• no ON/OFF button
• only last “click” counts
• display shows recorded answer
unique ID on back of clicker

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Think of something you are good at
Think of something you are good at

*How did you become good at this?*
Became good at it by:

1. trial and error
2. lectures
3. practicing
4. apprenticeship
5. other
1 education
What happens in a lecture?
some people talk in their sleep
some people talk in their sleep
lecturers talk while other people are sleeping

(Albert Camus)
education
The result?

education
Lack of learning
Lack of learning
Lack of retention
not transfer but assimilation of information is key
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
question

think

poll
question

think

poll

discuss
question

think

poll

discuss

repoll

explain
question

think

poll

discuss

repoll

explain
Let's try it!
thermal expansion
all of them
Consider a rectangular metal plate with a circular hole in it.
Consider a rectangular metal plate with a circular hole in it.

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

1. increases.
2. stays the same.
3. decreases.
Consider a rectangular metal plate with a circular hole in it.

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

1. increases
2. stays the same
3. decreases
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...
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
1 education  2 PI  3 test
consider atoms at rim of hole
consider atoms at rim of hole
consider atoms at rim of hole

you won’t forget this
Greater learning gains
Greater learning gains

Better retention
1 education
2 PI
3 test
in a lecture, students...
in a lecture, students...

1. don’t pay utmost attention
in a lecture, students…

1. don’t pay utmost attention

doi: 10.1109/TBME.2009.2038487
in a lecture, students…

1. don’t pay utmost attention

doi: 10.1109/TBME.2009.2038487
In a lecture, students do not pay utmost attention.

1. don’t pay utmost attention.

DOI: 10.1109/TBME.2009.2038487
1. don’t pay utmost attention
in a lecture, students...

1. don’t pay utmost attention
2. think they know it
2 short video lectures on calico cats, same content

2 short video lectures on calico cats, same content

fluent video

speaks fluidly w/o notes
upright
maintains eye contact

2 short video lectures on calico cats, same content

fluent video

speaks fluidly w/o notes
upright
maintains eye contact

disfluent video

speaks haltingly from notes
slumped
looks away

judgement of learning

![Bar graph showing mean performance (%) for fluent and disfluent conditions.](image)

- **Fluent** mean performance: 50%
- **Disfluent** mean performance: 40%

**Legend:**
- Purple bar: predicted

**DOI:** 10.3758/s13423-013-0442-z
judgement of learning

mean performance (%)

predicted

fluent  disfluent

mean performance (%)

judgement of learning

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
an illusion...
Education is not just about:

• transferring information

• getting students to do what we do
Education is not just about:

• transferring information

• getting students to do what we do

active participation a must!
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