

Why I use Polar Bears to talk about Innovative Assessment.



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m.socrative.com

room -806189

Q. What keeps you
up at night?

A.

Q. What keeps you
up at night?

A.

How to be an effective
teacher.

Chile

Q. What
up at n

Are they really understanding
the basics of my course?

Chile

A.

How to be an effective
teacher.

A.

How to recognize progress?

Chile

anything?

Q. What
up at night?

Q. What
up at night?

USA

A.

Are my students learning
anything?

~~anything?~~

Are my students learning or just
memorizing?

Q. What
up at night?

A.

Q. What
up at night?

A.

Q. What keeps you
up at night?

at night?

Q. What
up at night?

Are my students learning
anything?

Brazil

learning.

A.

A.

A.

That my students understand
the subject in depth.
Chile

Q. What keeps you
up at night?

Q. What keeps you
up at night?

Q. What
at night?

USA

Q. What keeps you
up at night?

A.

A.

at night?

Q. What keeps you
up at night?

Q. What

at night?

Do they memorize or truly
understand the subject?

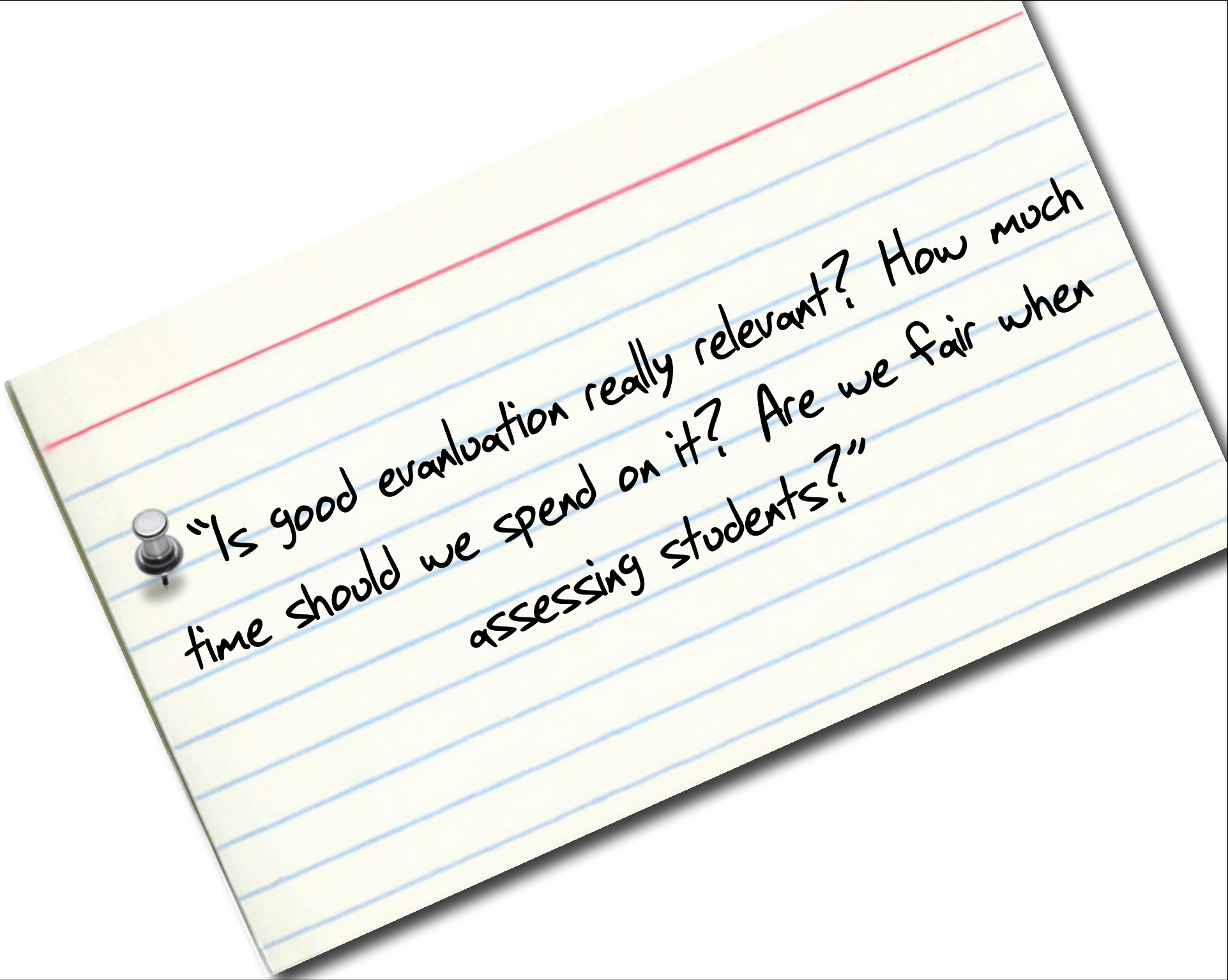
Canada?

Learn

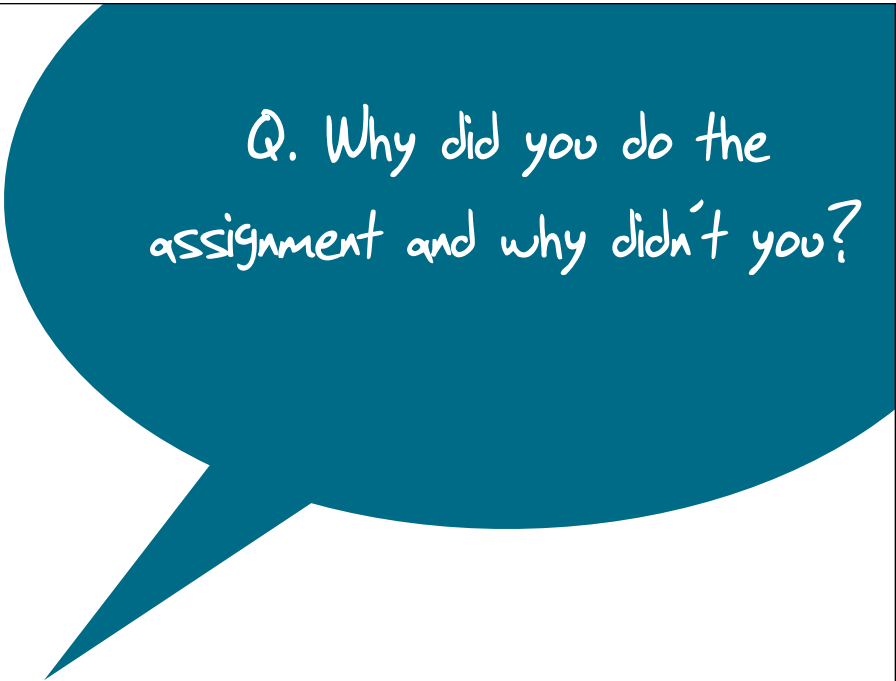
USA



Q. Why don't we know the
answer to this question?



"Is good evaluation really relevant? How much time should we spend on it? Are we fair when assessing students?"



Q. Why did you do the assignment and why didn't you?

JUNIOR

COURSE	1st SEM	2nd SEM	CR.	GPA 4.0
ENGLISH 3	A+	A+	1.00	
*SPANISH 3 H	A+	A+	1.00	
ALGEBRA 2 & TRIG.	A	A	1.00	
RELIGION 3	A+	A+	1.00	
CHEMISTRY 1	A	A	1.00	
AMERICAN HISTORY	A	A+	1.00	

How will this student do in first year university?

- a. Excellent
- b. Good
- c. Not bad, not great
- d. Bad

Beginning of Undergraduate Record

ENGL 102	Composition II	3.0	A
MATH 128	Algebra And Trig	5.0	C
PSC 231	World Politics	3.0	B
SPAN 101	Elem Spanish I	4.0	A

	Attempt	Earned	GPA	Crd	GPA Pt	GPA
Term	15.0	15.0	15.0	47.0	3.133	
Career	15.0	15.0	15.0	47.0	3.133	

Beginning of Undergraduate Record

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SPAN 101	Elem Spanish I	4.0	A

	Attempt	Earned	GPA	Crd	GPA	Pt	GPA
Term	15.0	15.0	15.0	47.0	3.133		
Career	15.0	15.0	15.0	47.0	3.133		

Most evaluations don't measure
deep learning.



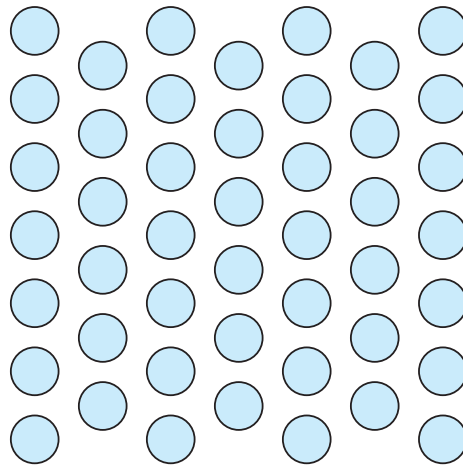
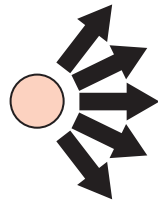
They measure surface learning...



and miss what is underneath.

Traditional approach to evaluation

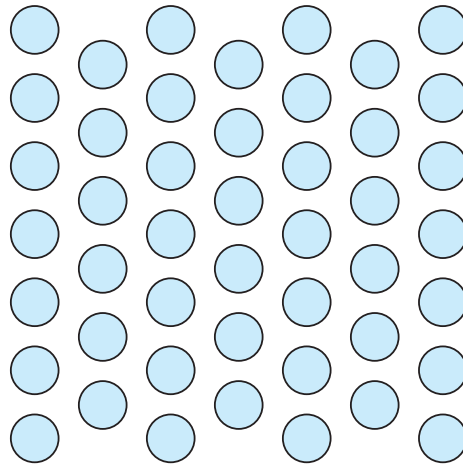
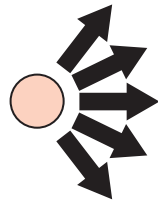
we tell



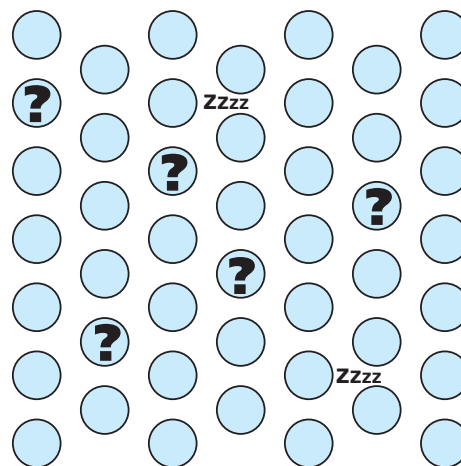
Traditional approach to evaluation

we tell

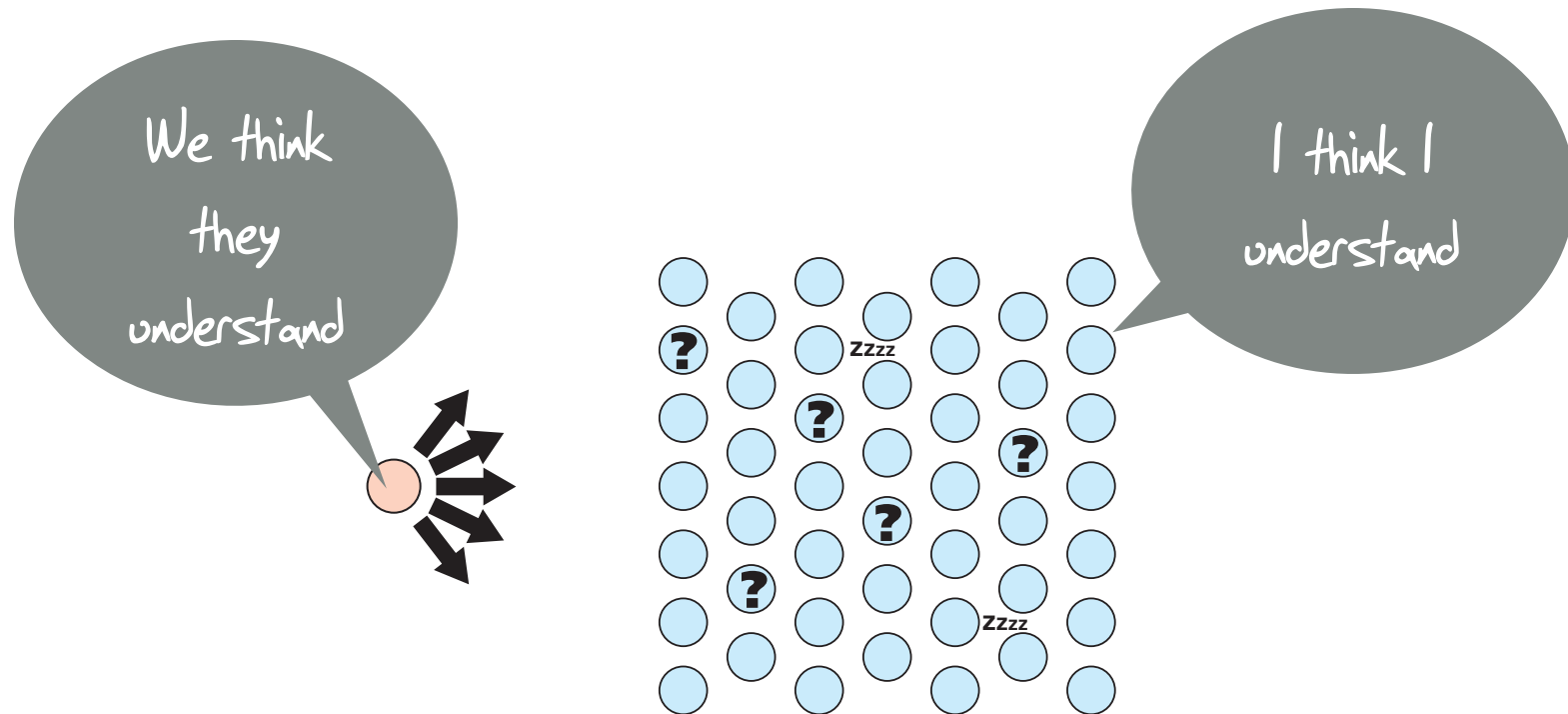
$$a^2 + b^2 = c^2$$



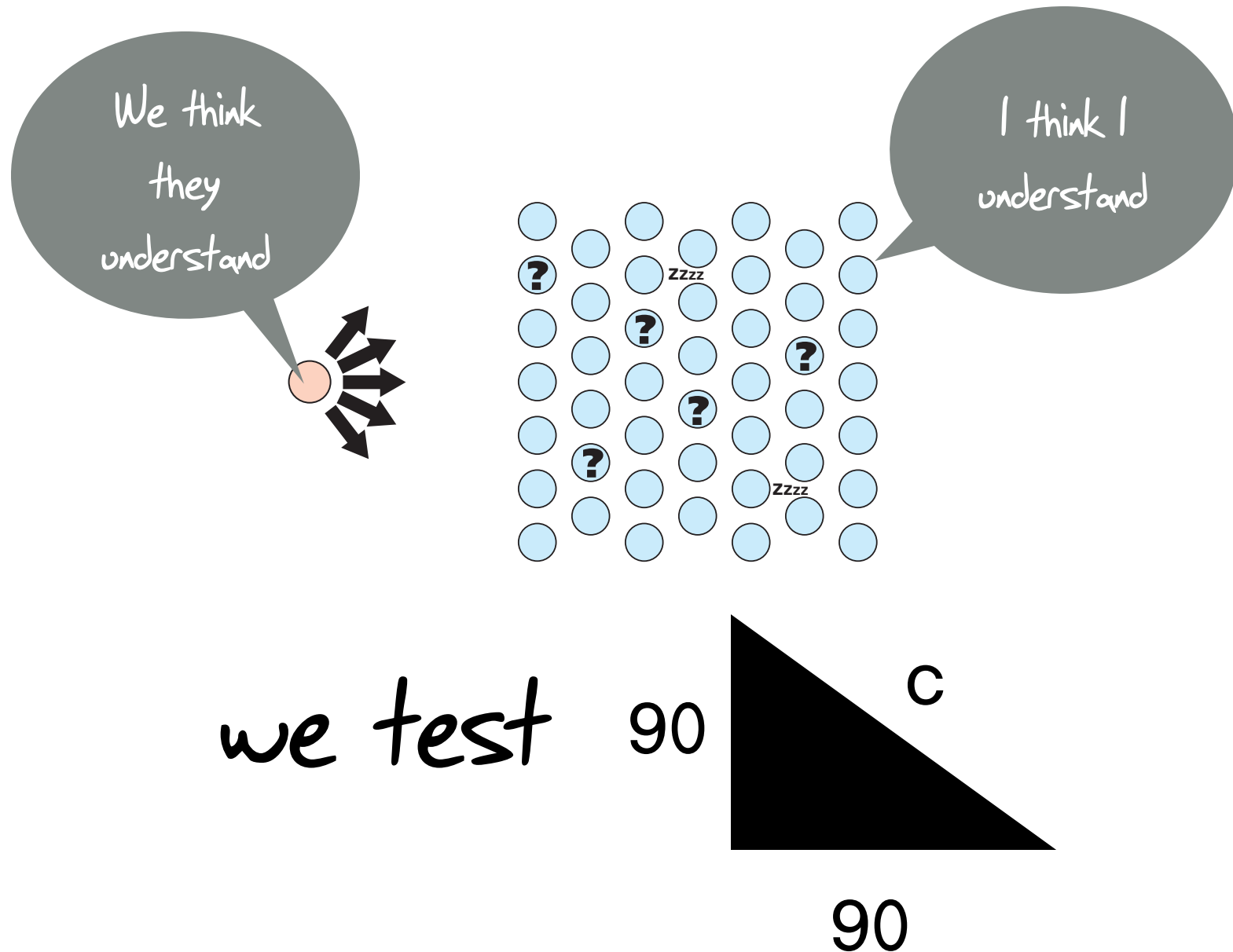
Traditional approach to evaluation



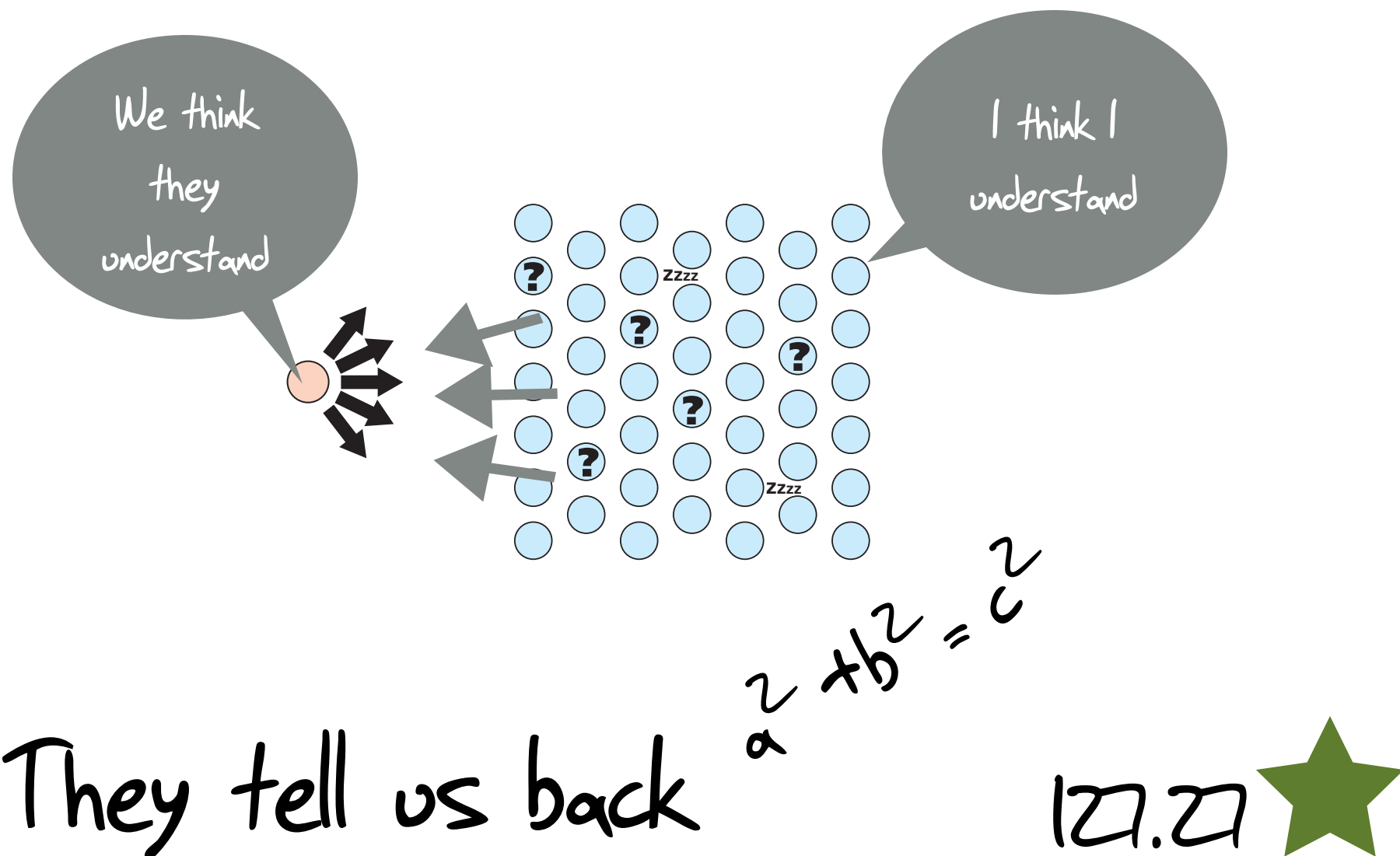
Traditional approach to evaluation



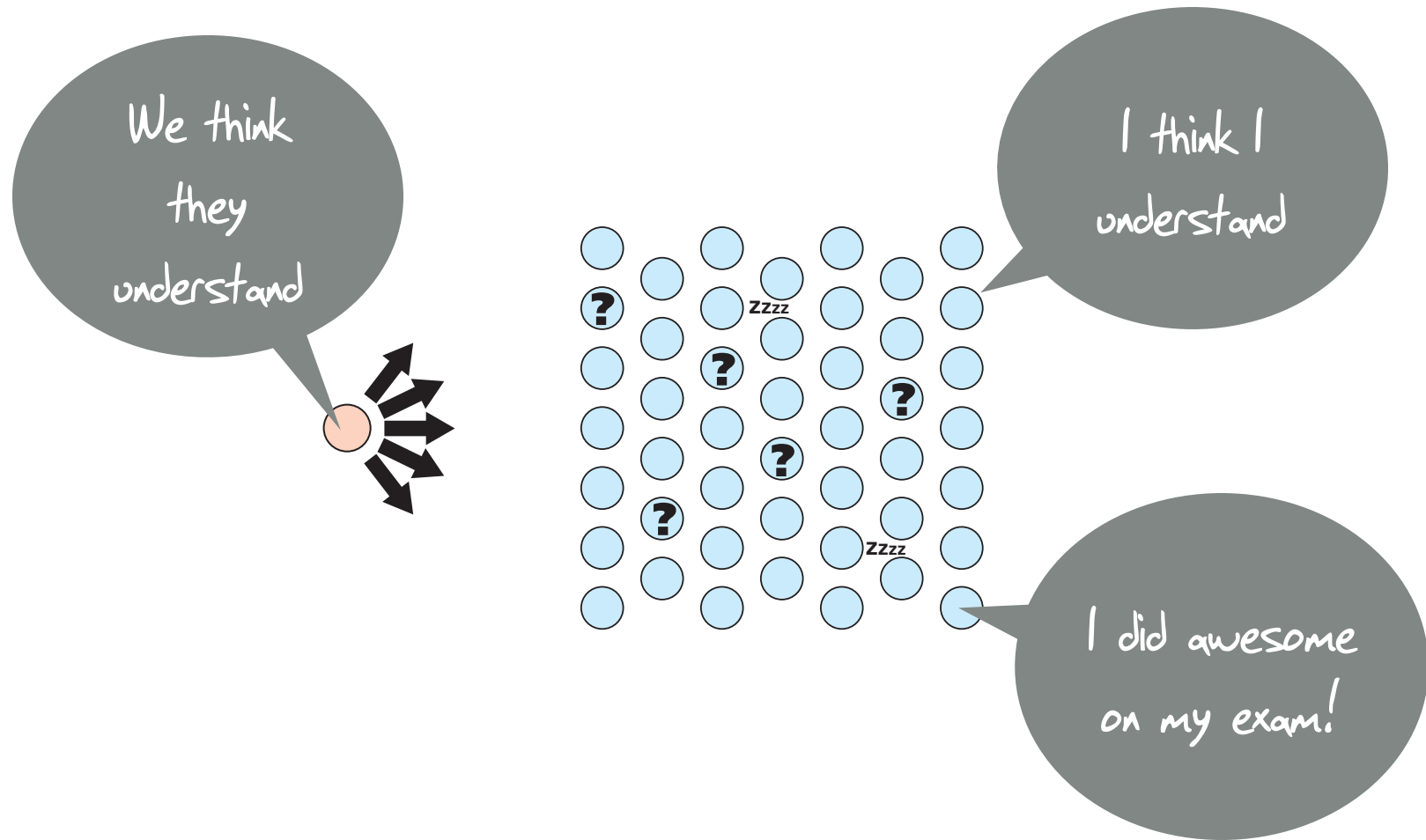
Traditional approach to evaluation



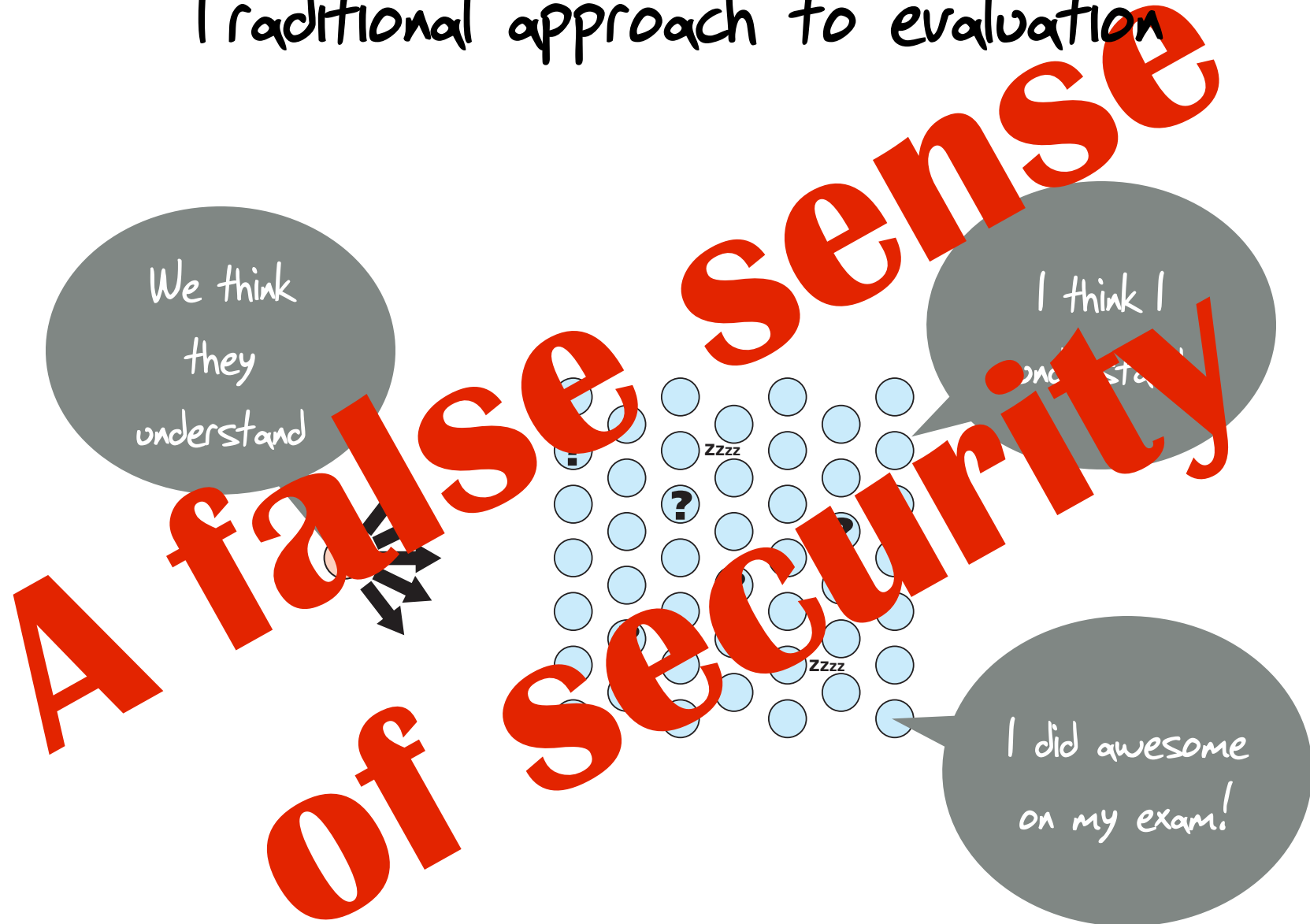
Traditional approach to evaluation



Traditional approach to evaluation



Traditional approach to evaluation



Traditional approach to evaluation

We think
they
understand

I think I
understand

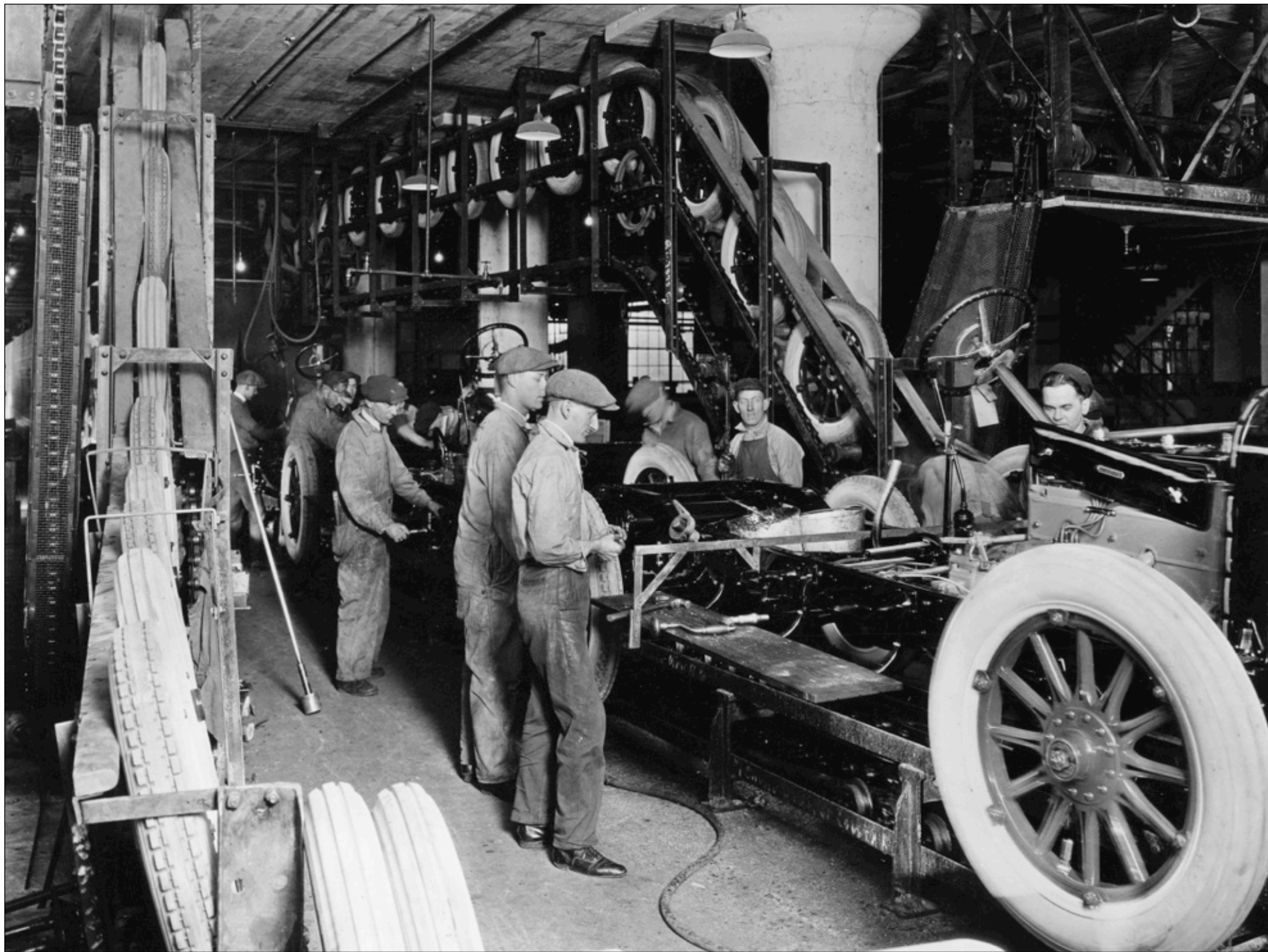
Memorization,
procedure.

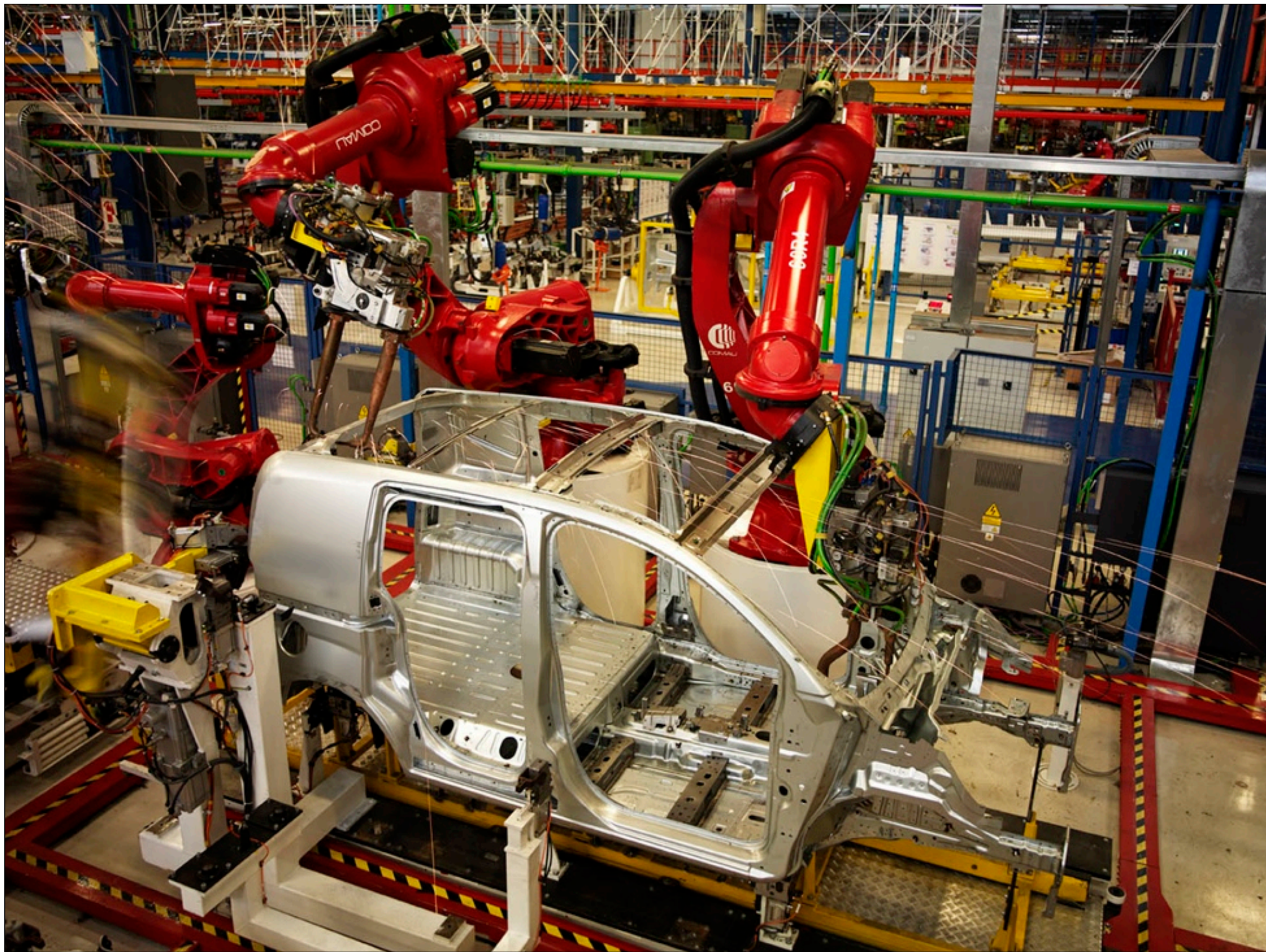
They tell us back

$$a^2 + b^2 = c^2$$

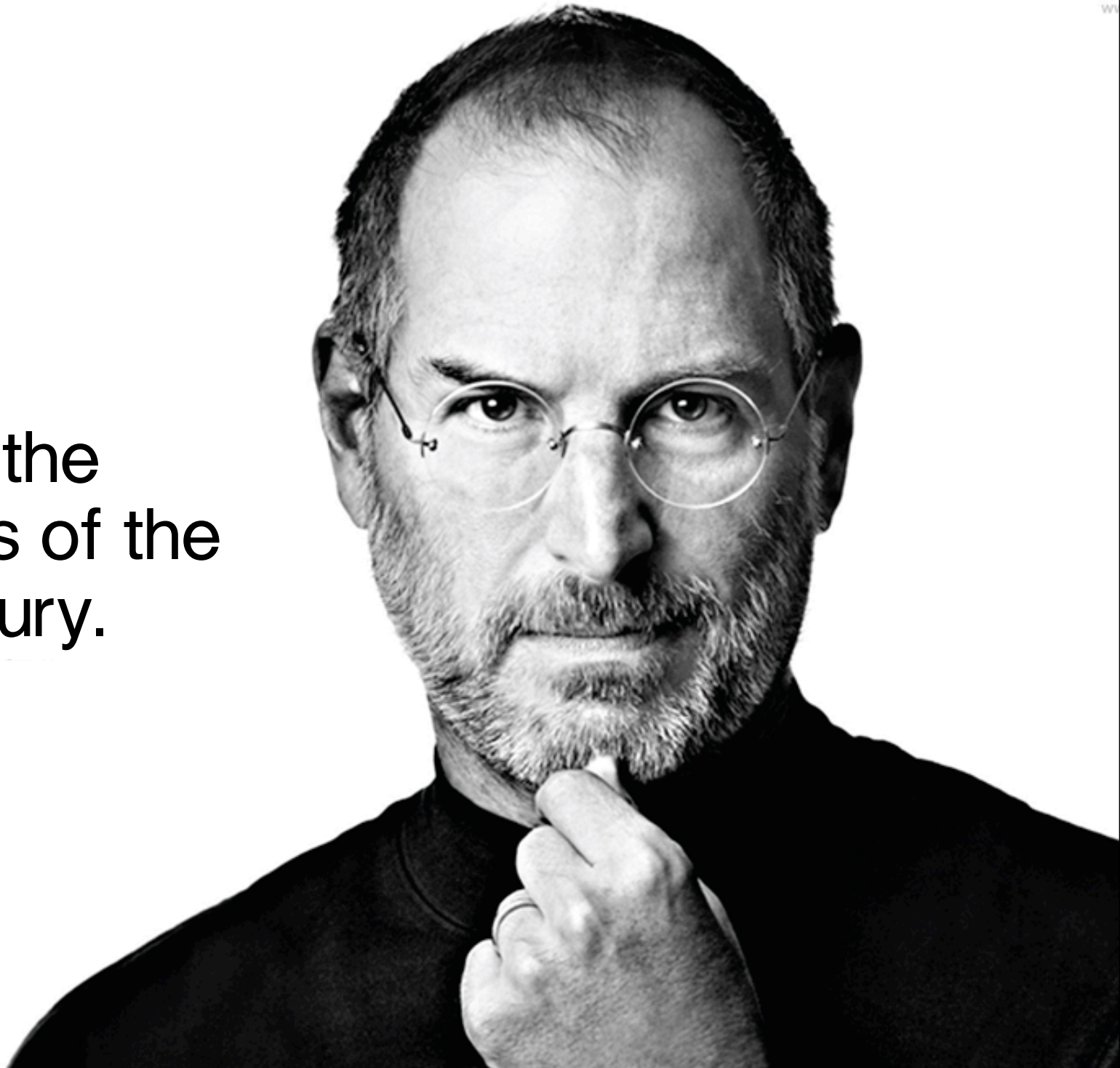
12.21







We need the
innovators of the
21st century.

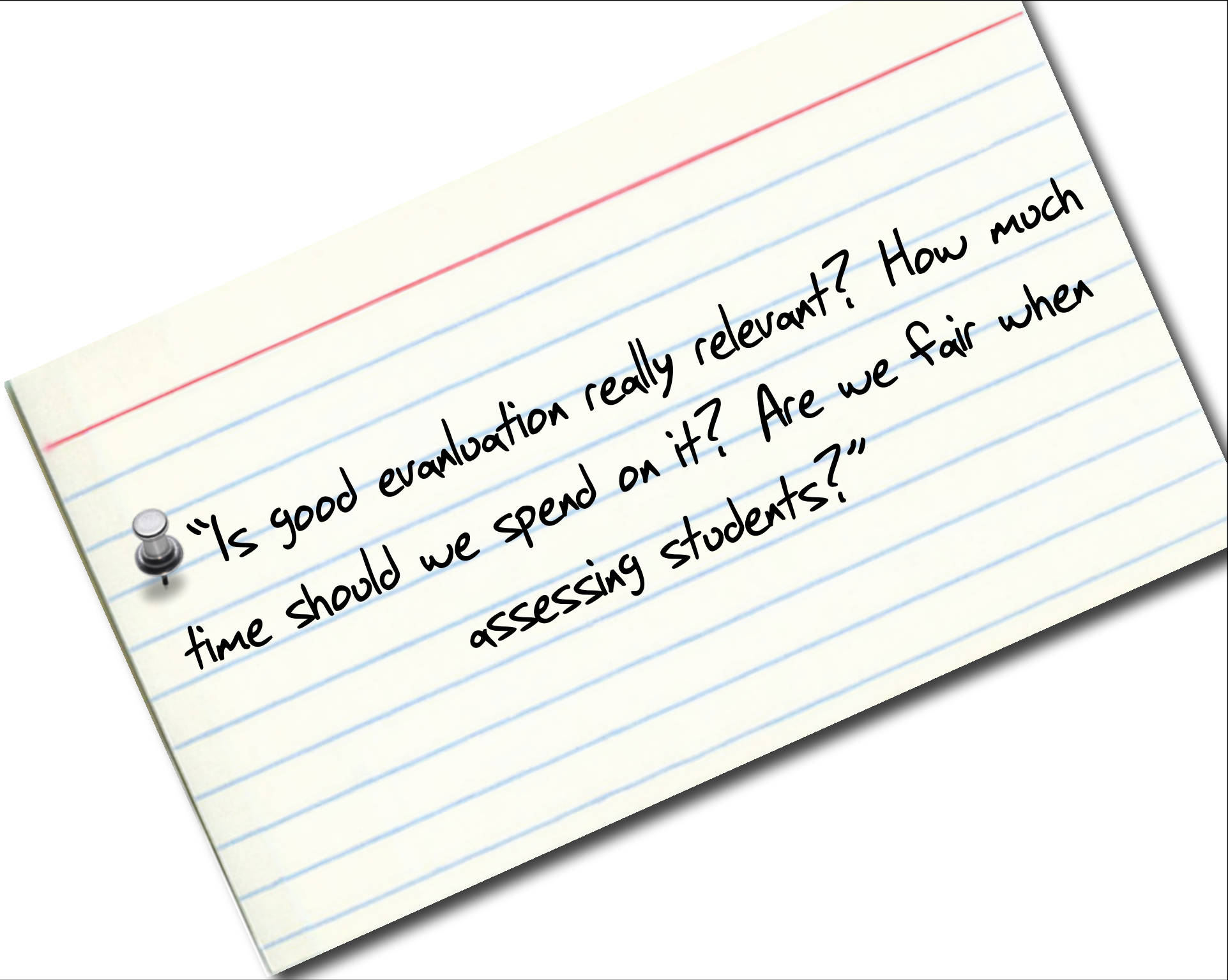


You can't change how teach and
assess your students using old
methods.





Most evaluations **don't** measure deep learning. If you are going to teach for deep learning, you have to assess for it.



"Is good evaluation really relevant? How much time should we spend on it? Are we fair when assessing students?"

Biggest Idea

Innovative
Assessment

is THE secret to great teaching,
not separate from it.



Call to Action

A person wearing a black jacket, black pants with a blue stripe, and dark boots is bending over on a vast, flat, frozen lake. The background shows a distant shoreline with trees under a grey sky.

Call to Action

After taking this
workshop you will
be able to...

rebuild your evaluations to uncover deep learning.



Spend less time up here...

A close-up, underwater photograph of a polar bear's head. The bear is facing left, with its eyes closed. A large, irregular piece of clear ice is held in its mouth, partially covering its black nose. The water is a deep teal color, and numerous small, light-colored bubbles are visible throughout the scene, particularly around the bear's head and the ice. The lighting is soft, highlighting the texture of the bear's white fur and the crystalline structure of the ice.

...and more time down here.

Outline

1. What is deep learning?
2. Five strategies for measuring deep learning.
3. Next Steps

What is deep learning?

Q. What is surface learning?

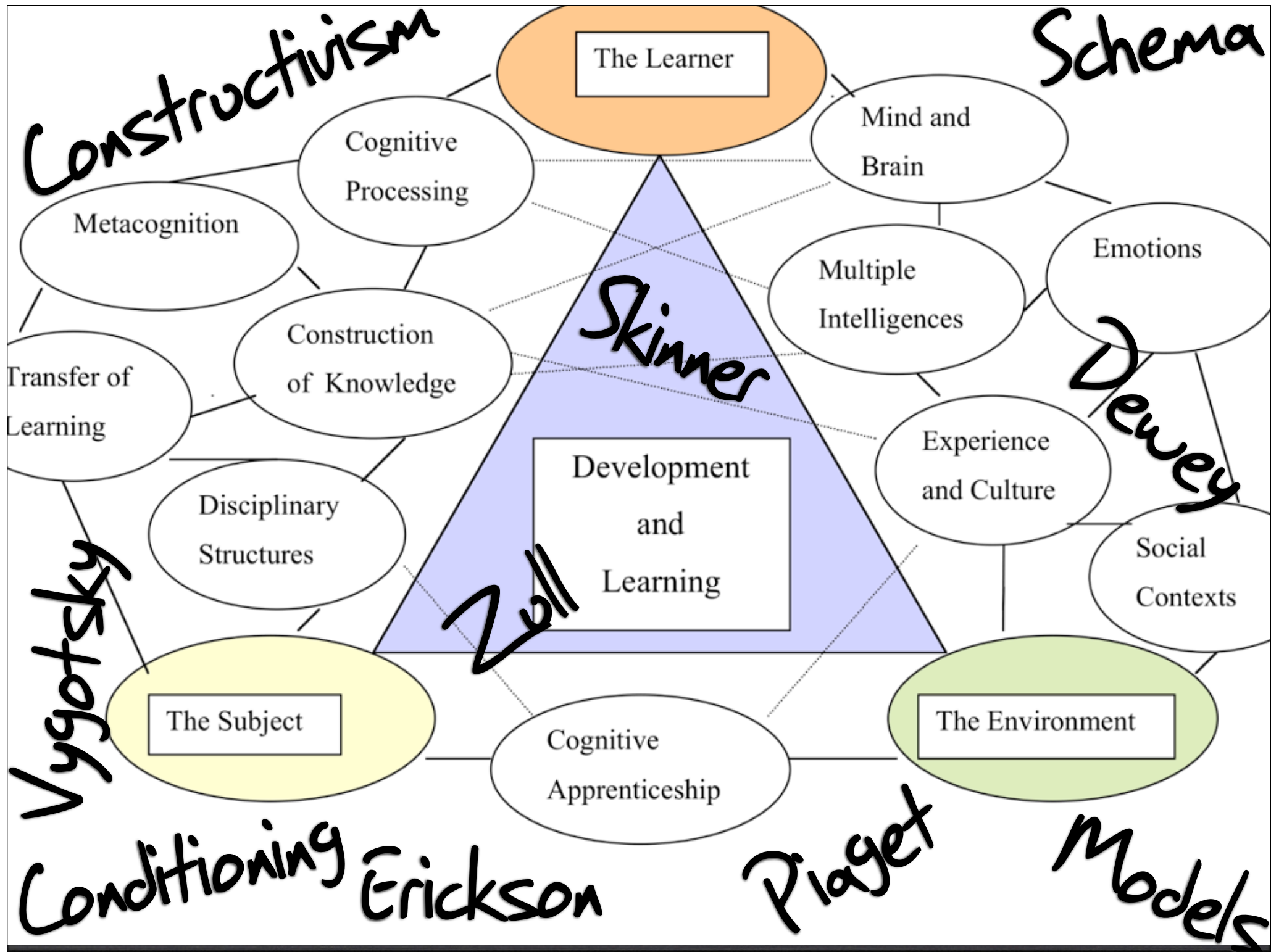
Q. What is deep learning?

Q. What is surface learning?

Q. What is deep learning?

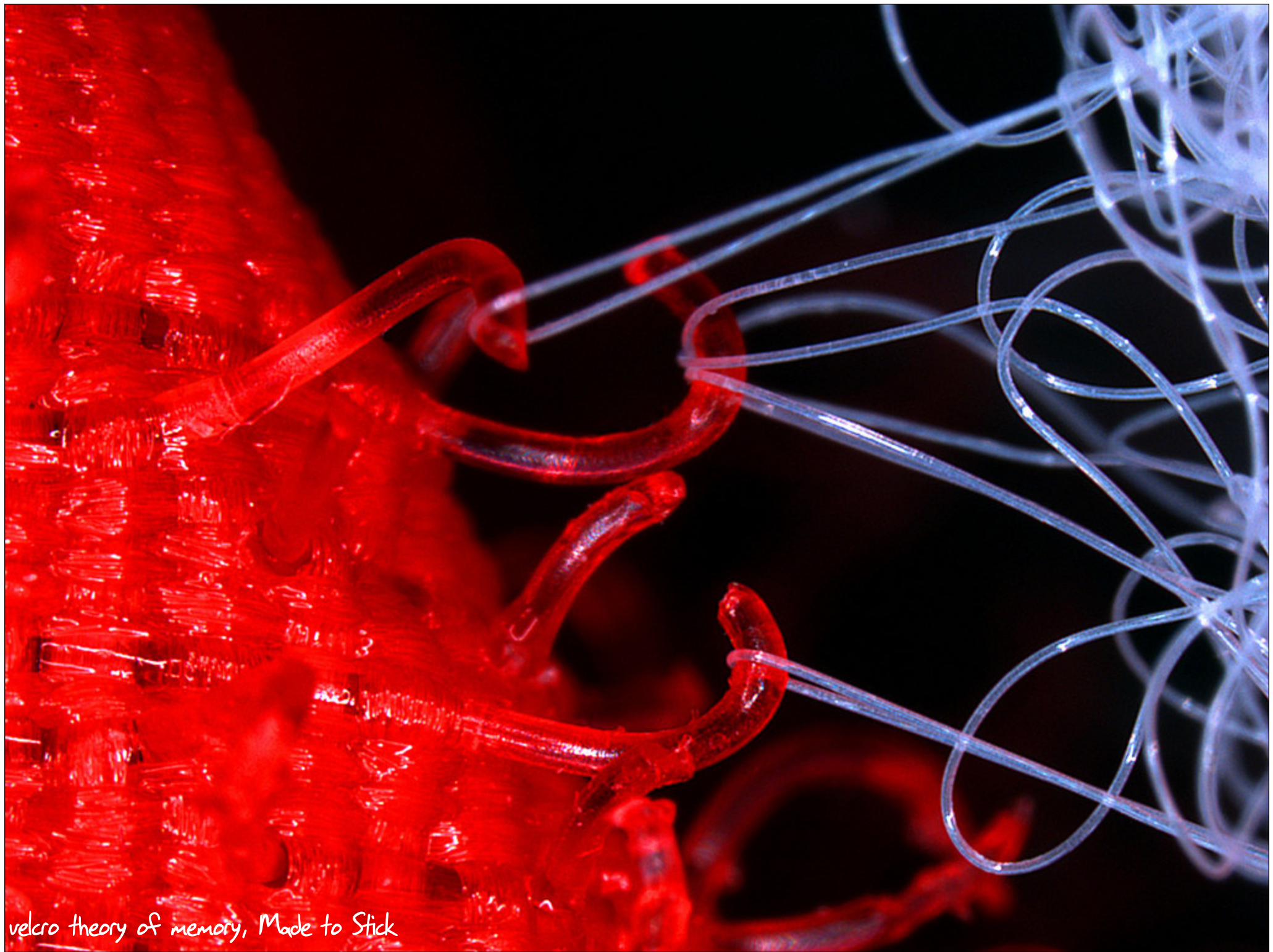


What is learning?



Learning

$$\text{Prior Knowledge} \times \text{New Information} = \frac{\text{Changes in}}{\text{Prior Knowledge}}$$



velcro theory of memory, Made to Stick

Learning = Changes in Prior Knowledge



Surface Learning

Deep Learning



Temporary, weak changes

Permanent, strong changes

Learning = Changes in Prior Knowledge



Surface Learning



Temporary, weak changes
"Rote" (Memorization)

Deep Learning



Permanent, strong changes
"Meaningful" (Understanding)

Ausbel

How do I measure deep learning?

Step 1.

Figure out and make explicit what it looks like down there.



Use backward design to!

1. Define Big Ideas

2. Prepare Learning Outcomes



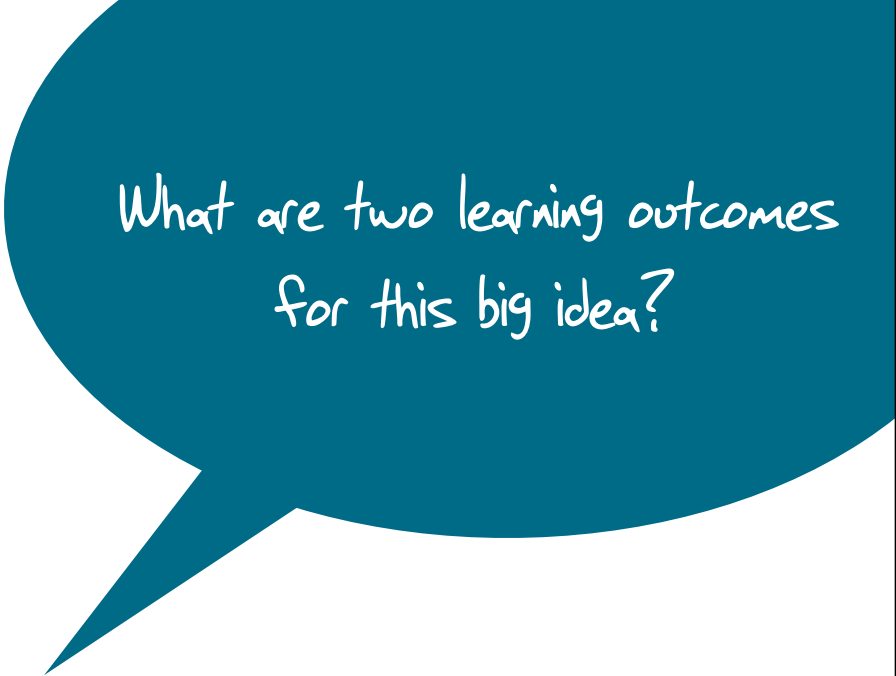
Understanding by Design



Q. What is one Big Idea in your class?

Backward Design





What are two learning outcomes
for this big idea?

1. Students will know that....
2. Students will be able to..



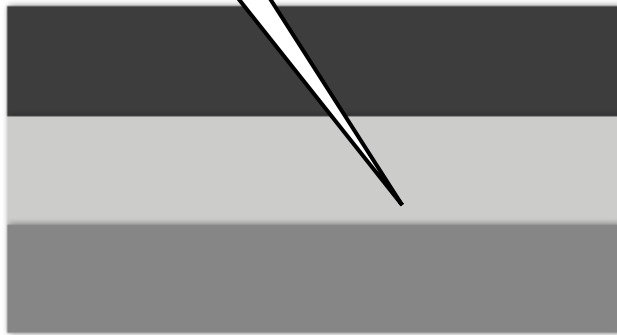
"Should assessment strategies vary according to the type of course?"



"There is a proper way to reconcile the different types of assessments, or is better to focus on one type of evaluation?"

The problems with traditional assessment

- separate from teaching & learning
- periodic
- late
- unidimensional
- not authentic
- high stakes



Traditional assessment



Teaching

The problems with traditional assessment

Grading not assessment

- separate from teaching & learning
- periodic
- late
- unidimensional
- not authentic
- high stakes



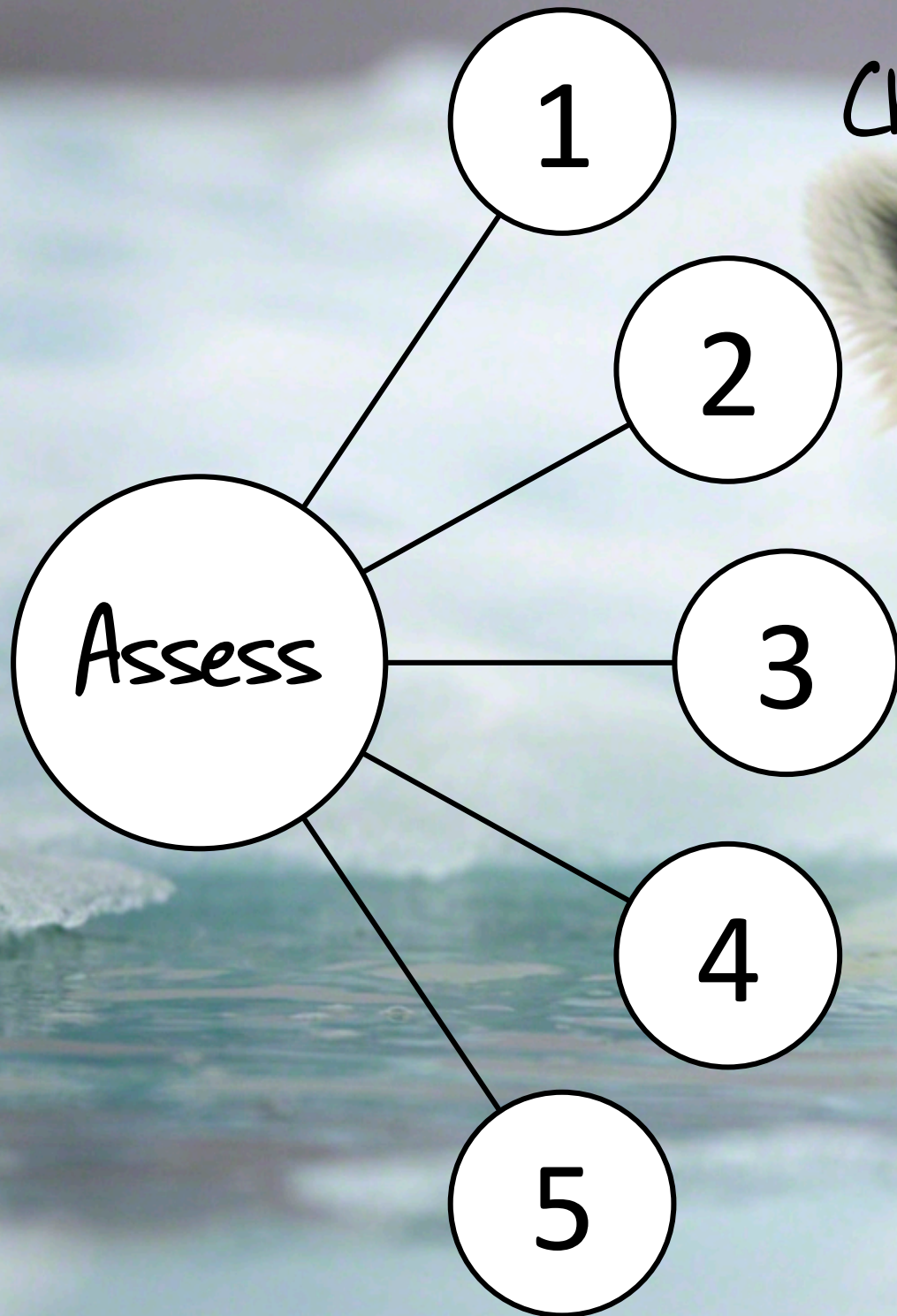
Teaching

Traditional assessment

A polar bear is shown from the chest up, swimming in a body of water. The bear's head is above water, and it is looking directly at the camera with a steady gaze. Its fur is white and appears wet. A small stream of water is dripping from its chin. The background is a soft-focus view of the water and some distant land or ice.

5 strategies for assessing
deep learning.

Change in students



Strategy 1

Assess Change in Students

Protocol: Measure prior knowledge and misconceptions

Tools

Strategy 1

Revised form 081695R

Force Concept Inventory

Originally published in *The Physics Teacher*, March 1992

by
David Hestenes, Malcolm Wells, and Gregg Swackhamer

Revised August 1995

by
Ibrahim Halloun, Richard Hake, and Eugene Mosca

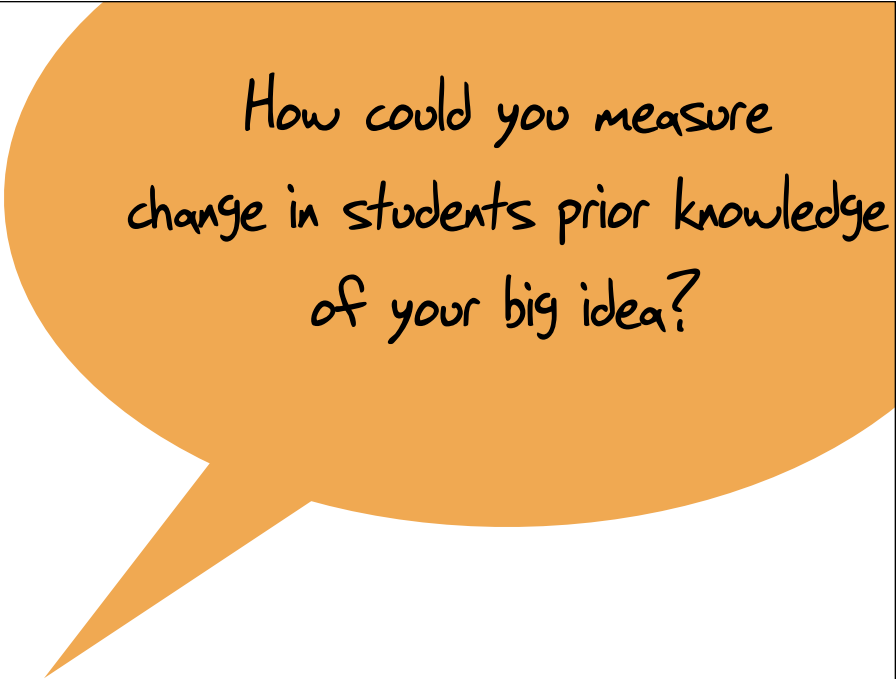
The Force Concept Inventory (FCI) is a multiple-choice "test" designed to assess student understanding of the most basic concepts in Newtonian mechanics. The FCI can be used for several purposes, but the most important one is to evaluate the effectiveness of instruction. For a full understanding of what has gone into development of this instrument and how it can be used, the FCI papers Diagnostic Test (refs. 3, 4), (b) the paper on the FCI predecessor, the Mechanics Diagnostic Test (ref. 5), which is recommended as an FCI companion test for assessing quantitative problem solving skills, and (c) Richard Hake's paper (ref. 6) on data collection on university and high school physics taught by many different teachers and methods across the U.S.A.

Refs. 1-5 are online at <http://modeling.asu.edu/R&E/Research.html> Ref. 6 is online as ref. 24 at <http://www.physics.indiana.edu/~hake>.

References

1. D. Hestenes, M. Wells, and G. Swackhamer (1992). Force Concept Inventory, *The Physics Teacher* **30**, 141-151.
2. D. Hestenes and I. Halloun (1995). Interpreting the Force Concept Inventory, *The Physics Teacher* **33**, 502-506.
3. I. Halloun and D. Hestenes (1985). The initial knowledge state of college physics students. *Am. J. Phys.* **53**, 1043-1055.
4. I. Halloun and D. Hestenes (1985). Common sense concepts about motion, *Am. J. Phys.* **53**, 1056-1065.
5. D. Hestenes and M. Wells (1992). A Mechanics Baseline Test, *The Physics Teacher* **30**, 159-166.
6. Hake (1998). Interactive-engagement vs. traditional methods: A six thousand-student survey of mechanics test data for introductory physics courses. *Am. J. Phys.* **66**, 64-74.

Conceptual Inventories
Pre-post surveys

An orange speech bubble with a black outline, pointing downwards and to the left. It contains handwritten text in black ink.

How could you measure
change in students prior knowledge
of your big idea?



Assess change

Knowledge organization

Strategy 2

Strategy 2

Assess Organization of Knowledge

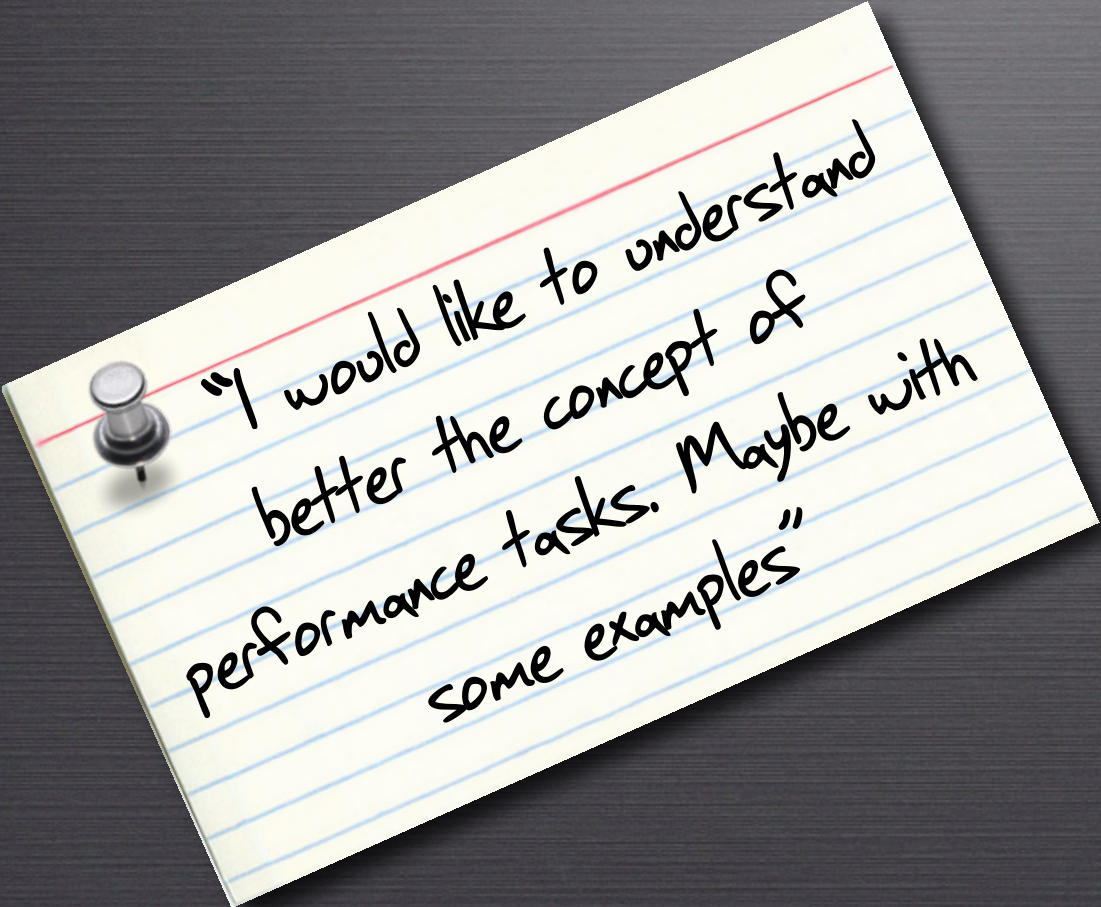
Strategy 2

Assess Organization of Knowledge

Protocol: Measure how students structure and organize knowledge, and their understanding of how and why, not just memorization of discrete facts.

Tools

Strategy 2

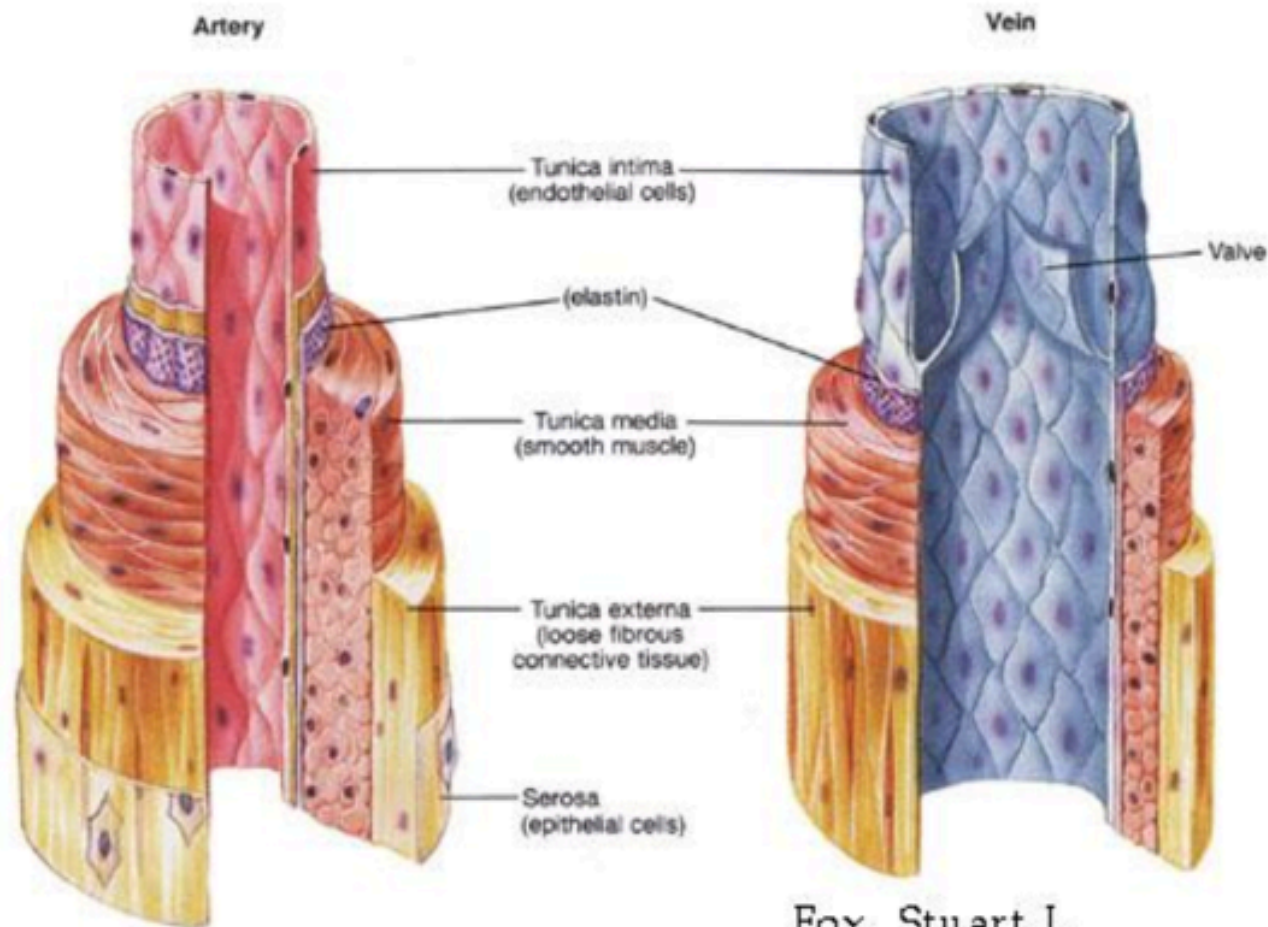


"I would like to understand better the concept of performance tasks. Maybe with some examples"



Performance tasks

Blood vessels (arteries and veins) are the transport conduits of the circulatory system. *Arteries* transport blood away from the heart whereas *veins* transport blood towards the heart.



Fox, Stuart I.
Human Physiology 4th
Brown Publishers

1. Arteries

- a. Carry blood to the heart
- b. Carry blood away from the heart
- c. Both a and b
- d. Both b and c

1. Arteries

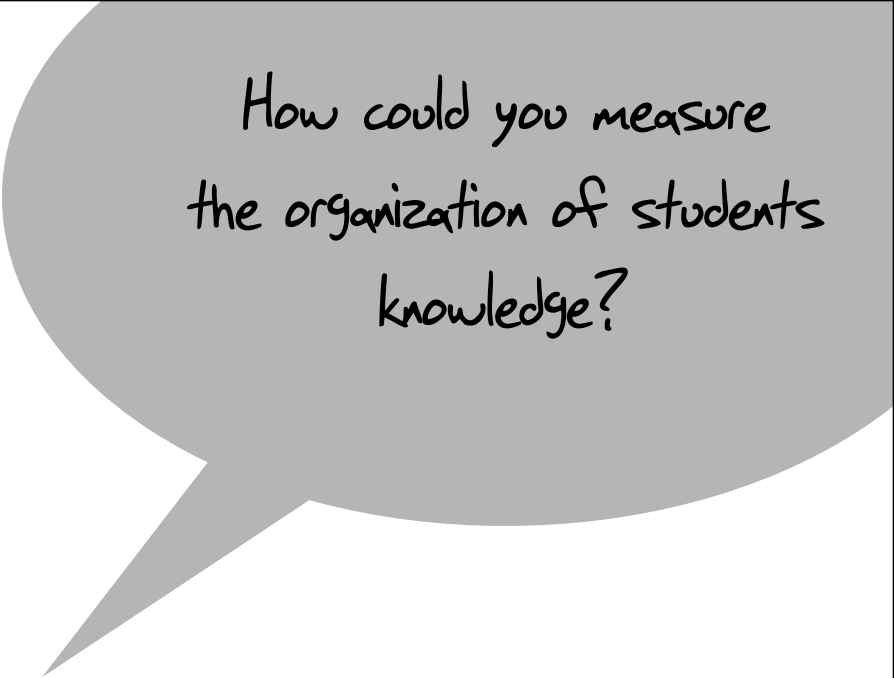
- a. Carry blood to the heart
- b. Carry blood away from heart
- c. Both a and b
- d. Both b and c



Design an artificial artery.

Design an artificial artery.





How could you measure
the organization of students
knowledge?



Assess change

Knowledge organization

Sophistication of
Basics



Strategy 3

Assess Sophistication of the Basics

Strategy 3

Assess Sophistication of the Basics

Protocol: Measure how well students grasp a series of basic understandings about concepts.







Tools

Strategy 3



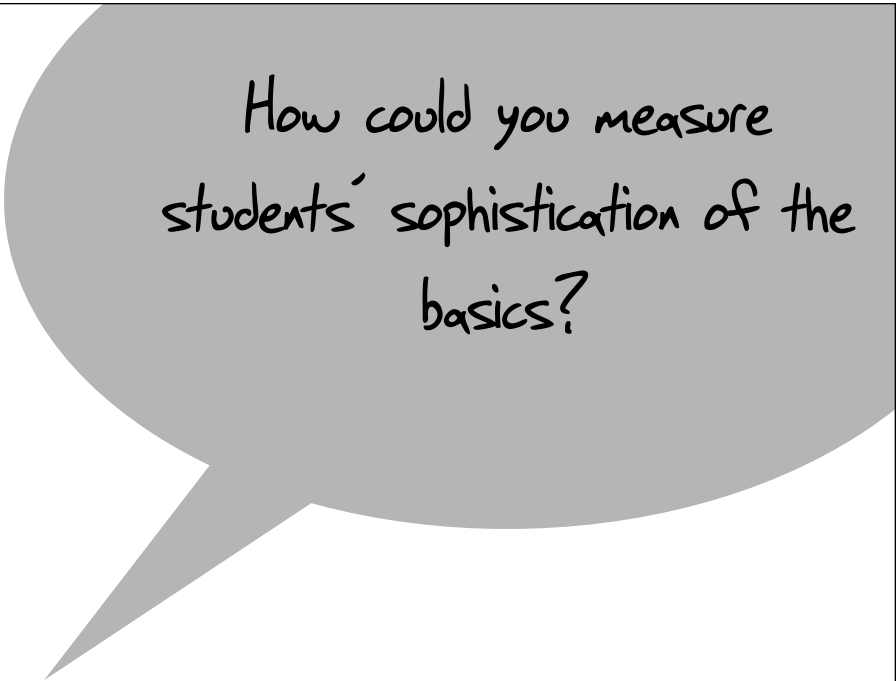
"Provide us with three questions that you would like answered concerning the topics covered in your textbook readings or in lecture. These can be any questions you might have, as long as the questions are about the material or are stimulated by the material. They can be questions about concepts you are still unclear about, about further information you would like to have, or questions about how some issue applies to your own life or to other course concepts" (p. 306).

Tools

Strategy 3

A	Assign out-of-class coverage activity (e.g. video, reading, pdf video lesson!).
S	Solicit student questions about out-of-class assignment.
K	Keep students engaged by addressing their questions in class.
?	See if this approach has any effect on student success in your class.





How could you measure
students' sophistication of the
basics?



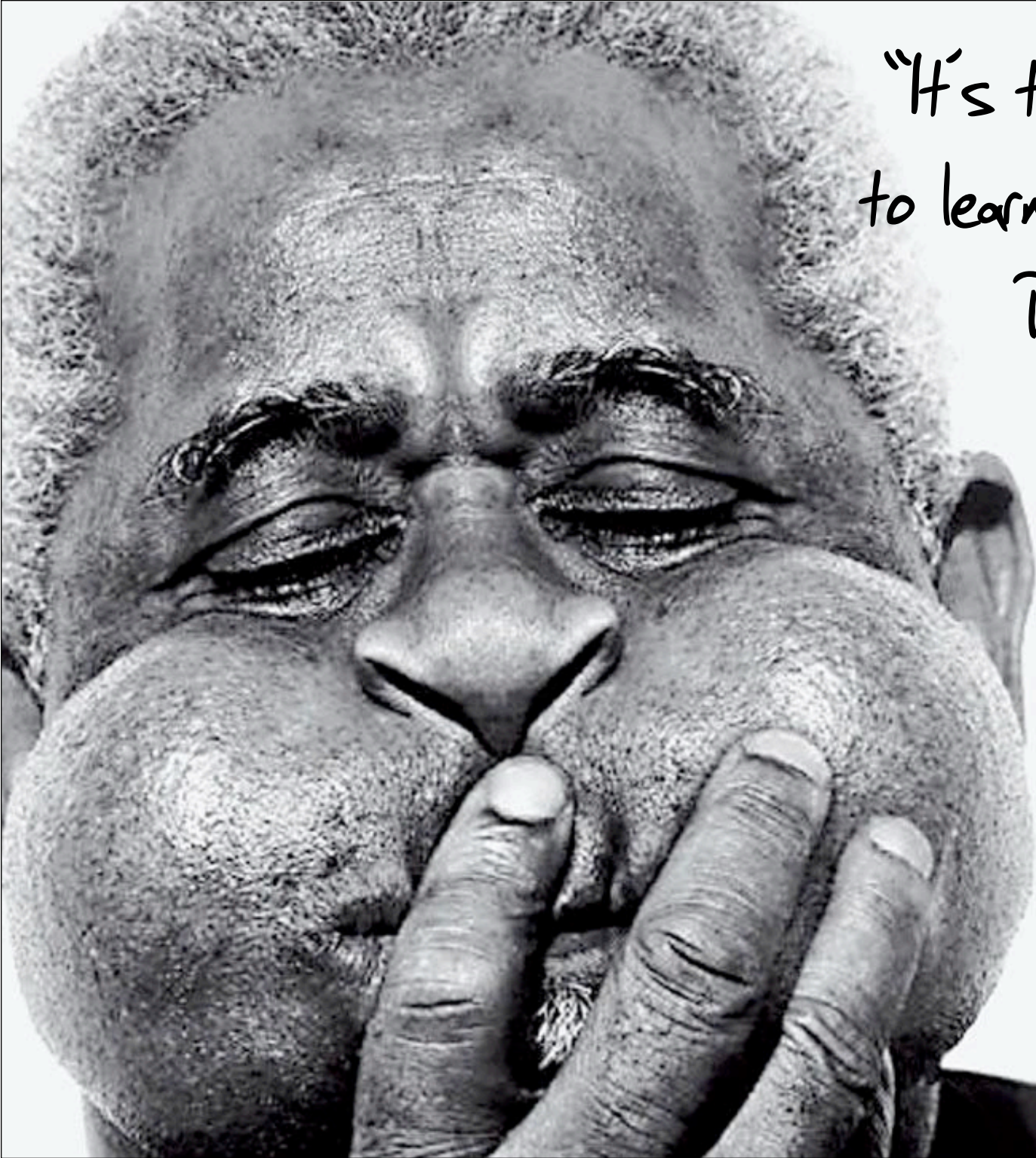
Strategy 4

Strategy 4

Assess Self Assessment

Protocol: Measure how accurate students are in their own assessment of their abilities.



A black and white close-up photograph of Dizzy Gillespie. He has his eyes closed and a hand covering his mouth, with his fingers spread. The lighting is dramatic, highlighting the texture of his skin and the intensity of his expression. The background is a plain, light color.

"It's taken me all my life
to learn what not to play."

Dizzy Gillespie

Tools

Strategy 4



"One of the themes we discussed as a group was about self-assessment and peer assessment. My experience on self-assessment have been awful".

Tools

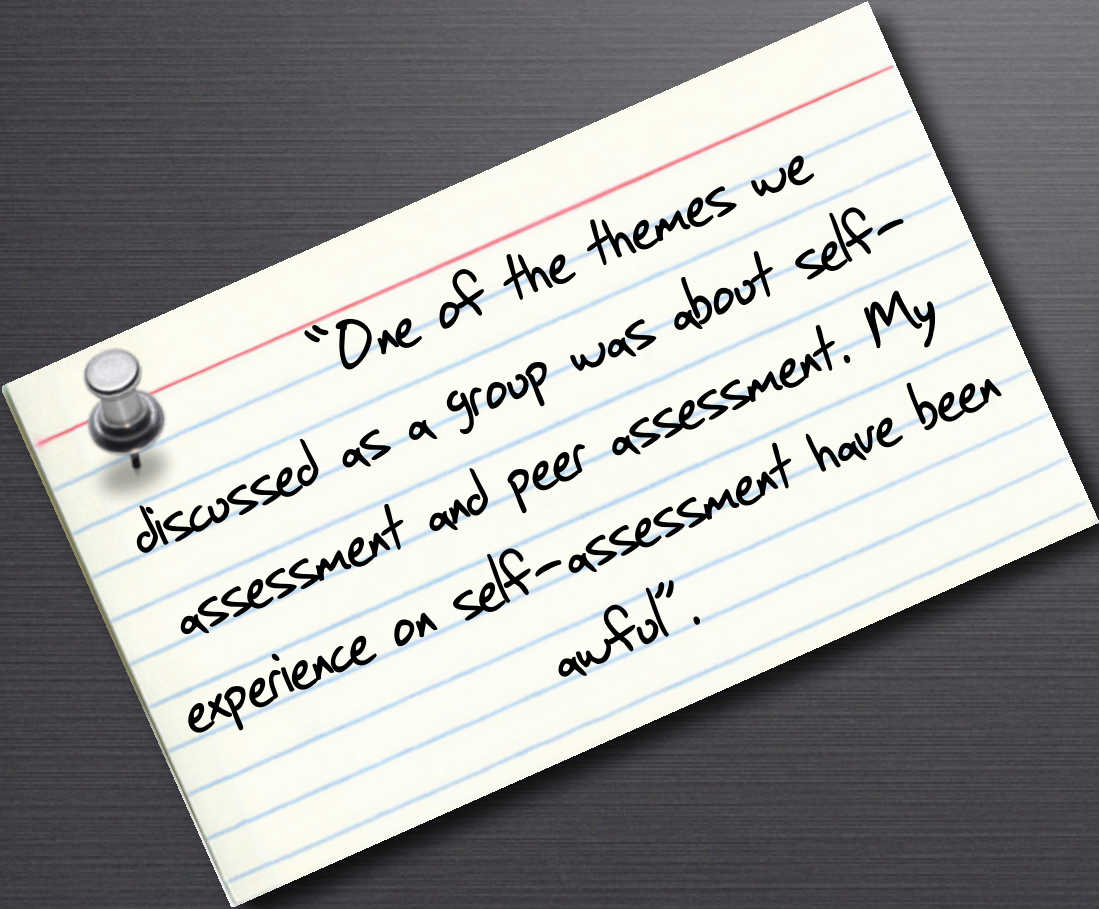
Strategy 4

Rubrics

0	1	2
No answer	Answer but no reasoning	Answer and reasoning

Tools

Strategy 4



"One of the themes we discussed as a group was about self-assessment and peer assessment. My experience on self-assessment have been awful".

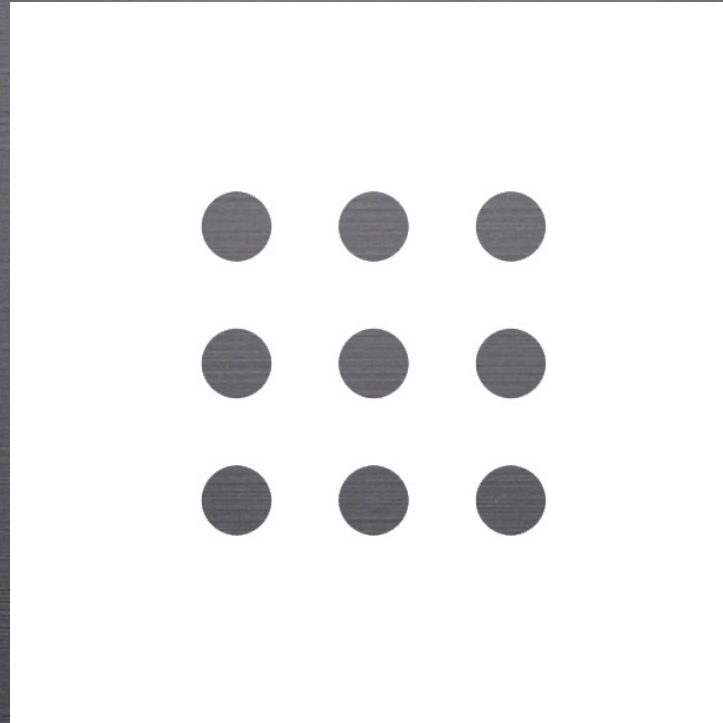


Concept Tests and IFAT

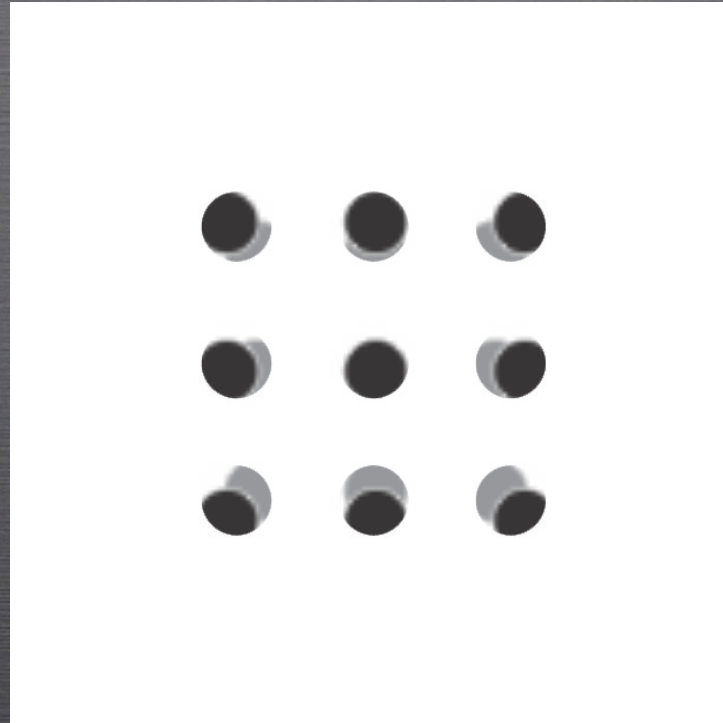
Thermal Expansion



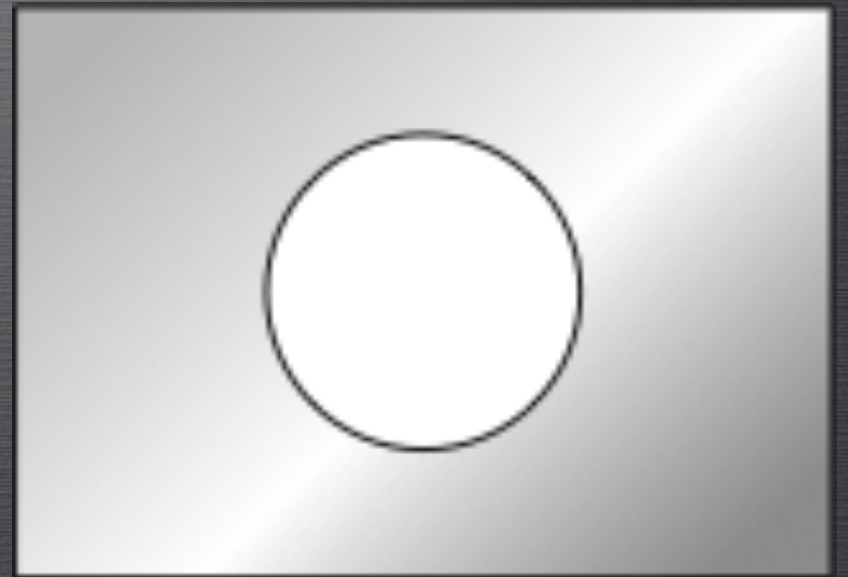
When metals heat up, they expand



When metals heat up, they expand

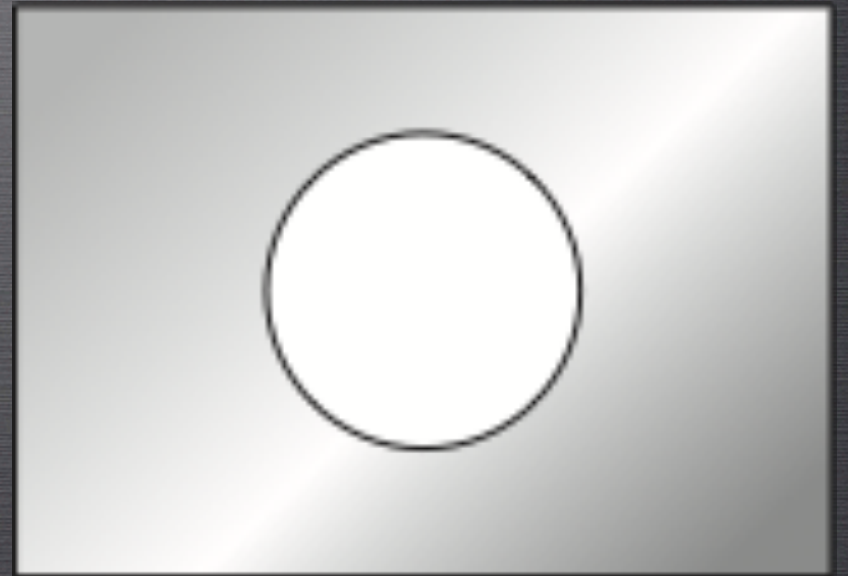


Consider a metal plate with a hole
in it...



If you heat the plate uniformly,
what happens to the hole?

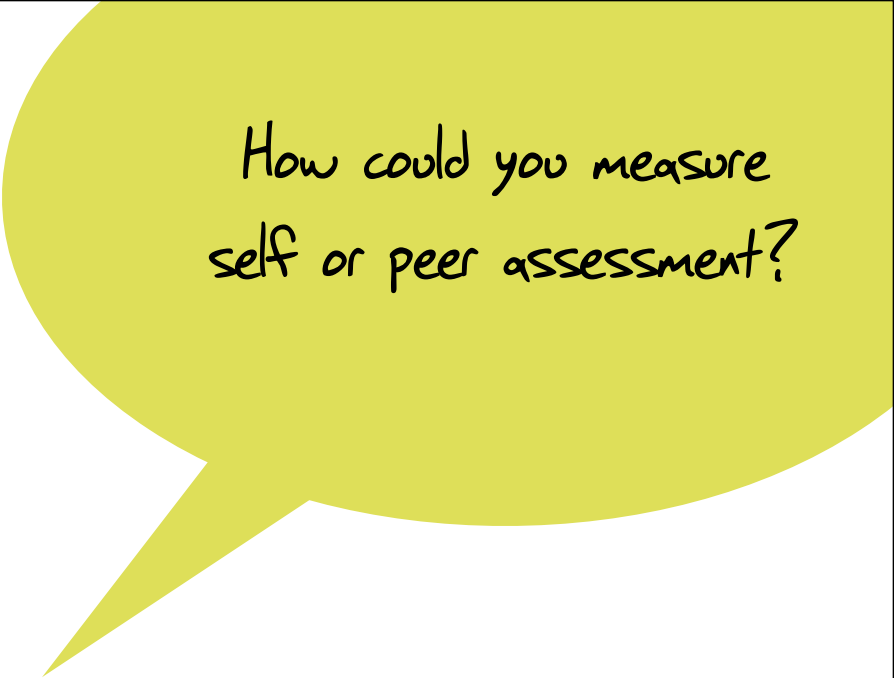
- A. decreases
- B. stays the same
- C. increases



What happens when you heat up metals?

- A. decreases
- B. stays the same
- C. increases





How could you measure
self or peer assessment?



Strategy 5

Strategy 5

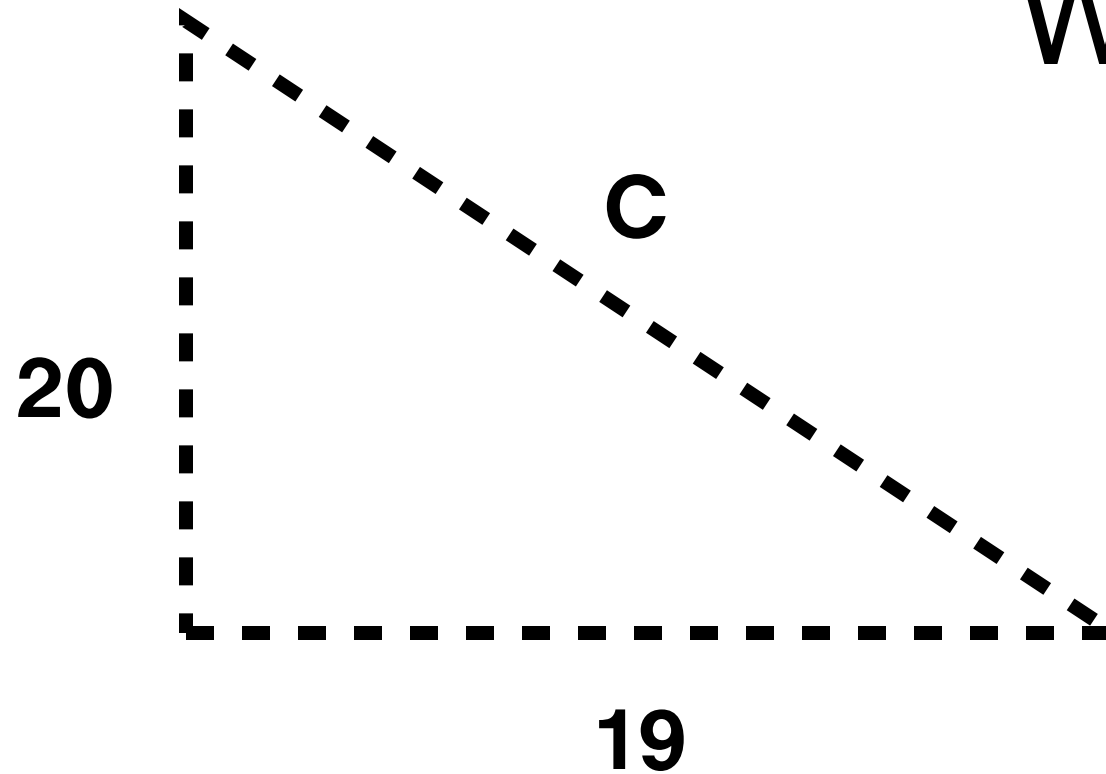
Assess for Knowledge Transfer

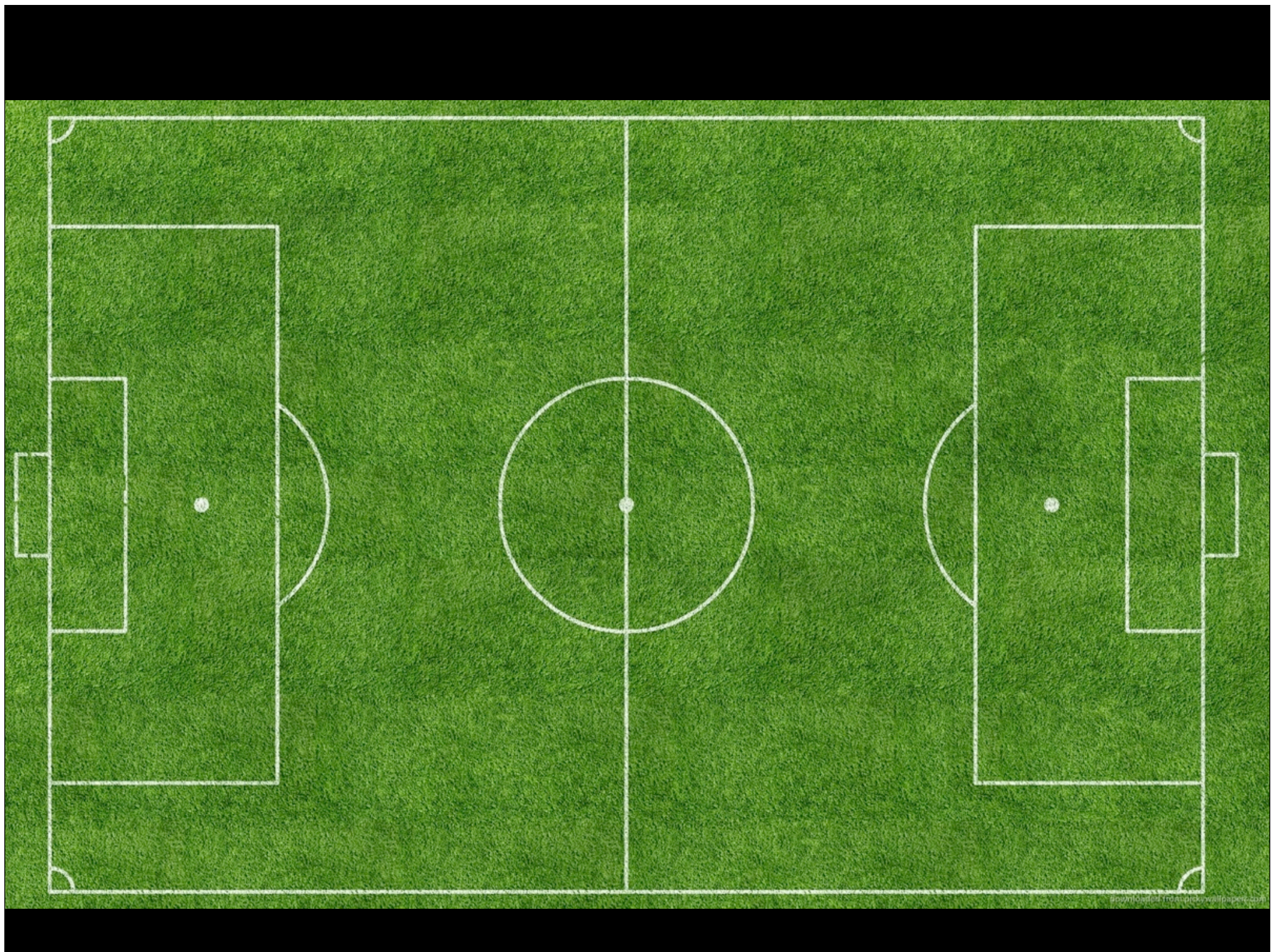
Protocol: Measure students ability to transfer knowledge across contexts.

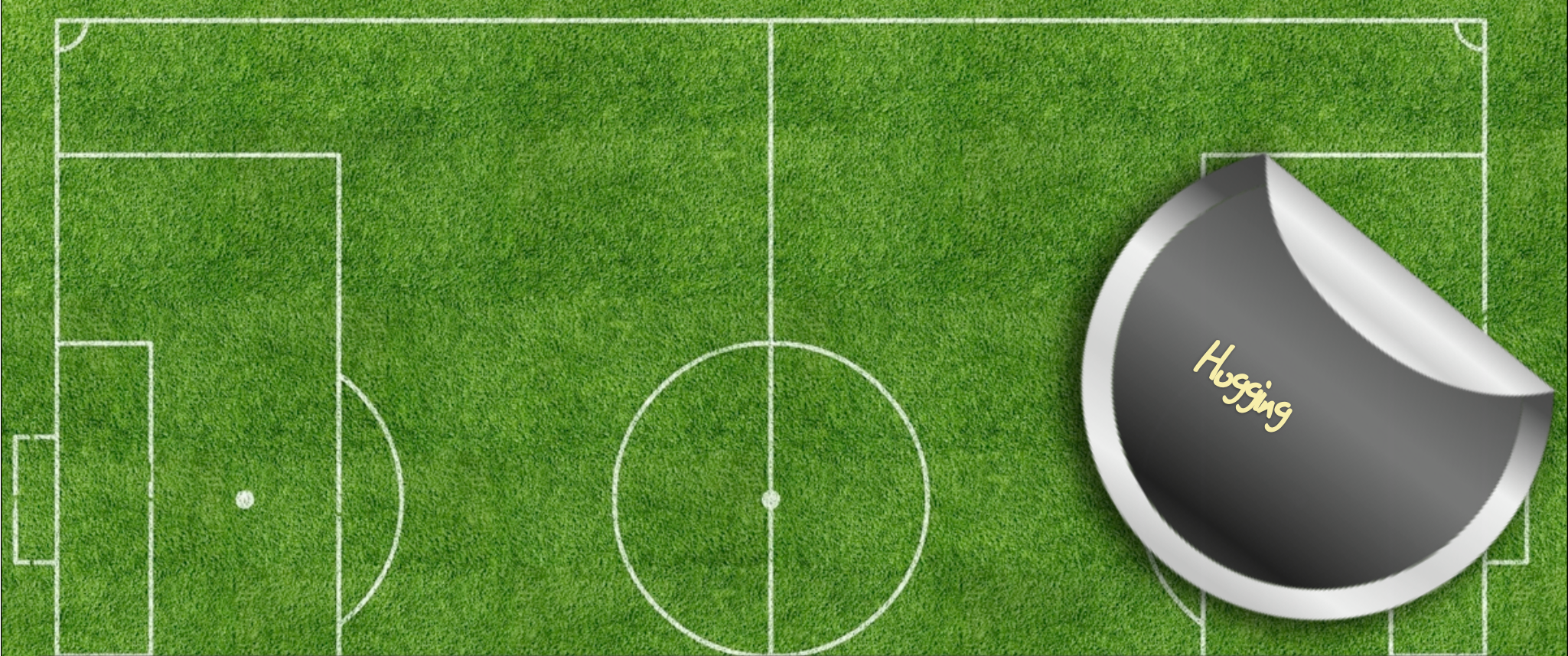


Hugging - (Near Transfer)

What is c ?







What is the shortest distance from the corner of the field to the center?



Bridging

(Far Transfer)





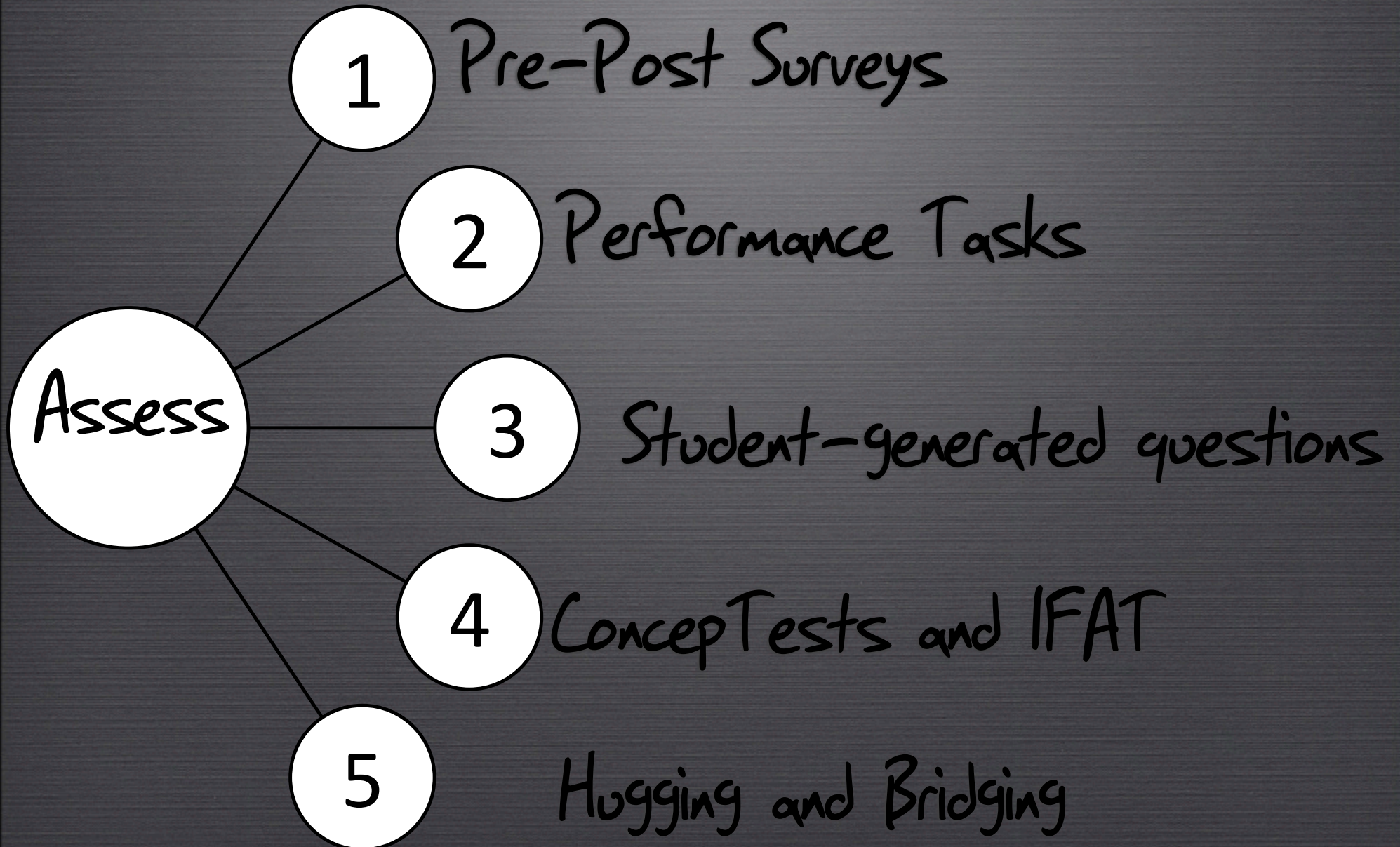
Write a question that hugs and
bridges.



5 Strategies

	Surface Learning	Deep Learning
CHANGE	-	+
ORGANIZATION	-	+
SOPHISTICATED BASICS	-	+
SELF-ASSESSMENT	-	+
KNOWLEDGE TRANSFER	-	+

Tools



Next Steps





What will you do next?

Next Steps

Teaching in new ways and
assessing in old ways is like
what????

Next Steps

Use ^{new approaches to} [^] assessment to

UNCOVER

learning.





5 Strategies

Quick Start Guide

5 Strategies for Assessing Deep Learning Julie Schell

1. Assess change in students' knowledge
 - a. Possible Tools
 - i. Conceptual Inventories: Tests designed with prior knowledge or common misconceptions in mind
 - ii. Pre-post Surveys: Surveys of concepts or attitudes given before and after instruction
 - iii. Background Knowledge Probes: short questionnaires used at beginning or end of instruction
2. Assess for Organized Knowledge
 - a. Possible Tools
 - i. Performance Tasks: "A task that uses one's knowledge to effectively act or bring to fruition a complex product that reveals one's knowledge and expertise."
 - ii. Concept Maps: Diagrams of concepts and their relationships to other concepts, topics, or ideas
 - iii. Defining Feature Matrix: Categorization of concepts by defining



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Acknowledgements

- Classroom Assessment Techniques, Angelo and Cross
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- How People Learn, Bransford et al.
- 5 Elements of Effective Thinking, Burger and Starbird

Eric Mazur

The Mazur Group

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Jen Ebbeler

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