1. Go to learningcatalytics.com/demo
2. Enter info, click “Start”
3. Join session 123456789
The Tyranny of the Lecture

Simon Fraser University
Burnaby, BC, 22 January 2015
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@eric_mazur
EXCITING stuff!
What happens in a lecture?
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
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)
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 (out of class)

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

2. assimilation of that information (in class)
question
question

think
1 lecture

2 PI

question
think
poll
discuss
repoll
explain
lecture

question

think

poll

discuss

repoll

explain
speak
speak

question
lecture
- speak
  - question
    - poll
speak
->
question
->
poll

> 70%
->
explain
speak

question

poll

> 70%

explain

repeat
lecture

speak

question

poll

30–70%

discuss

> 70%

explain

repeat
1 lecture

2 PI

- speak
- question
- poll
- 30–70%
- discuss
- repoll
- > 70%
- explain
- repeat
1. lecture

2. PI

- speak
- question
- poll

- < 30%
  - discuss
  - repoll

- 30–70%
  - explain
  - repeat

- > 70%
Let's try it!
thermal expansion
lecture  PI
lecture

PI
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
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
You won't forget this.

Consider atoms at rim of hole.
Peer instruction gains
Higher learning gains
Better retention
PeerInstruction.net
feedback
1993
technology
How do I...

• design good questions?
• optimize the discussions?
• manage time?
learning | catalysis
Use intelligent algorithms and data analytics to...

- improve questioning
- manage discussions
- facilitate time management/flow
1. A 30-year fixed rate mortgage at 12%
2. A 15-year fixed rate mortgage at 12%
3. A 30-year fixed rate mortgage at 12%
4. A 15-year fixed rate mortgage at 12%

The biggest factor that leads American companies to manufacture their products overseas is:

- Higher quality of craftmanship
- Lower labor costs
- Decreased transportation costs
- Effective legal systems

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

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

In order to start an online business, an individual would need all but which of the following?

A business model

- Depreciation?
The biggest factor that leads American companies to manufacture their products overseas is:

a. Higher quality of craftsmanship
b. Lower labor costs
c. Decreased transportation costs
d. Effective legal systems

Which of the following correctly summarizes the accounting equation for a sole proprietorship?

a. Assets = Liabilities + Owner's equity
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c. Owner's equity = Assets + Liabilities
d. Revenue = Assets - Liabilities

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

In order to start an online business, an individual would need all but which of the following?

a. A business model
b. A plan for financial management
c. An understanding of marketplace trends
d. Excel
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
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.
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.
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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.
If \( 2x - y = 4 \), then \( x = \)
This is a graph of $f(x) = \ln x$. Sketch a graph of the derivative $f'(x)$. 
This is a graph of $f(x) = \ln x$. Sketch a graph of the derivative $f'(x)$. 
This is a graph of $f(x) = \ln x$. Sketch a graph of the derivative $f'(x)$.
***PART ABOUT TIME/FLOW MANAGEMENT***
human interaction
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:

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.
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

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
- 75 responses, 81% correct

1. A. 51%
2. B. 4%
3. C. 30%
4. D. 0%
5. E. 0%

Round 2
- 75 responses, 83% correct

1. A. 83%
2. B. 0%
3. C. 17%
4. D. 0%
5. E. 0%
A positively charged rod is held near a neutral conducting sphere as illustrated below. A positively charged particle is removed from point A to point B at constant speed. 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

Review results for session 399757 in electrostatic work and energy II
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

A. positive
B. zero
C. negative
D. depends on the path taken from A to B

Note: The potential cannot be determined without knowing more about the polarization induced in the sphere.
let system manage pairing
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
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.
percent changing answer

- incorrect before discussion
- correct before discussion

random pairing
A bar chart showing the percentage change in answers before and after discussion.

- Incorrect before discussion:
  - Random pairing: 20%
  - Algorithm 1: 50%

- Correct before discussion:
  - Random pairing: 10%
  - Algorithm 1: 30%
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
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