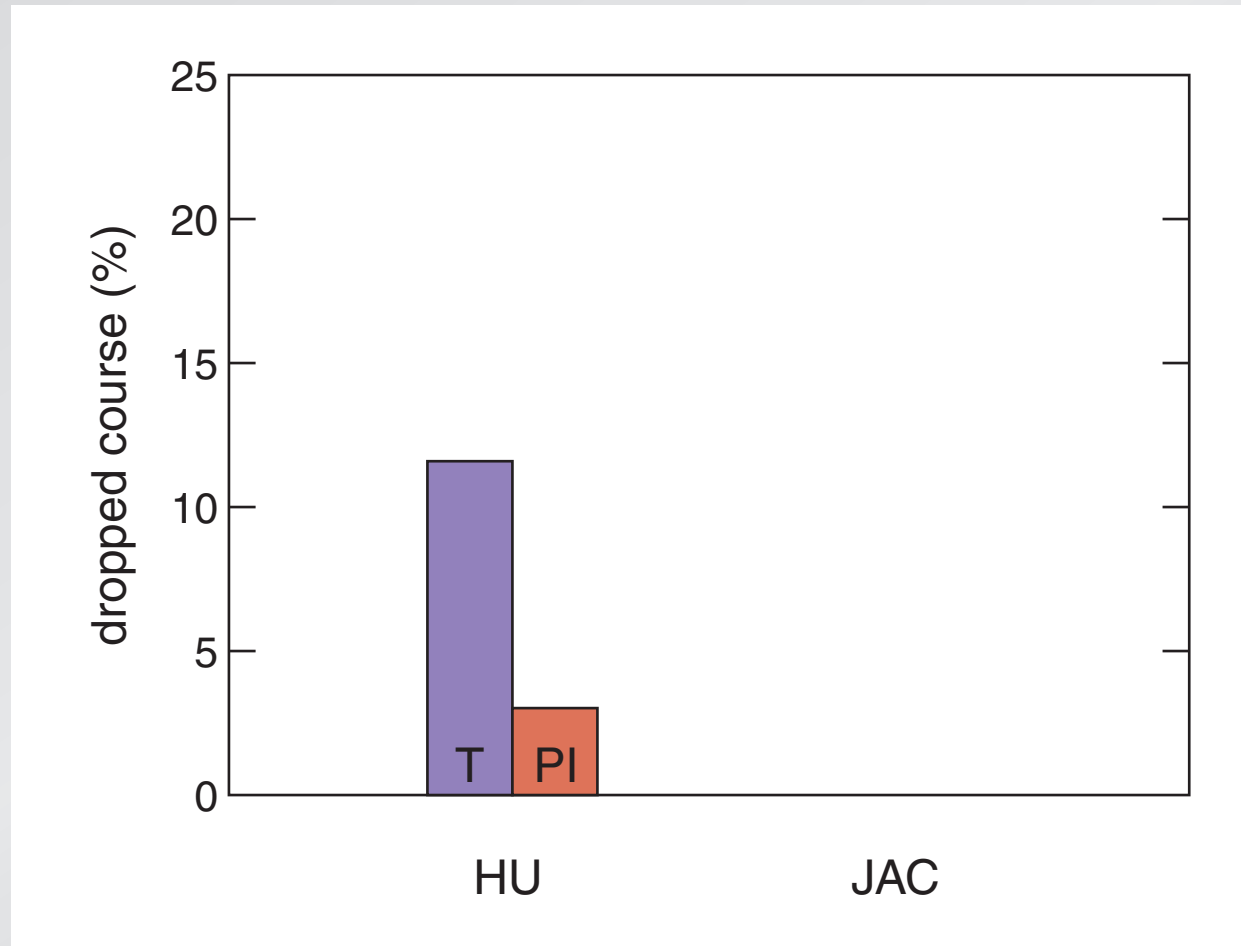
Will it work at my institution?

student retention



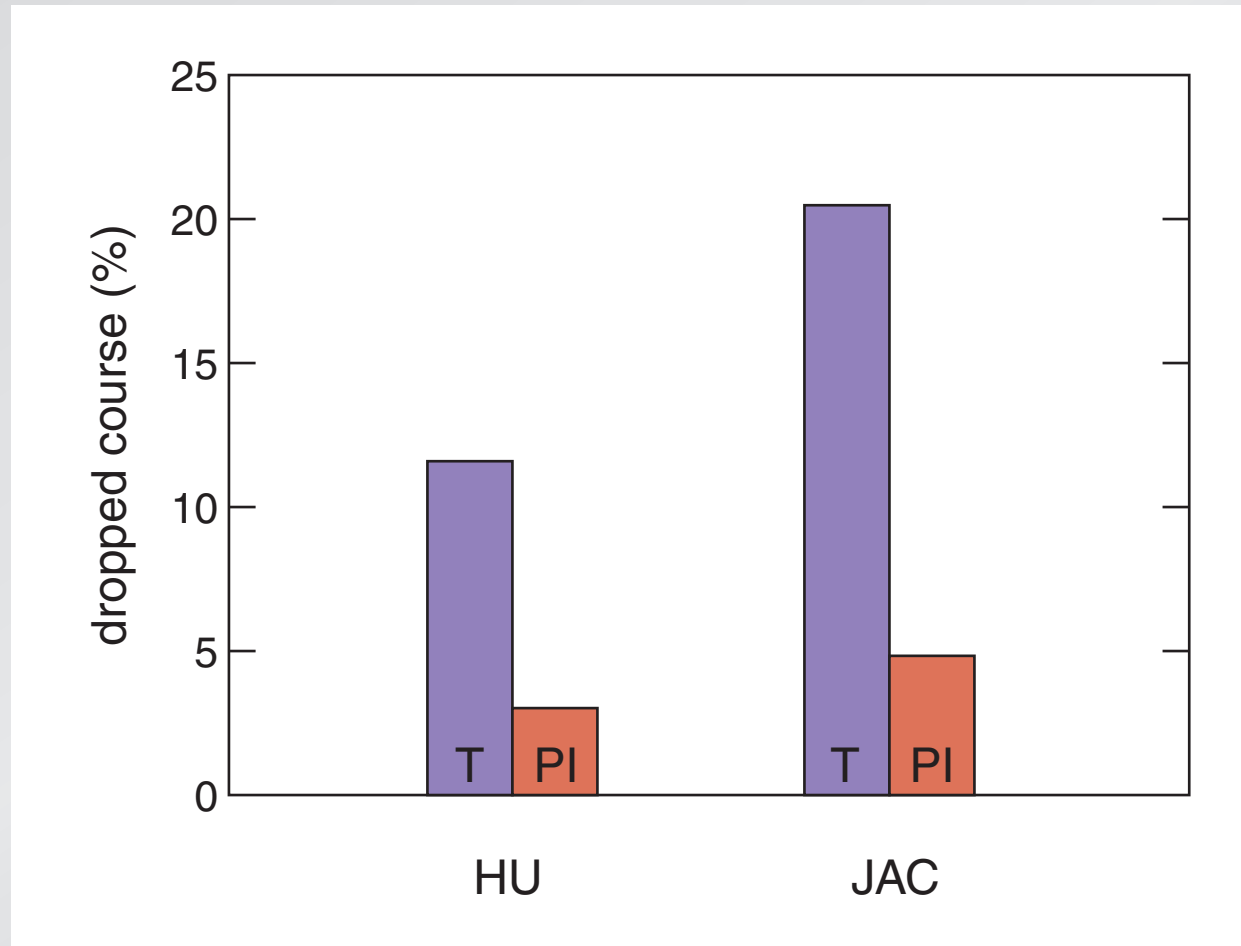
Will it work at my institution?

student retention



Will it work at my institution?

student retention



Will it work at my institution?

similar learning gains in different environments

Frequently Asked Questions

“Why does it work?”

Why does it work?

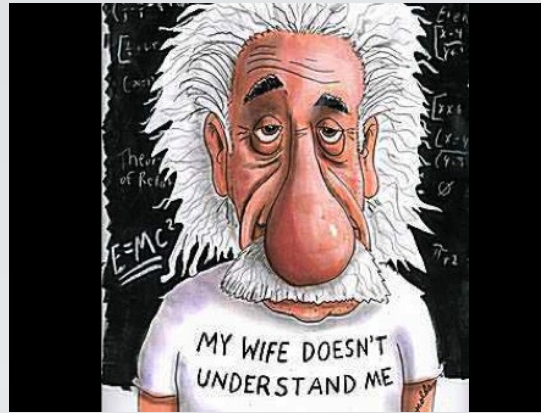
discussion or more time to think?

Why does it work?

compare three activities



question



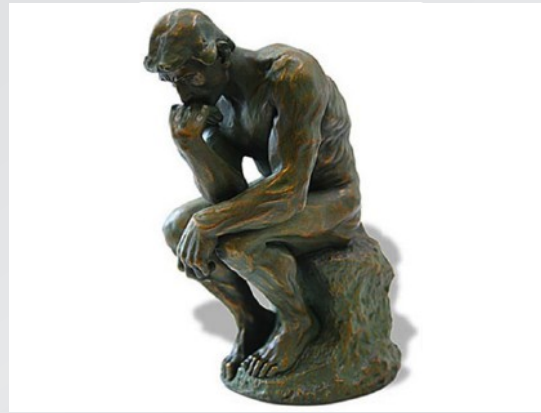
distract



question

Why does it work?

compare three activities



question

reflect

question

Why does it work?

compare three activities



question



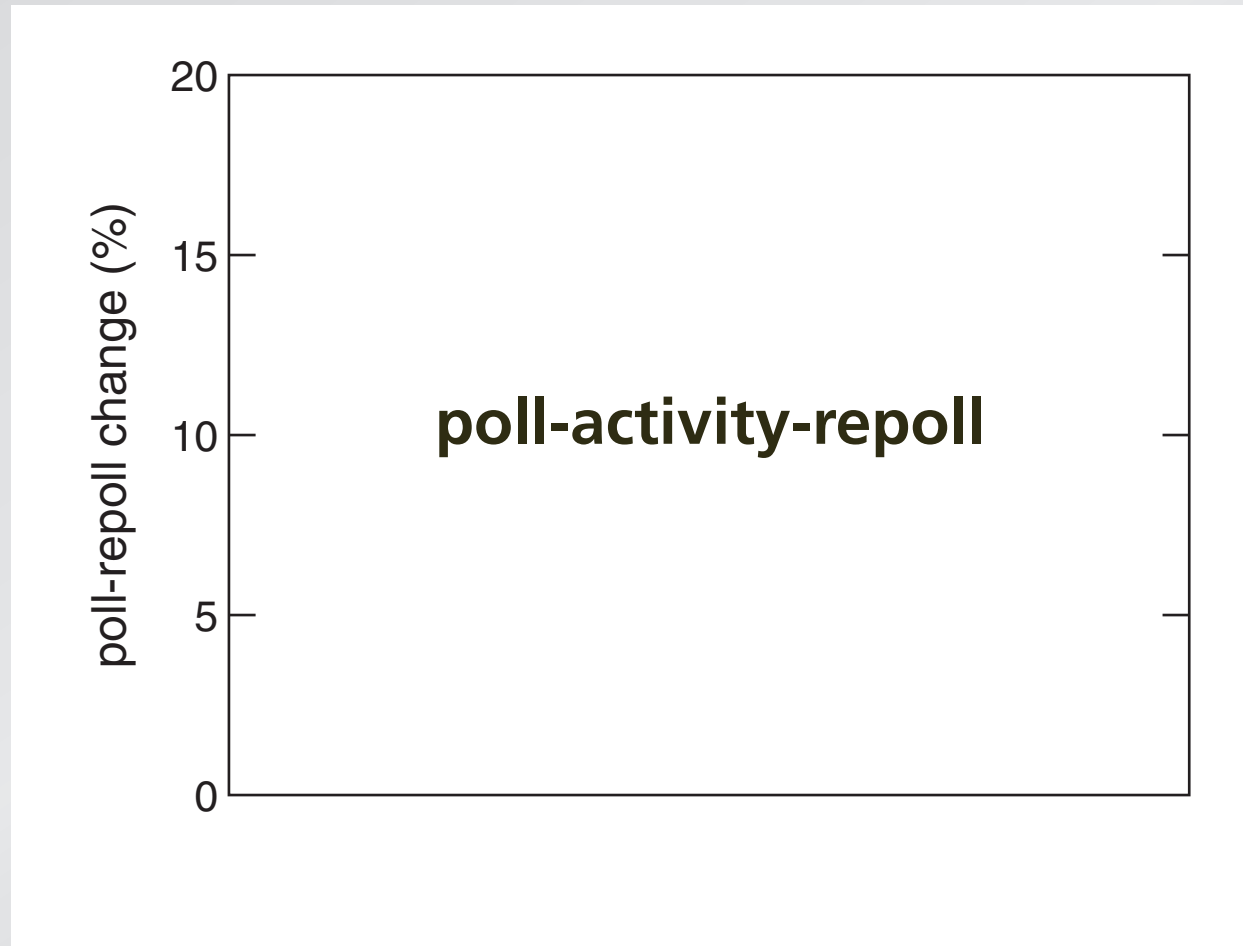
discuss



question

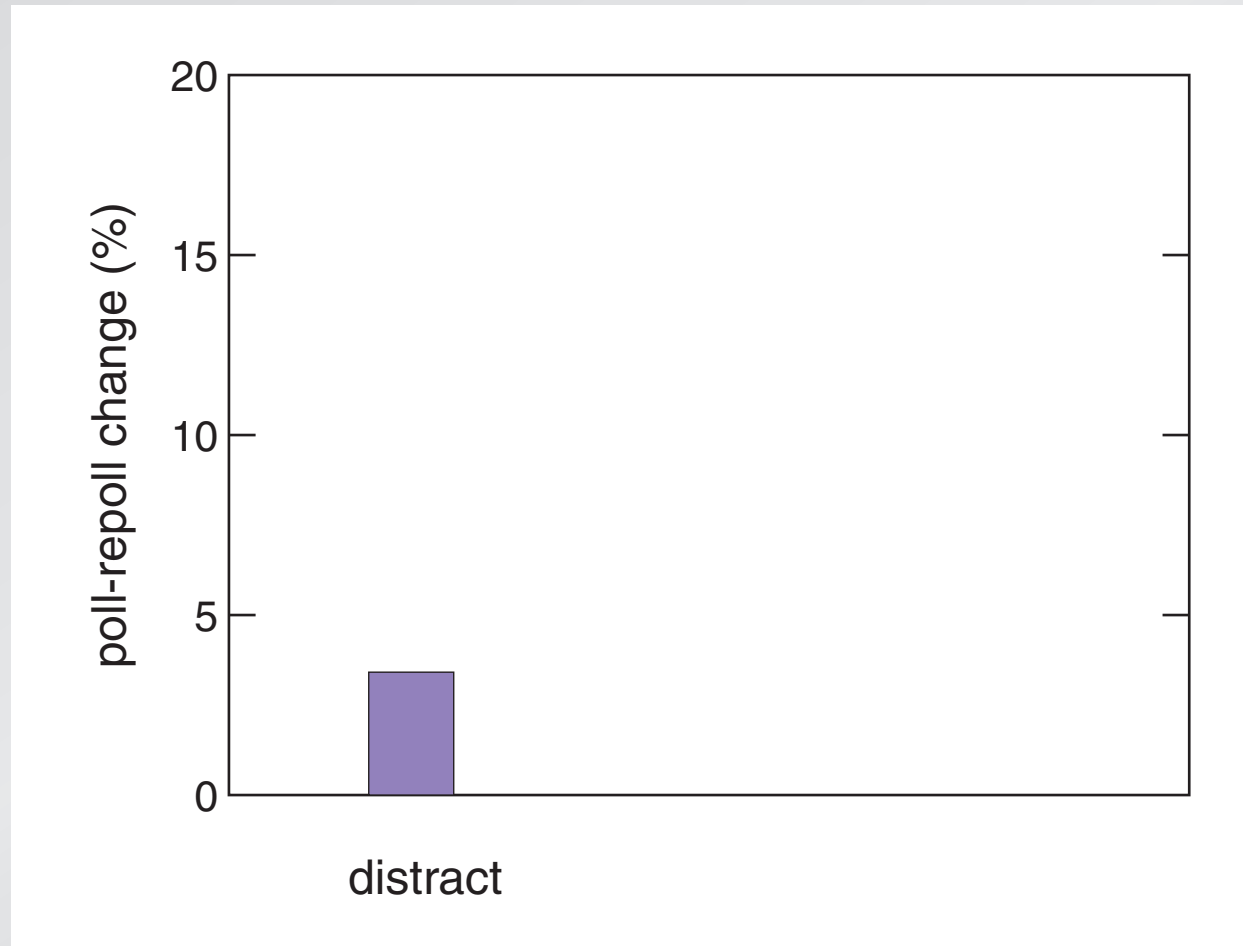
Why does it work?

the importance of discussion



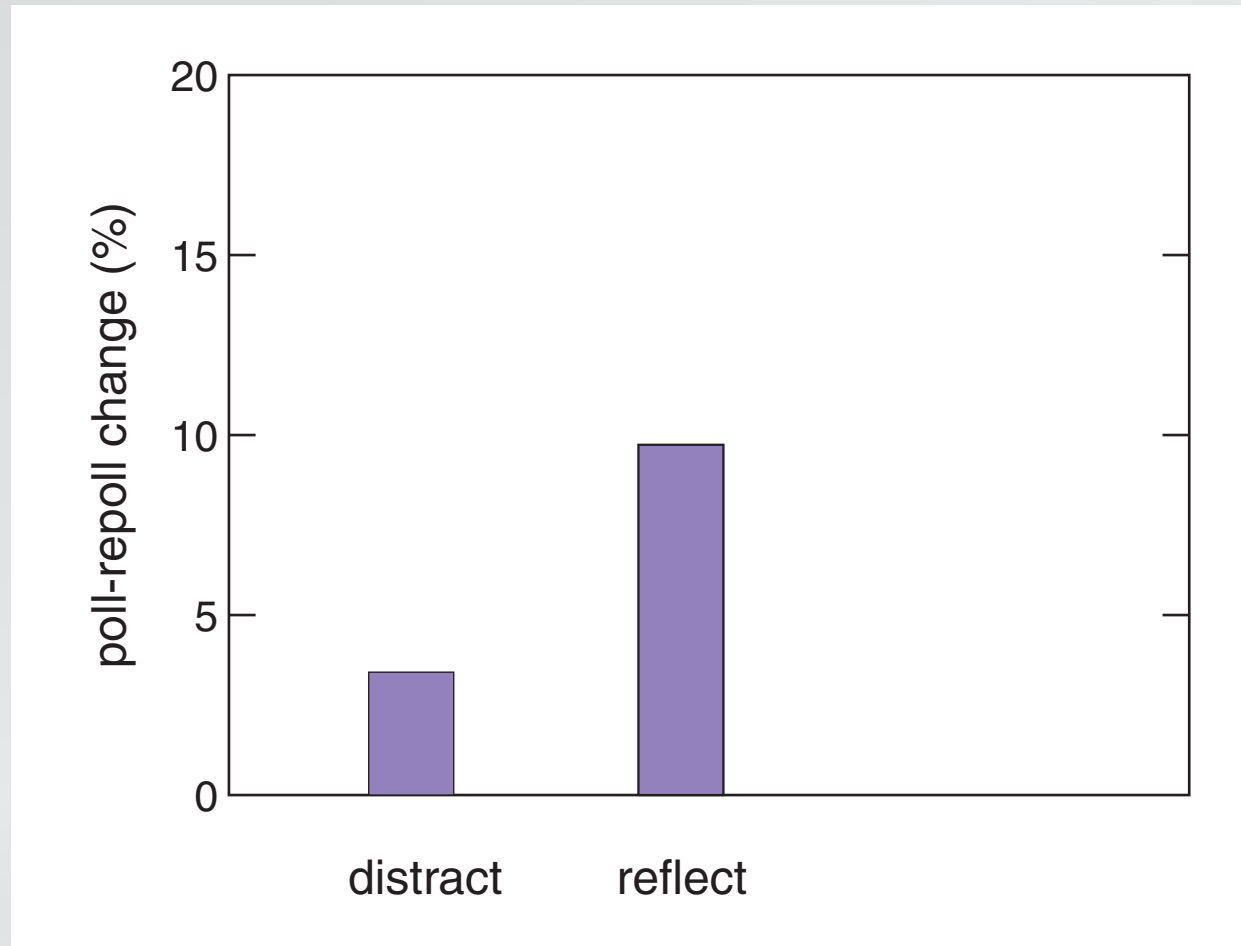
Why does it work?

the importance of discussion



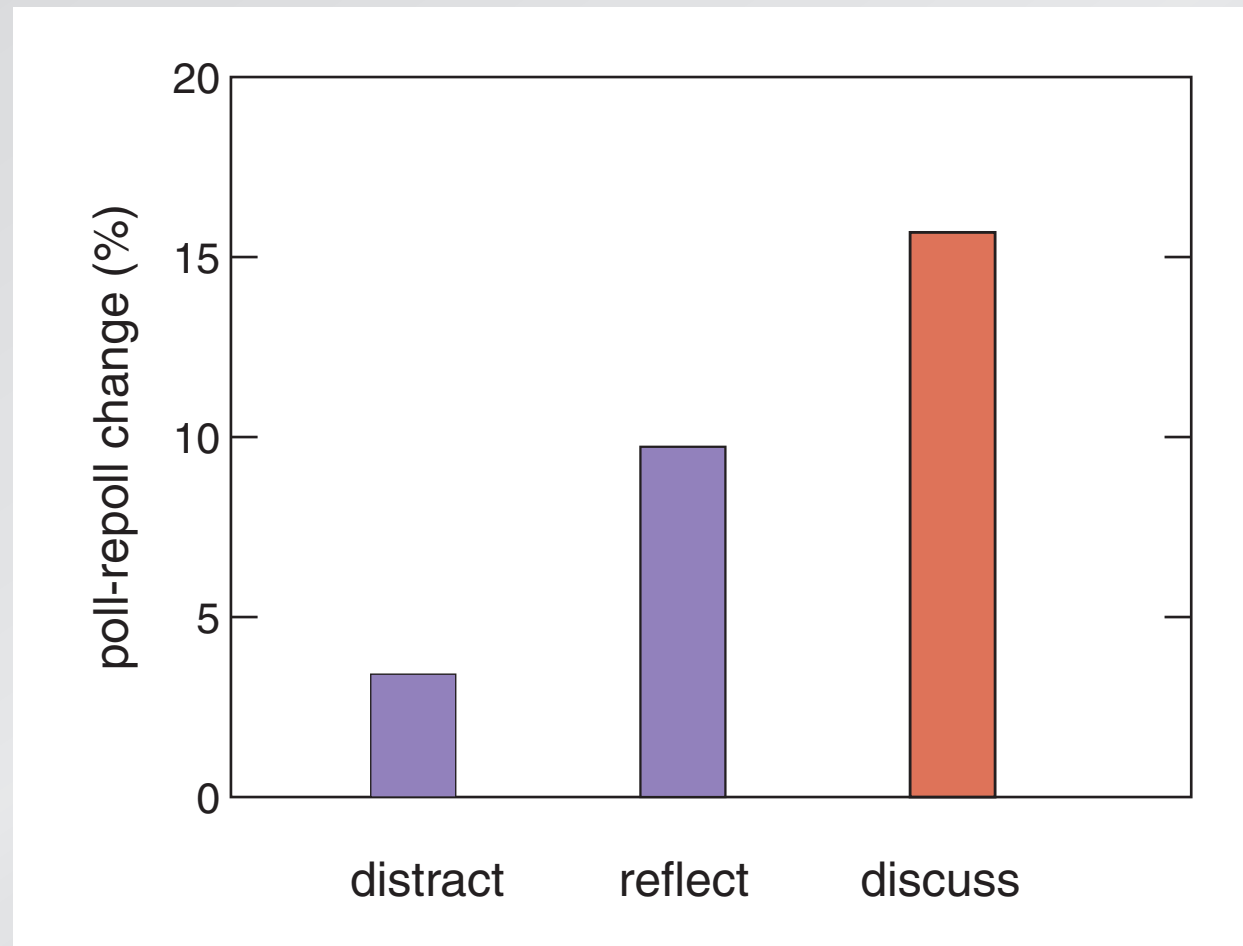
Why does it work?

the importance of discussion



Why does it work?

the importance of discussion



Frequently Asked Questions

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

Getting students to read

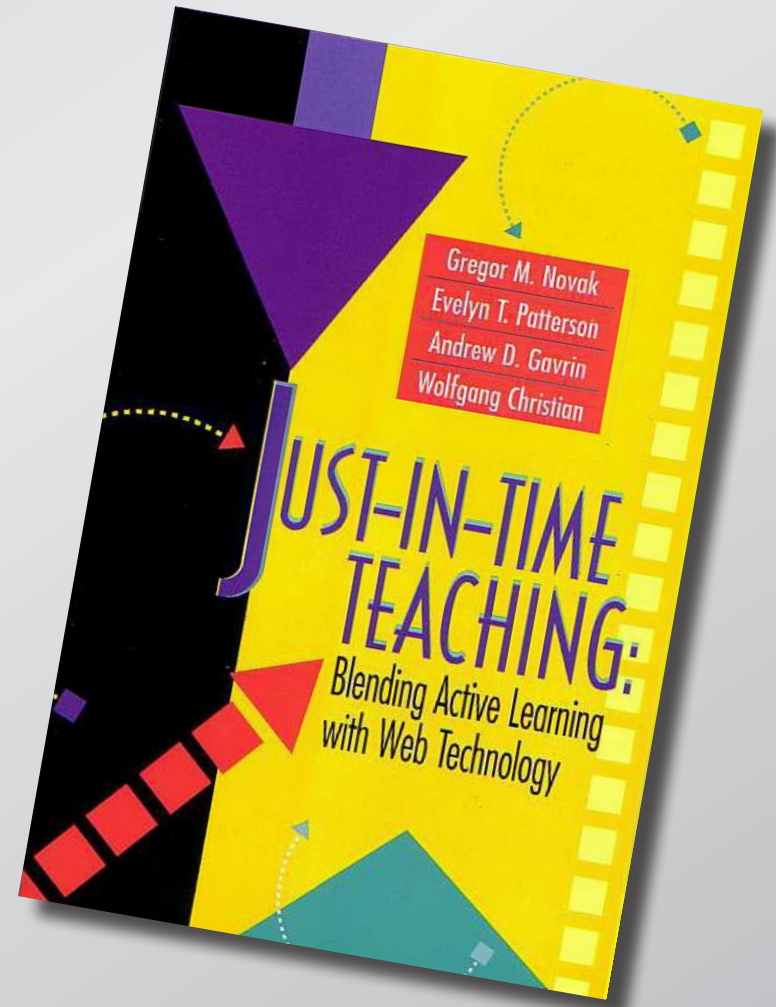
My approach:

- **Reading quizzes (1991)**
- **Reading summaries (1994)**
- **Just-in-Time Teaching (1999)**

Getting students to read

Just-in-time-Teaching (JiTT)

www.jitt.org



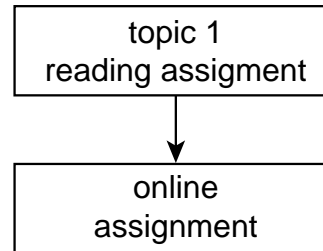
Getting students to read

JiTT workflow

topic 1
reading assignment

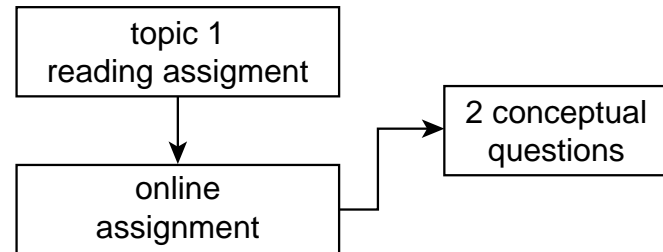
Getting students to read

JiTT workflow



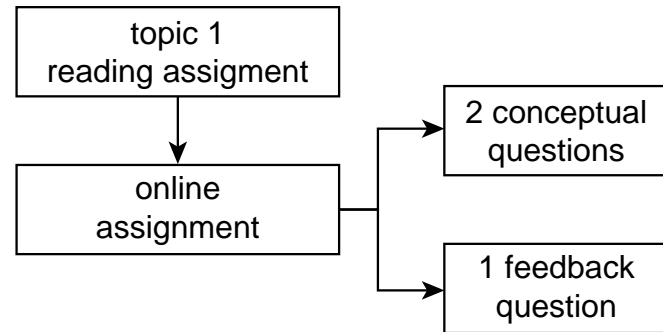
Getting students to read

JiTT workflow



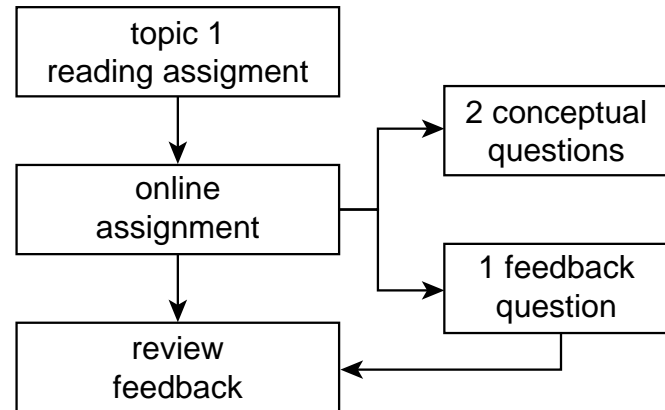
Getting students to read

JiTT workflow



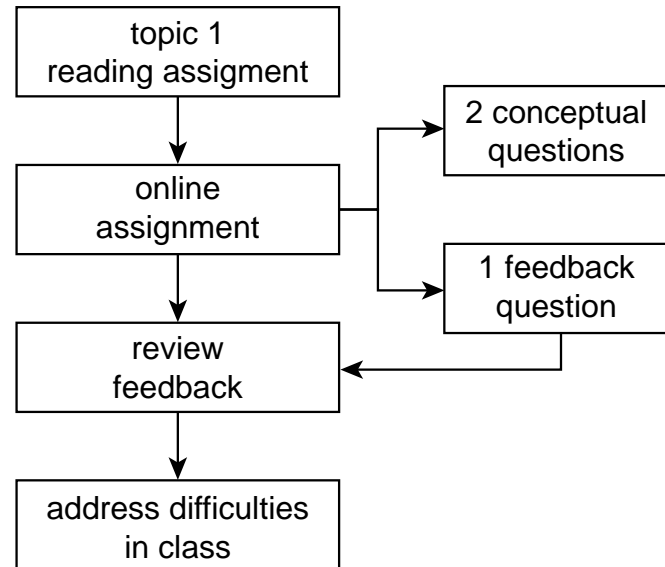
Getting students to read

JiTT workflow



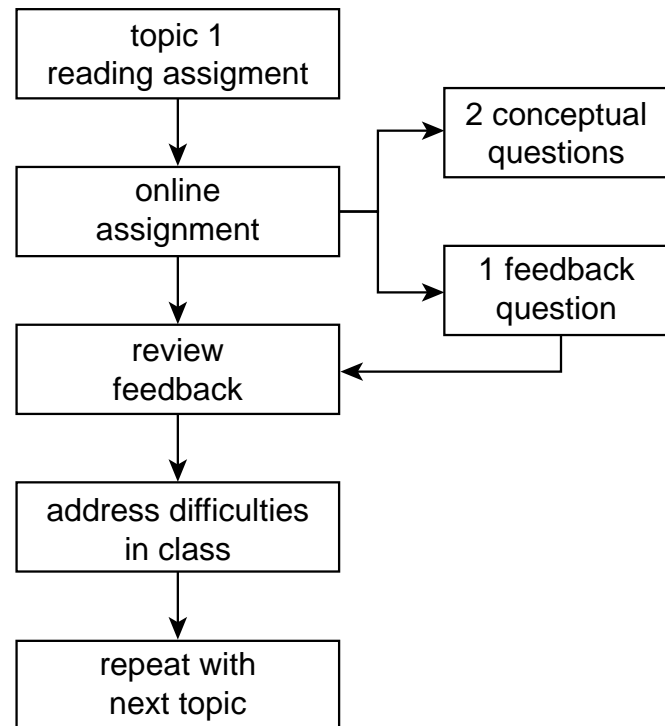
Getting students to read

JiTT workflow



Getting students to read

JiTT workflow

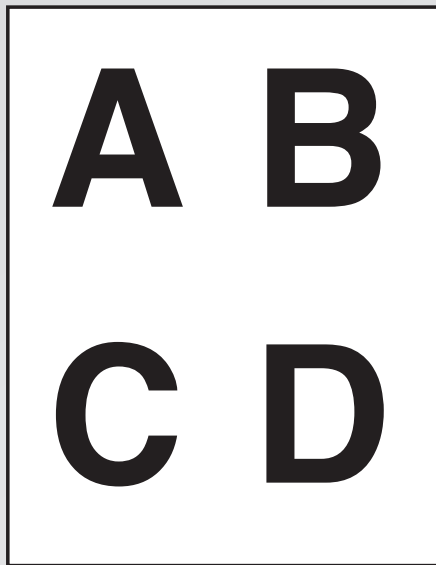


Frequently Asked Questions

“Do I need clickers?”

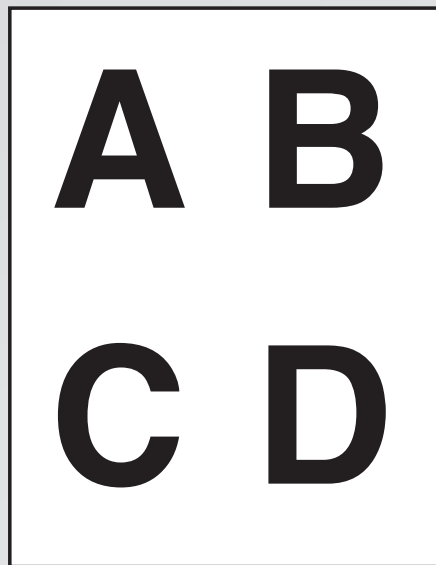
Clickers necessary?

Flashcards: simple and effective



Clickers necessary?

Flashcards: simple and effective



Meltzer and Mannivanan, South Eastern Louisiana University

Clickers necessary?

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?

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?

circumference at the equator:

$$2\pi R_E$$

Clickers necessary?

circumference at the equator:

$$2\pi R_E$$

new circumference:

$$2\pi R_E + 1 \text{ m}$$

Clickers necessary?

circumference at the equator:

$$2\pi R_E$$

new circumference:

$$2\pi R_E + 1 \text{ m}$$

radius of circle with new circumference:

$$2\pi R = 2\pi R_E + 1 \text{ m}, \quad \text{and so} \quad R = R_E + \frac{1 \text{ m}}{2\pi}.$$

Clickers necessary?

You all got fired up!

Clickers necessary?

You all got fired up!

(WITHOUT CLICKERS!)

Clickers necessary?

It's not the technology, but the pedagogy!

Clickers necessary?

It's not the technology, but the pedagogy!

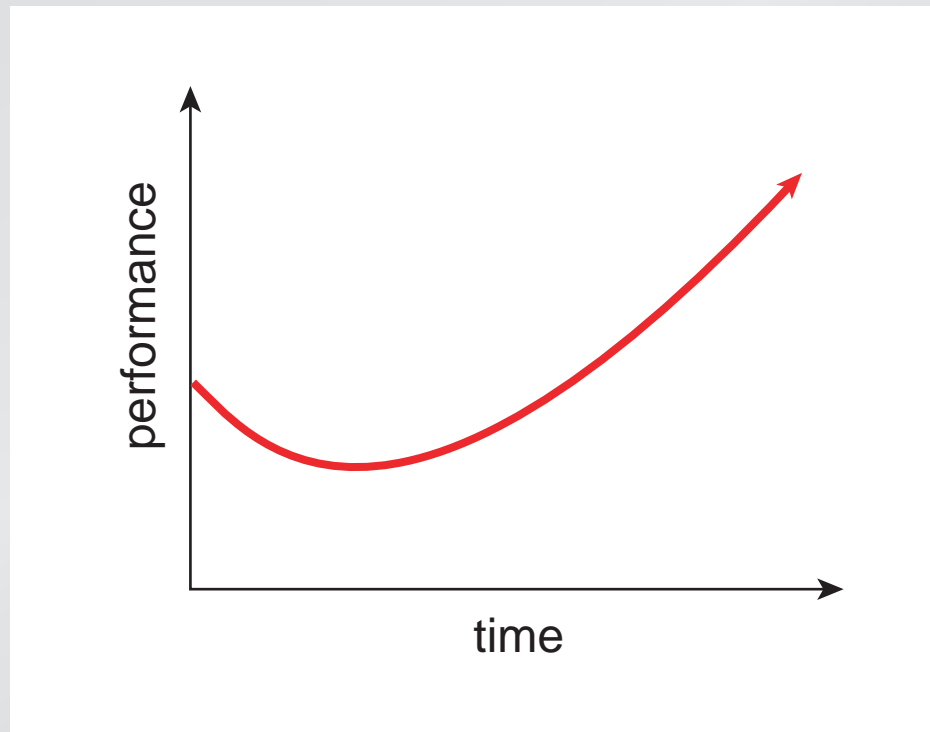
(but clickers do offer advantages)

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

Hello Prof. Mayer,
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
an inspiring and have
changed how I look at
"learning". I also wanted
to thank you for
how understanding
you were of all
my circumstances.
You really made a difference
in my life. So THANKS
Thank you!



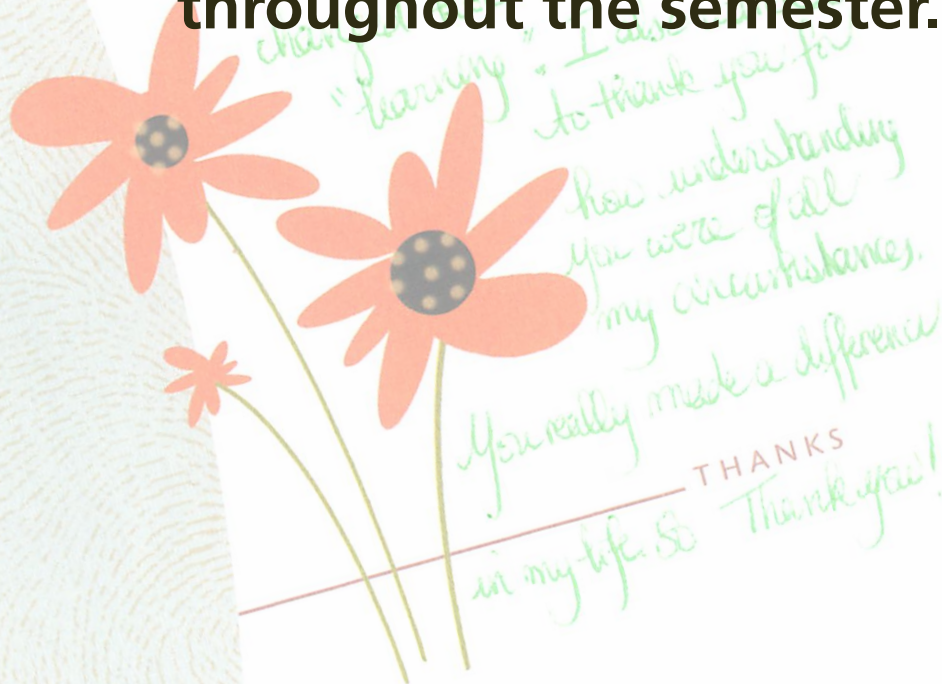
You made a difference.

Best

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 made a difference.



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 made a difference.



*You really made a difference
in my life. So THANKS
Thank you!*

Best

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."

You made a difference.

*THANKS
in my life. So Thank you!*

Best

Student resistance

and don't forget...

Student resistance

and don't forget...

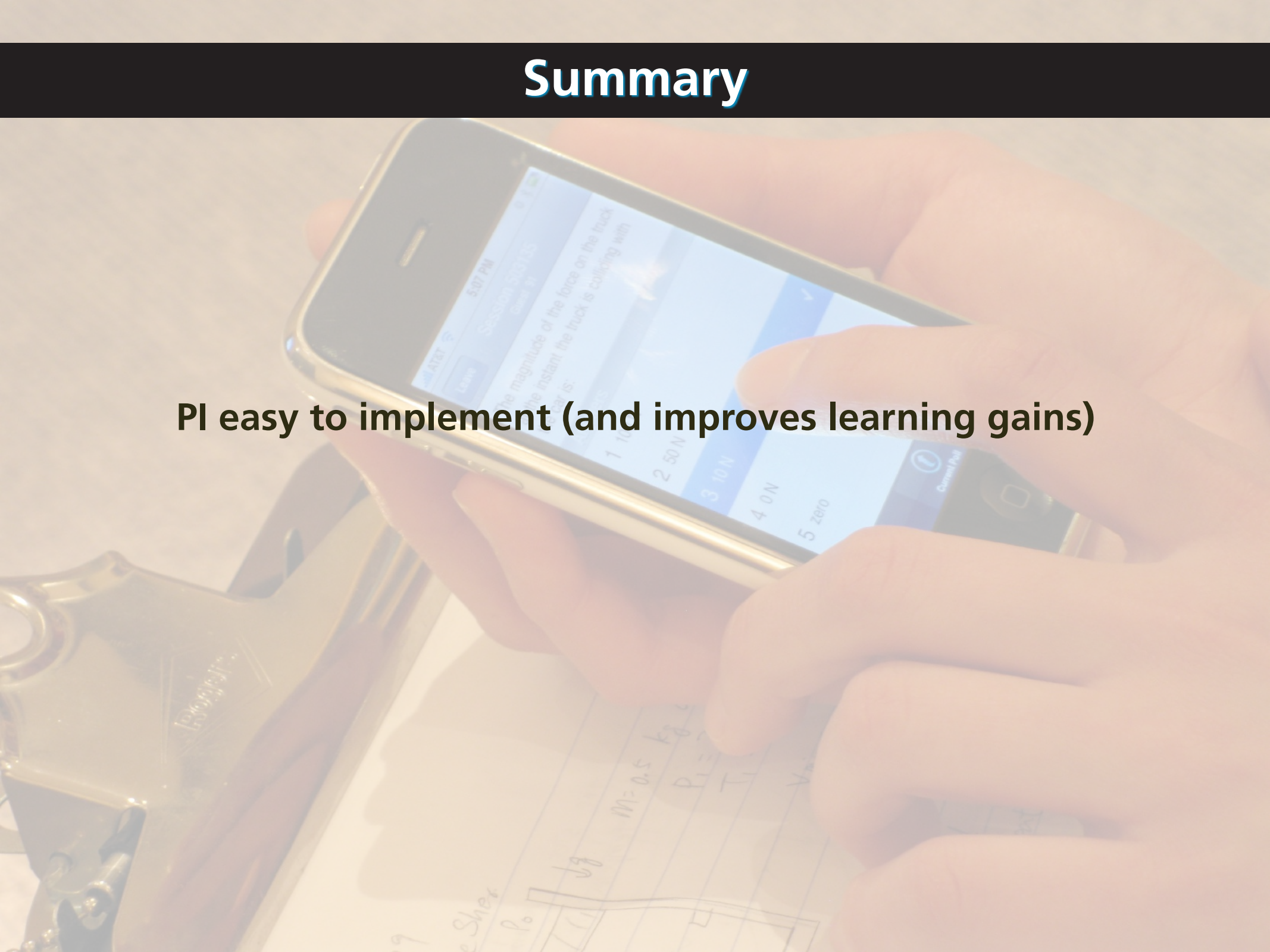
PI leads to better learning and retention!

Summary



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)

For a copy of this presentation:

<http://mazur.harvard.edu>

Follow me!



eric_mazur