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**What is the most important
function of assessment for you?**

Assessment: More Than Just Grades



Assessment Workshop

Learning Outcomes

Participants will be able to . . .

- **use backward design for alignment**
- **use Bloom's Taxonomy to evaluate assessments**
- **explain how formative assessment enhances student learning**

Questions we will address:

What do we want students to know?

How do students know that we want them to know it?

How will we know that they know it?

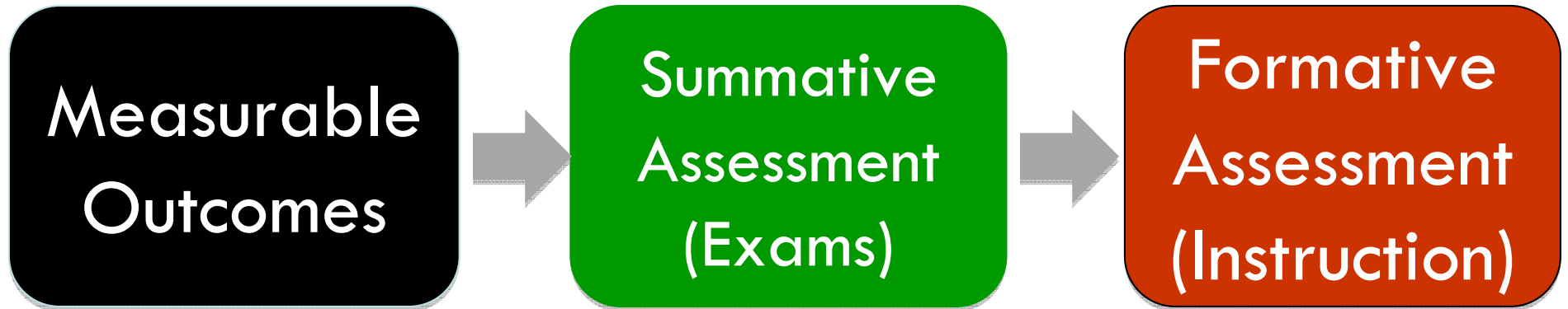
How will students know they know it?

Questions we will address:

What do we want students to know?

How do students know that we want them to know it?

Backward Design (Planning)



These are linked!

Summative Assessments Drive Learning



THE MONTILLATION AND USES OF TRAXOLINE

It is very important to learn about traxoline. Traxoline is a new form of zionter. It is montilled in Ceristanna. The Ceristannians found that they could gristerlate large amounts of fervon and then bracter it to quasel traxoline. This new, more efficient bracterillation process has the potential to make traxoline one of the most useful products within the molecular family of lukizes snezlaus.

QUIZ:

1. What is traxoline?
2. Where is it montilled?
3. How is traxoline quaseled?
4. Why is traxoline important?

Summative Assessments

**Is when students demonstrate what they
have learned**

So...

**If you test them on fact-based knowledge,
then that is what they will study!**

Misalignments

Lower Order Cognitive Skills = LOCS
Higher Order Cognitive Skills = HOCS

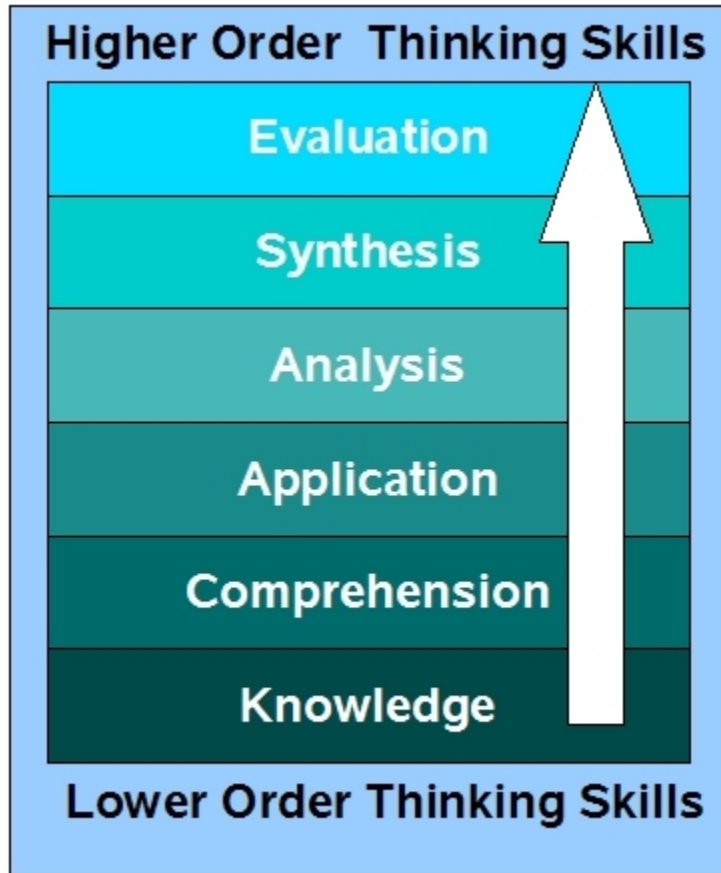
<u>Practice</u>	<u>Testing</u>	<u>Outcome for Student</u>
HOC	LOC	(fill in blank)
LOC or none	HOC	(fill in blank)
HOC	HOC	(fill in blank)

Misalignments

Lower Order Cognitive Skills = LOCS
Higher Order Cognitive Skills = HOCS

<u>Practice</u>	<u>Testing</u>	<u>Outcome for Student</u>
HOC	LOC	Frustration
LOC or none	HOC	Frustration
HOC	HOC	Excitement and Learning

Bloom's Taxonomy



Higher order cognitive skills
(HOCS)

Lower order cognitive skills
(LOCS)

Benjamin S. Bloom *Taxonomy of educational objectives*. Published by Allyn and Bacon, Boston, MA. Copyright (c) 1984 by Pearson Education.

Cognitive Level	Bloom Level A Simple Phrase to Guide Categorization
HOC	Evaluate “Defend or judge a concept or idea”
	Synthesize “Create something new”
	Analyze “Distinguish parts and make inferences”
LOC/HOC	Apply “Use information or concepts in new ways”
LOC	Comprehend “Explain information or concepts”
	Know “Recall information”

Practice Using Bloom's Taxonomy

Work with a neighbor to categorize your first or last five test questions as either a LOC or HOC.

If you didn't bring an exam, there are also questions provided for you on your table.

What did you have to consider when doing this?

LET'S PRACTICE BACKWARD DESIGN

Work with your neighbor

- 1. For the HOC questions you found on your exam, state the learning outcome for that question.**
- 2. Discuss what activities you did in class to prepare your student to achieve that learning outcome.**

What percentage of multiple-choice questions to you typically have on your exams?

A. 0%

B. 1-30%

C. 30-60%

D. 60-99%

E. 100%

HOC Multiple-Choice Questions



Valid and Reliable Rubrics

Writing Multiple-Choice Questions That Test High Order Cognitive Skills

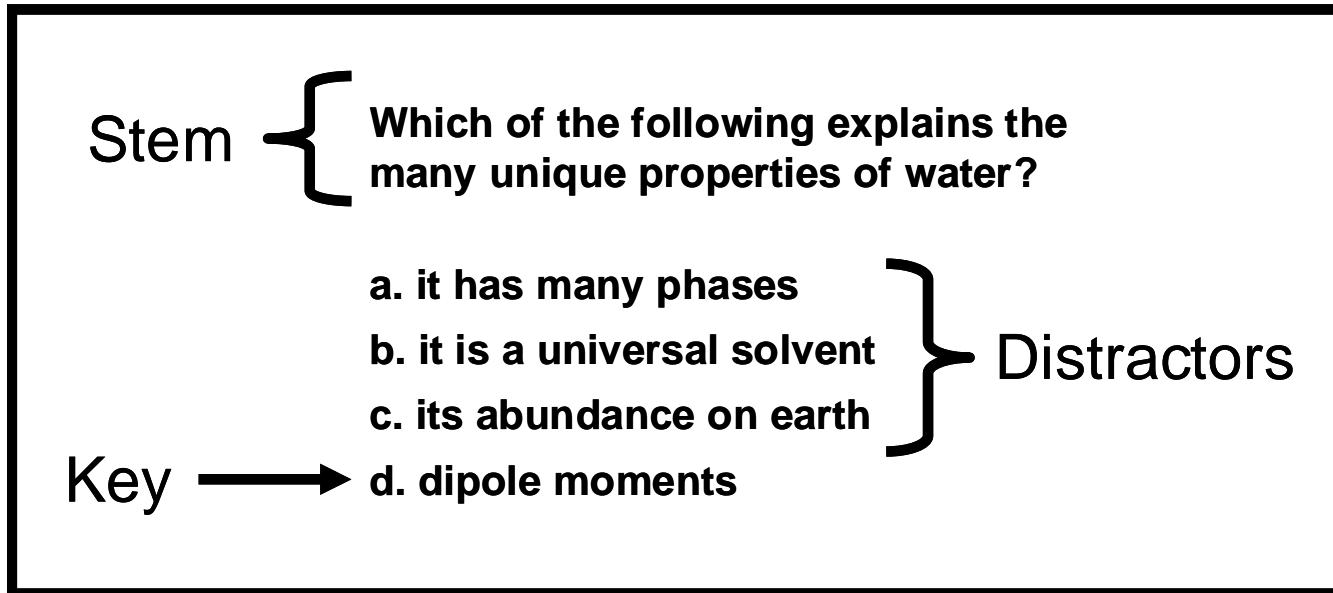
Warning!

Faculty often get distracted by the content of a question and miss out on the process of what is being presented.

Let's focus on the process!

Structures of Multiple-Choice Questions (MCQs)

Standard MCQ



MCQ Format	Advantages	Disadvantages
Standard	Useful for measuring HOC skills if a strong distractors are used	If not well written the structure can cue a student to the answer
Context Dependent	Useful for measuring HOC skills if strong distractors are used	Not time efficient
Two-Tiered	The second tier may survey students' misconceptions	Not time efficient Answer to one tier can cue the answer to the other tier.
Complex (K-Type)	Requires analytical skills of comparing and contrasting	Not time efficient Tends to be very misleading
Matching	Time efficient	Typically not useful for measuring HOC skills
True/False Multiple True/False	Time efficient Useful for measuring HOC skills	True/false with less than 5 items have increased errors associated with guessing
Alternate Choice	Useful for measuring HOC skills	Not time efficient Less discriminating than standard format

Take a few minutes and evaluate your exam.

What kinds of questions are you asking?

Free response, multiple-choice, or both?

Do you have questions that help you to identify student misconceptions?

Do you have any free response questions that requires a student to explain their reasoning or two-tiered MCQs.

Using Two-tiered questions:

A MCQ followed by a free response requiring students to explain why they answered the question the way they did will be very revealing!

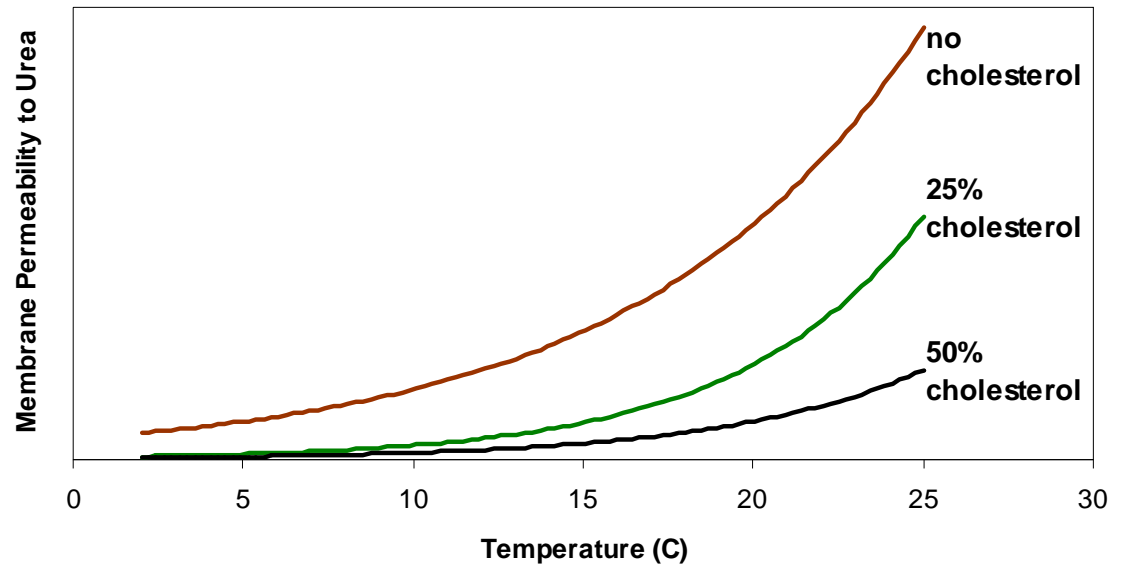
Enchanted Valley is located within the Olympic National park of Washington state and is home to many black bears. A researcher is studying the different types of berries that 20 Enchanted Valley black bears eat.

Which of the following passages describes the researcher's data that would be graphed as a histogram?

- A) amount of each type of berry the bears ate in a week
- B) amount of salmon berries eaten by each bear in a week
- C) amount of huckleberries eaten by male and female bears in a week

In the space provided below, please explain your reasoning for selecting the answer to the above question.

Review the graph right.



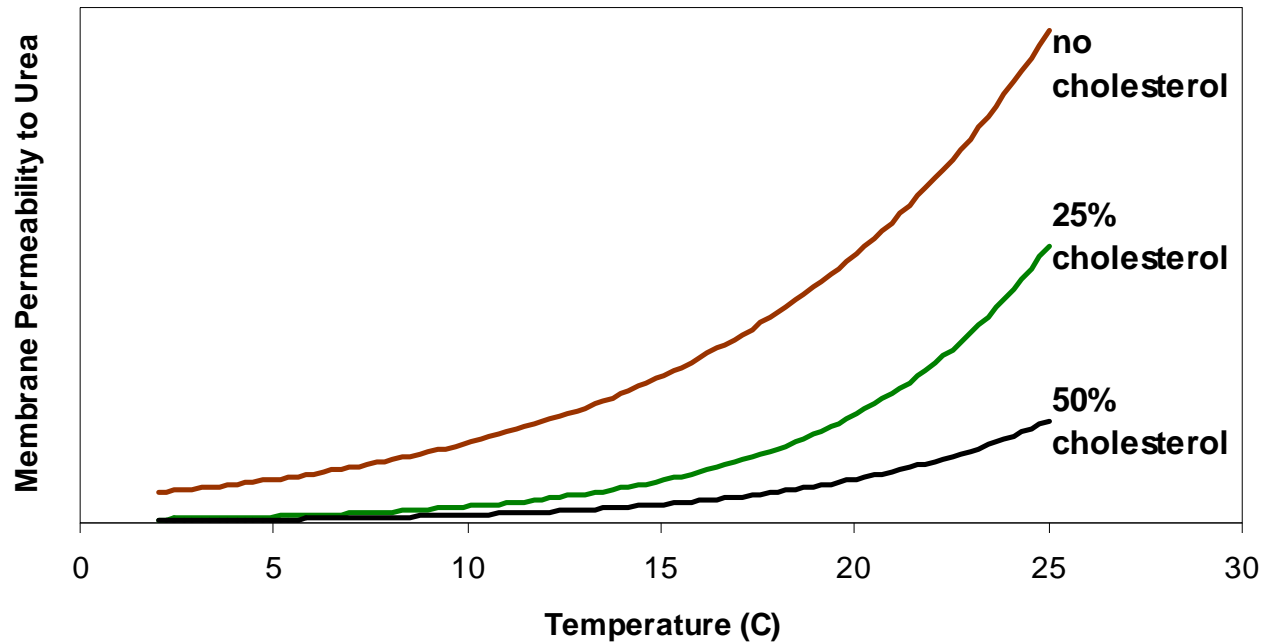
Which of the following passages describes the graph?

A) membrane permeability to urea is only dependent on the amount of membrane cholesterol

B) amount of membrane cholesterol is only dependent on membrane permeability to urea

C) membrane permeability to urea is dependent on temperature and the amount of membrane cholesterol

D) amount of membrane cholesterol and membrane permeability to urea are dependent on one another



Which of the following best describes why you selected the answer that you did?

The graph shows . . .

- A) two dependent variables and one independent variable
- B) one dependent variable and two independent variables
- C) one dependent variable and one independent variable
- D) two dependent variables and two independent variables

Q: Why do we care about student misconceptions?

Concept Inventories

An MCQ test based of a specific content area that uses common student misconceptions as distractors.

We have been talking about MCQ, but how do we accurately and fairly grade free-response questions?

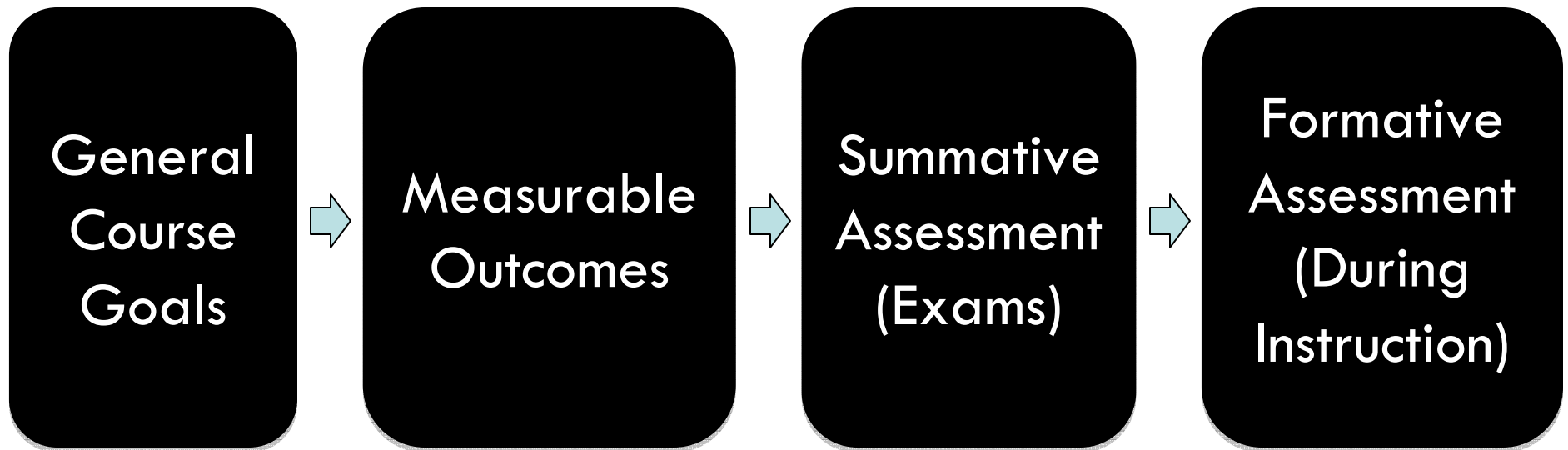
How will students know they know it?



Think-Pair-Share

- **How do you know when you know something?**
- **How do you know when your students know something?**
- **How do your students know when they know something?**

Backward Design (Planning)



Communicate your intent,
allows *student* to practice
metacognition, informs *you*
about student progress

Alignment

Course Goal	Measurable Outcome (<i>content + behavior</i>)	Summative Assessment (exam question)	Formative Assessment (in class activity)
<p>What will students <u>learn</u>?</p>	<p>If they have learned it, what will students <u>know and be able to do</u>?</p>	<p>How will students <u>demonstrate they know it or are able to do it</u>?</p>	<p>What will students <u>do to learn it</u>?</p>
<p>Students will understand the principles of evolution by natural selection</p>	<p>Students will be able to use the assumptions of natural selection to predict how a population changes</p>	<p>Students will predict the distribution of a trait following directional selection</p>	<p>Students are given a variable trait and predict the relationship between parent and offspring values for the trait if the trait is: a. Heritable b. Not heritable</p>

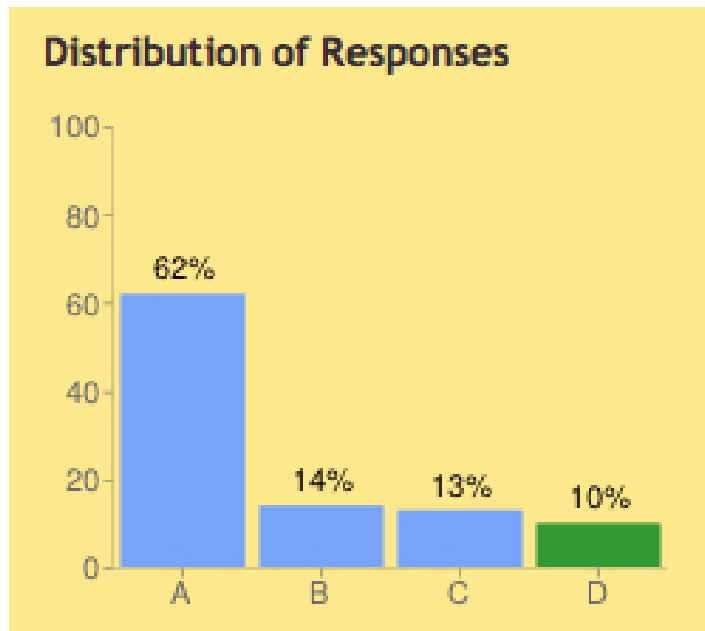
Assessments help identify and confront misconceptions



Some organisms, such as a chimpanzee and a human, have many similarities. Others, such as a chicken and an oak tree, have fewer similarities. What is TRUE about the ancestors of these organisms?

- A. Chimpanzees and humans share a common ancestor with each other, but chickens and oak trees do not share a common ancestor with each other
- B. Chimpanzees and humans share a common ancestor with each other, and chickens and oak trees share a common ancestor with each other, but chimpanzees and humans do not share a common ancestor with chickens and oak trees.
- C. Because chimpanzees, humans, chickens, and oak trees are separate species, none of them shares a common ancestor with any other.
- D. Chimpanzees, humans, chickens, and oak trees all share an ancient common ancestor.

Actual Student Responses!



Correct Answer: D
(<http://assessment.aaas.org/>)

- A. Chimpanzees and humans share a common ancestor with each other, but chickens and oak trees do not...
- B. Chimpanzees and humans share a common ancestor with each other, and chickens and oak trees share a common ancestor with each other, but...
- C. Because chimpanzees, humans, chickens, and oak trees are separate species, none of them shares a common ancestor...
- D. Chimpanzees, humans, chickens, and oak trees all share.

Assessments help students distinguish between what they know and what they don't know



Genetic diseases, like PKU, confirm that there is a link between an individual's DNA and that individual's proteins.

Below is a DNA molecule and the amino acid sequence that would result from translating the DNA sequence.

Which nucleotides are responsible for this particular sequence of amino acids?

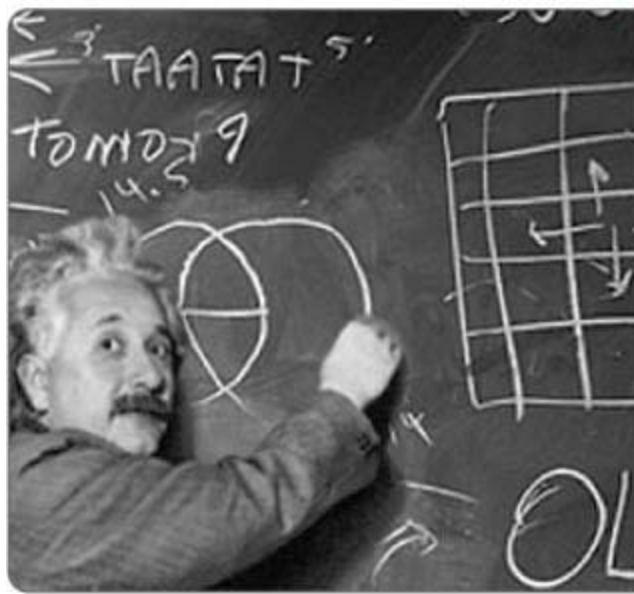
- **3'CGTTTTACCAAACCGAGTACTGAG**
- **5'GCAAATGGTTTGGCTCATGACTC**

- **TRP-PHE-GLY-SER**

What do you know?

What do you need to know?

Assessments can aid construction of new knowledge



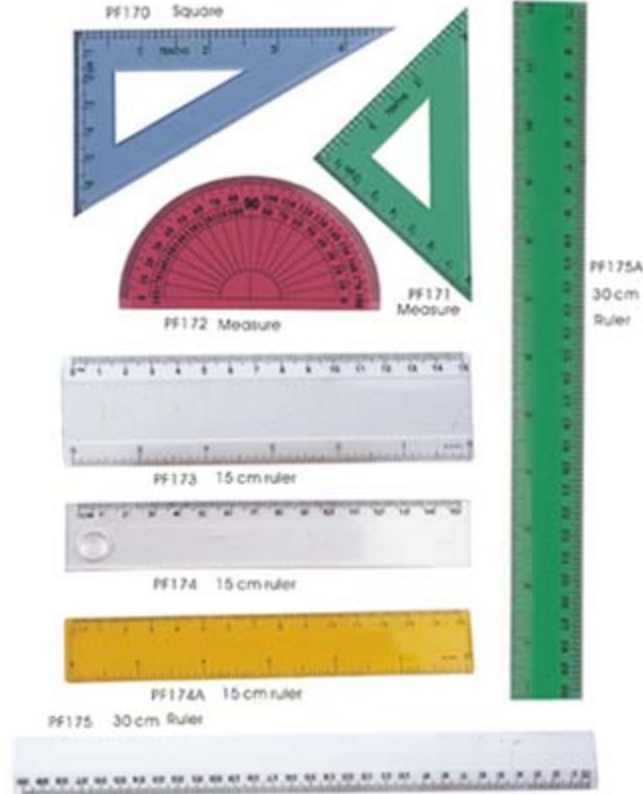
In a population of snails shell thickness varies from 0.9 mm to 1.5 mm. Describe the relationship between parent and offspring shell thickness if this trait is heritable.

How can we make this a higher order question/activity?

In a population of snails shell thickness varies from 0.9 mm to 1.5 mm. **Graph** the relationship between parent and offspring shell thickness if this trait is heritable.

In a population of snails shell thickness varies from 0.9 mm to 1.5 mm. Graph the relationship between parent and offspring shell thickness if this trait is **not heritable**.

Assessment allows students and instructors to gauge students' progress during learning.



Darwin at the Olympics

- **Work with your group to modify the 100-meter dash such that it would become an example of natural selection.**

Representative answers

- **“Add hurdles”**
- **“Make the runners run over rocky, uneven ground to select for the ones with best balance and speed”**
- **“Release a tiger behind the runners”**
- **“Kill the losers”**
- **“Only the first two runners across the finish line can reproduce”**

EnGaugements

- When you ask a student to do something, they are simultaneously *engaged* in learning and can *gauge* their progress by whether or how well they can perform.
 - *Handelsman et al., 2006 Scientific Teaching.*

Some Things to Consider

- **Start small:** Try out a few new assessments. Ongoing, incremental improvement is better than trying to change too much at one time and becoming overwhelmed
- **Allow enough time:** Allot about 50% more time than you think you will need the first time you administer a new formative assessment
- **Give feedback:** After any formative assessment, let students know what you learned from their work and how you and they can use that information to improve learning

Adapted from Angelo & Cross, 1993

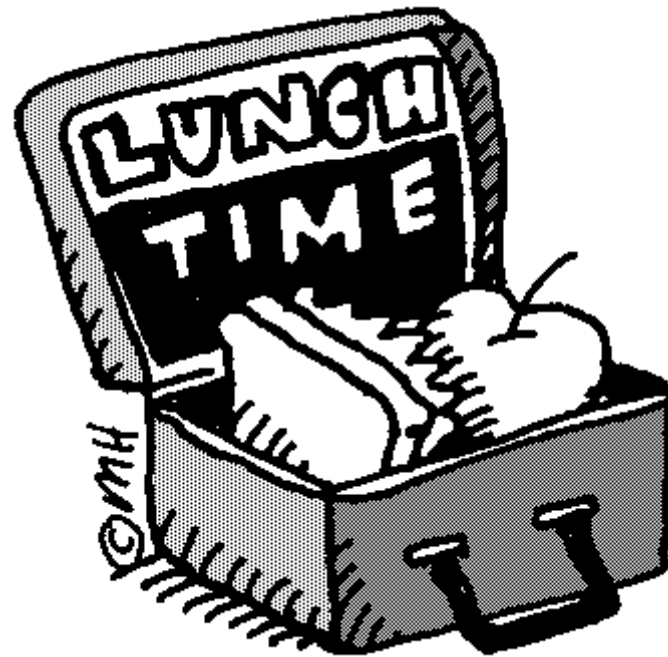
Recap: Learning Outcomes

You will be able to . . .

- **use backward design to align learning outcomes with formative and summative assessments**
- **use Bloom's Taxonomy to evaluate assessments**
- **explain how formative assessment enhances student learning**

Reflection

- **During this session what did you learn or experience in the role of student?**
- **What feedback do assessments offer students?**
- **How do you think this feedback compares with a traditional lecture classroom?**



Thanks for Blooming!