



# SCIENCE ASSESSMENT FOR THE FUTURE

**NASBE Regional Symposium**
**The Next Generation Science Standards: Updates, Challenges, and Opportunities**

Pittsburgh, PA
9/20/13

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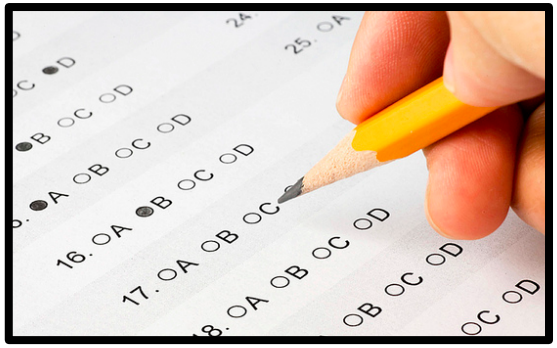
University of Wisconsin

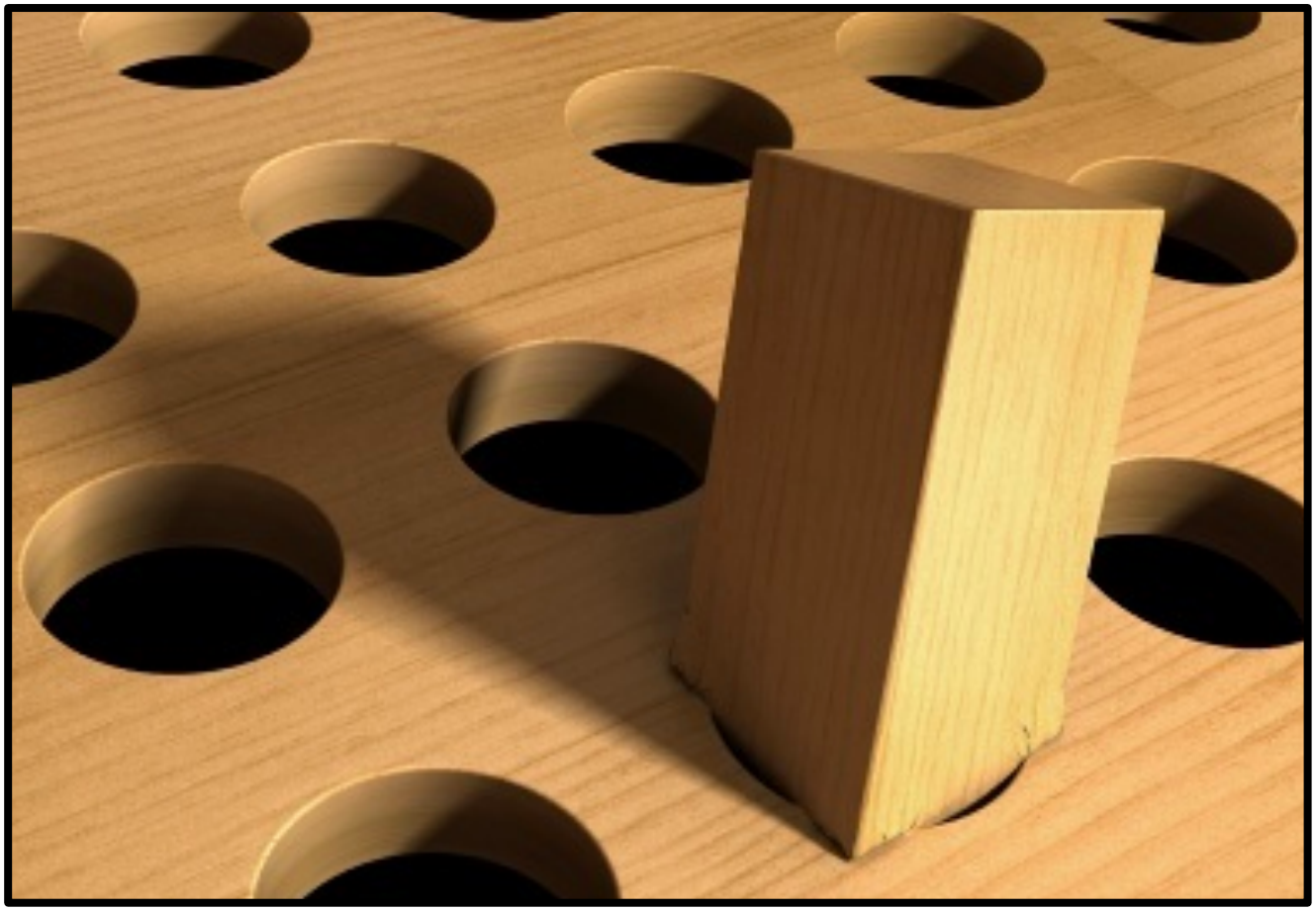

# Problem:

**Pop Quiz**

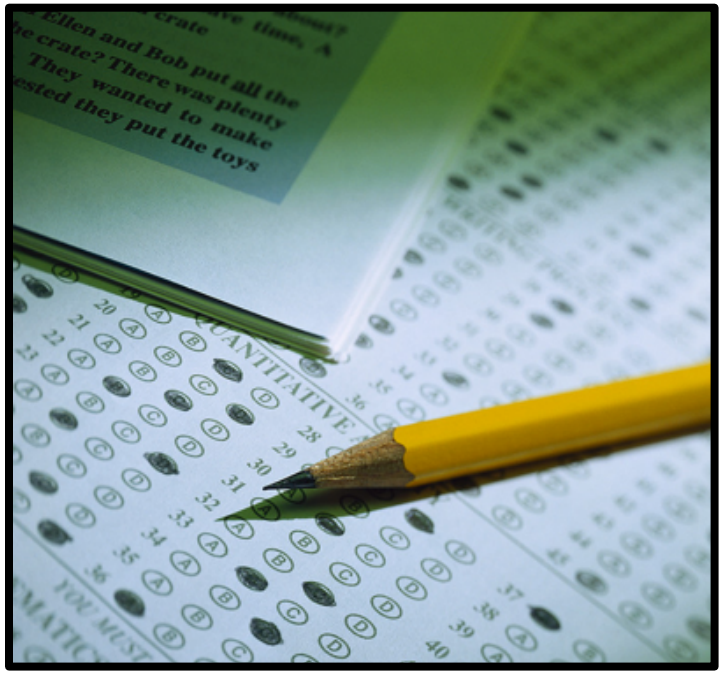
NEXT GENERATION SCIENCE STANDARDS
For States, By States



# Answer:



# The Past: Superficial, Static

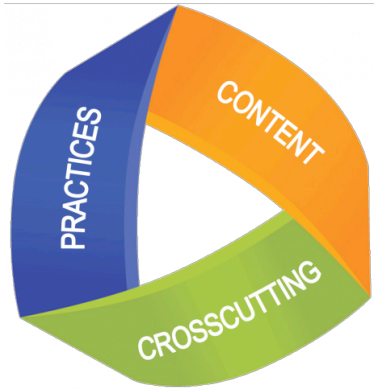



If the only tool you have is a hammer, you tend to see every problem as a nail.

*-Abraham Maslow*

Form – i.e., multiple-choice – constrained test content as much as (or more than) intended measurement topics…resulting in **'mile wide, inch deep'** assessments.

# The Future: Deep, Dynamic




**From the National Research Council's *Framework*:**

Science as "…both **a body of knowledge *and*** an **evidence-based, model and theory building enterprise** that continually extends, refines, and revises knowledge."

So too measurements.

# New Standards Beg New Assessments

- NGSS are best assessed with truly interactive tasks that measure deeper learning and cognitive processes.
- We (and others) have learned to build rich, efficient, and effective computer-delivered performance tasks – and to score them electronically in real time.
- Research shows that this type of assessment can work well for **all** types of learners.

# The Time Has Come…

**For differentiated learning with *REAL* Universal Design assessment.**

We *can* convey substantive meaning to and from students using multiple, multi- semiotic representations.

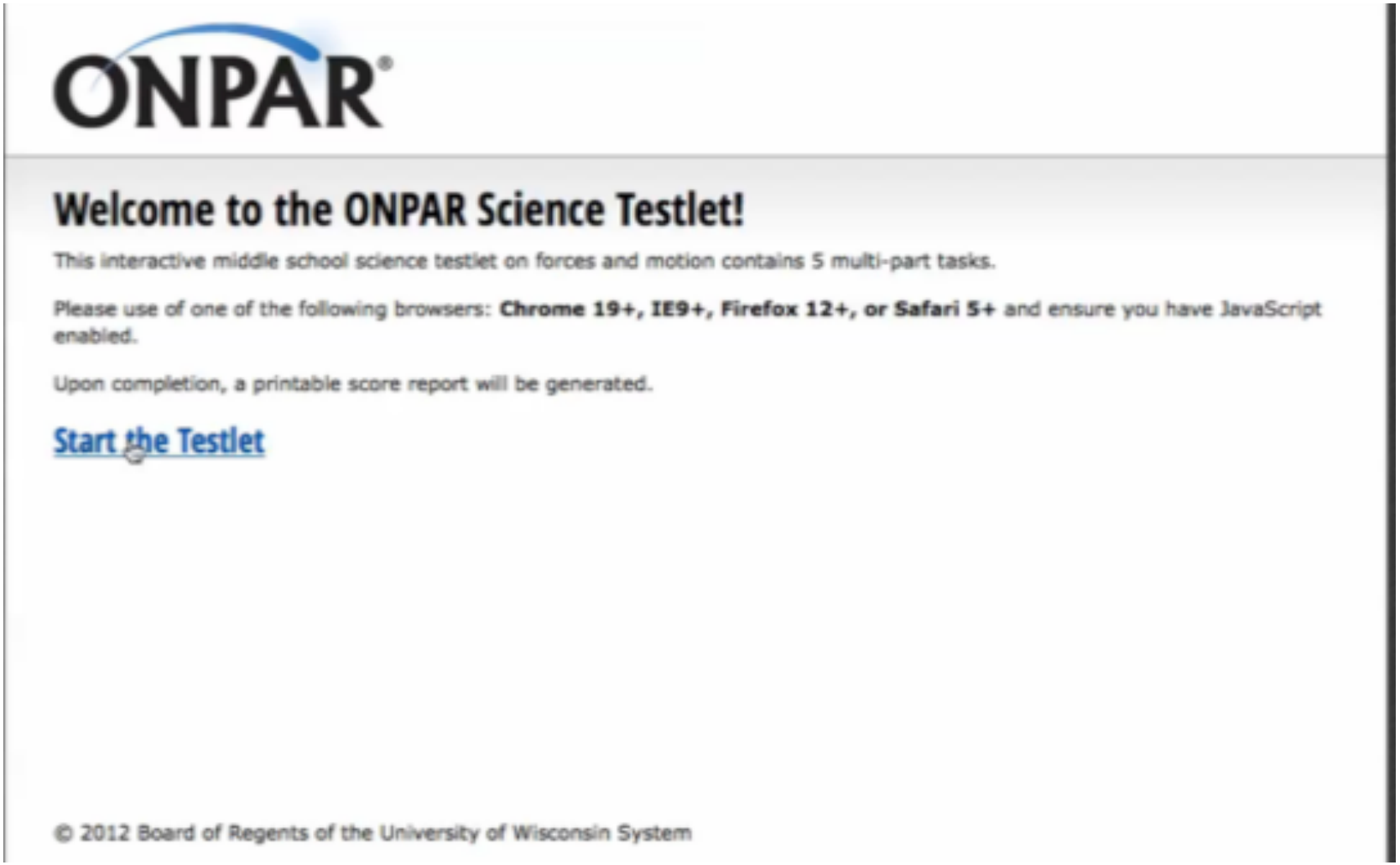
It *works* for everyone and disadvantages no one.

And it's *good* assessment!

# Multiple Representations and Cognitive Complexity: A Good Fit

- Interactive, multi-modal performance tasks especially effective for tapping higher order knowledge, skills, and abilities
- Not necessary to use these types of tasks on the entire test
- Good, well edited multiple-choice items work well for some types of questions and content
- It all depends on what you're measuring…

# ONPAR Middle School Forces and Motion Promotional Testlet - **www.onpar.us**



# Cognitive Psychology Foundations

As you can see, the **ONPAR approach** involves:

- Asking questions in many different ways
- Providing various and varied means for students to provide responses
- Using many different types of media
- Eliciting continuous interaction between student and task elements

How do we handle possible confusion/cognitive ‘overload’?

Multiplicity and richness is balanced by numerous instructional elements and ‘Help’ resources integrated into assessment tasks…

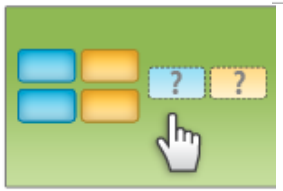
# Rich, Efficient, Effective

- Many layered ways of conveying meaning ***to and from*** student are integrated seamlessly within and across tasks
  - Text (Less ➔ More)
  - Audio
  - Simulations
  - Visuals
  - Creating, building, modeling, demonstrating solutions

# Rich, Efficient, Effective, Cont'd

- Tutorial to acclimate students


- Animated '*How To*' Icons


We want rich tasks but we also know we need to do it efficiently.

ONPAR approach allows us to get in, get out – conveying a lot of meaning quickly (like good ads).

# Empirical Basis for Interactive Tasks

Research (ours and others') has shown that dynamic assessment tasks *are* valid and effective.

**ONPAR**:

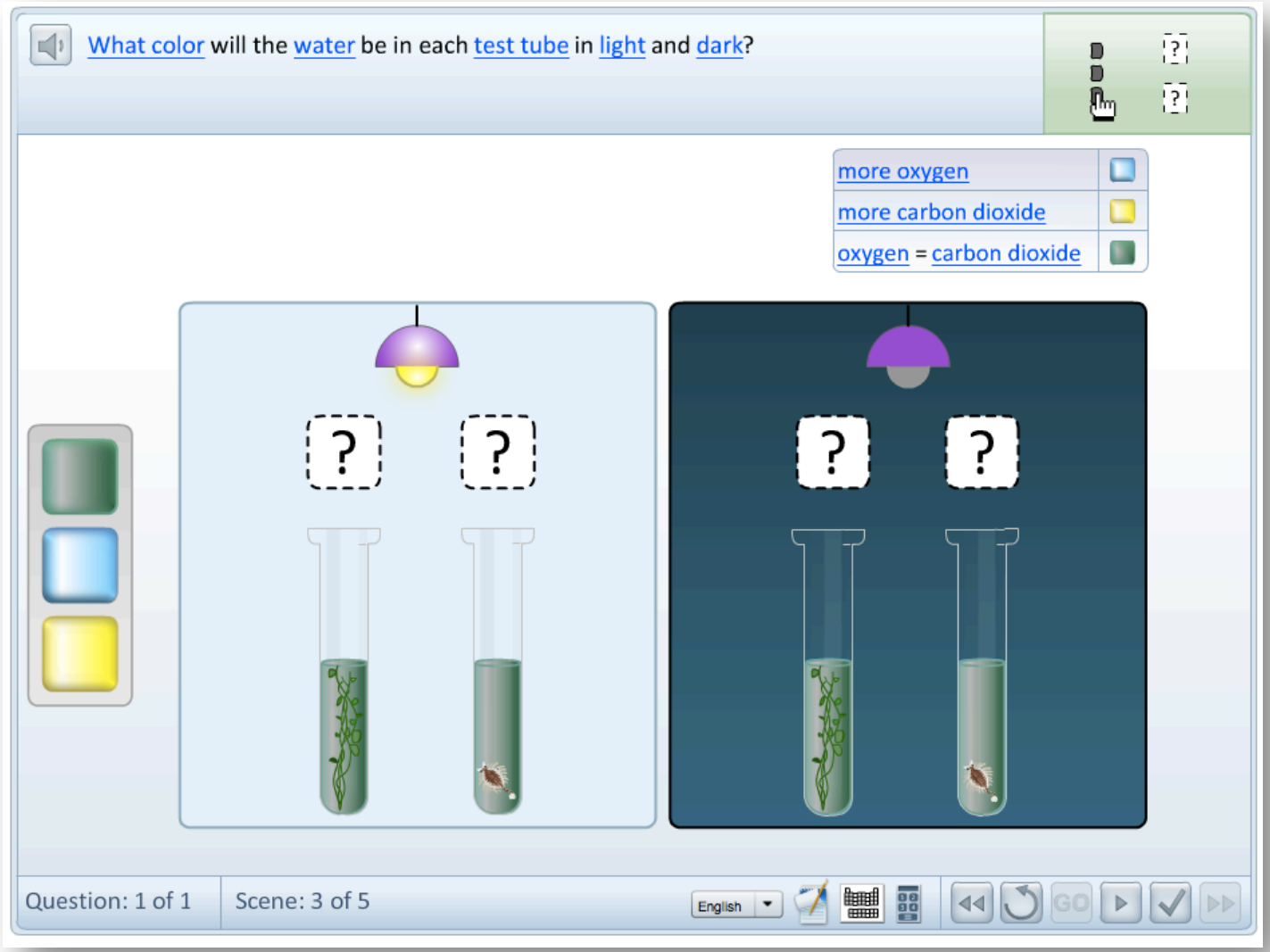
- Built on R&D efforts spanning 1996-present
- Backed by over $15M in competitive federal, other funding
- Rigorous randomized controlled trials and one-on-one student interviews
- 100+ prototypes and 2 promotional testlets
- Beneficial for measuring higher order thinking
- **Works for everyone, disadvantages no one**

(See www.onpar.us for research reports, papers, presentations)

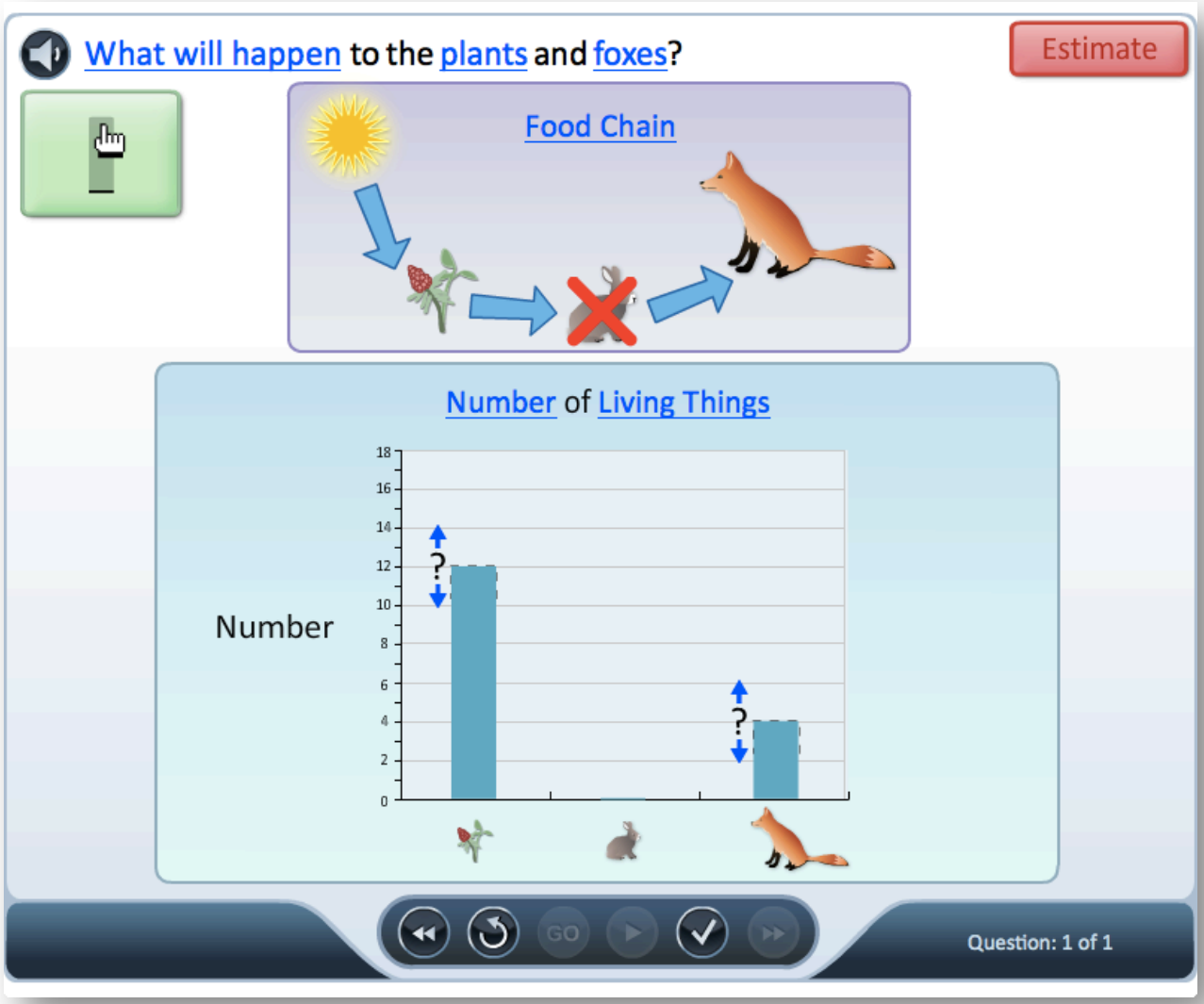

# ONPAR AND NGSS

Selected Examples – And Affinities – with NGSS

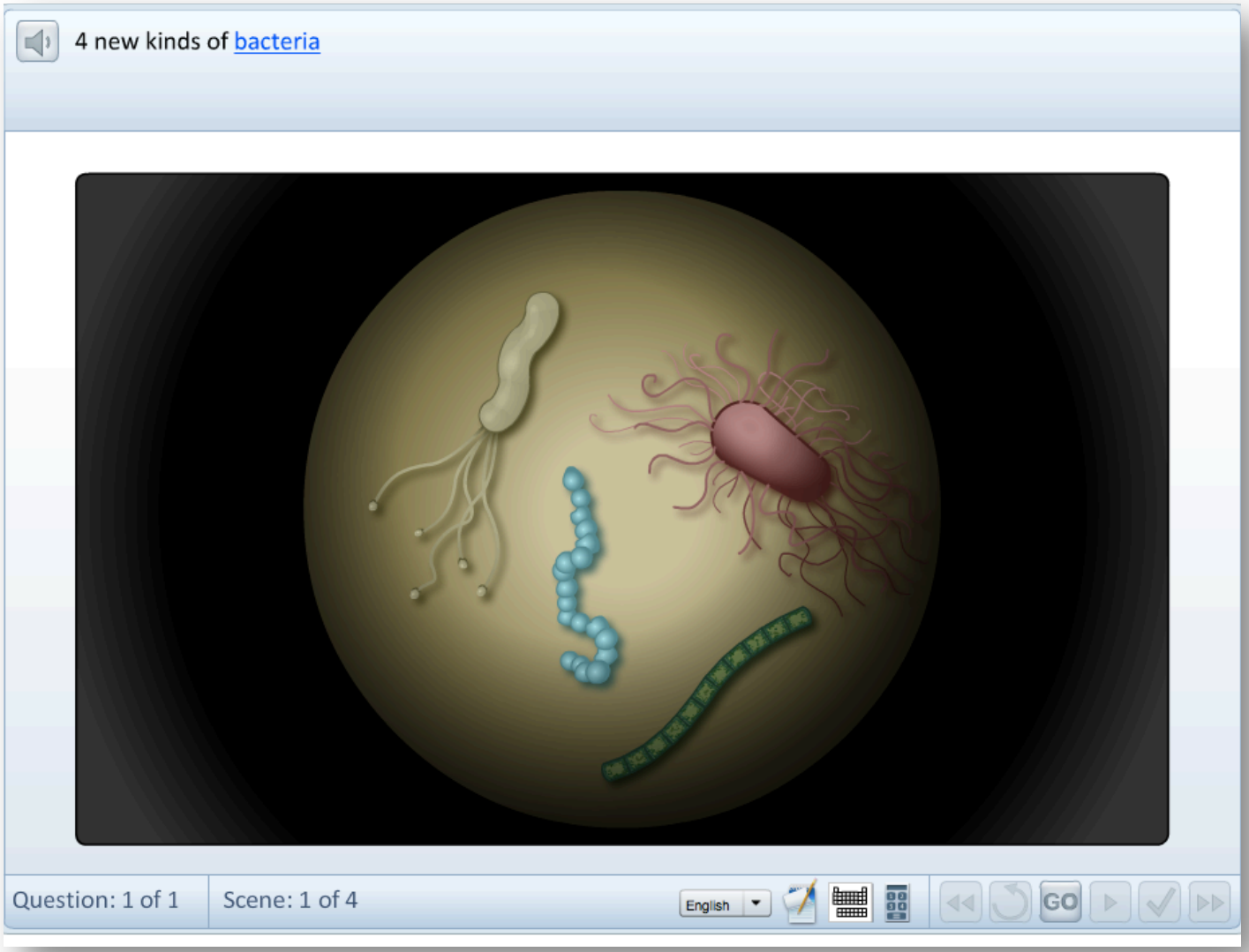
# Gas Exchange – Middle School



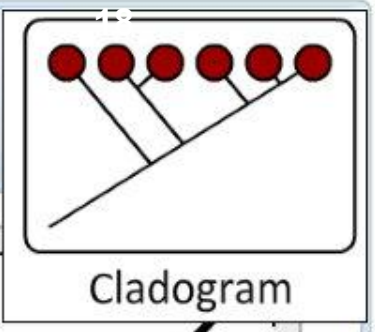
# Food Web Crises - Elementary



# Cladogram – High School

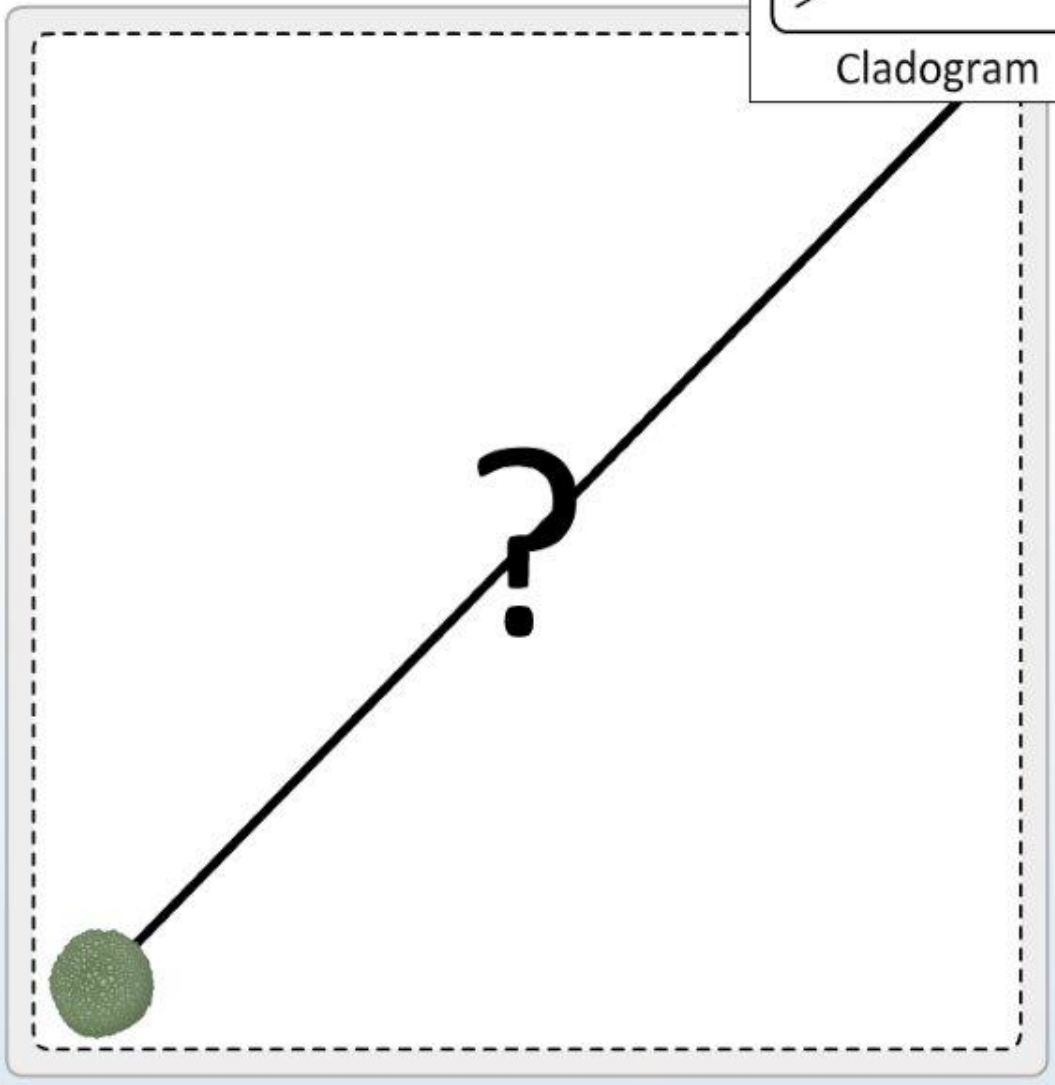


Use the amino acid differences to make a cladogram for the bacteria.




| | Bacteria | Position 11 | 52 | 79 |
|---|---|---|---|---|
| Given |  | W | E | K |
| New |  | V | P | R |
| New |  | V | E | R |
| New |  | W | E | R |
| New |  | V | E | R |



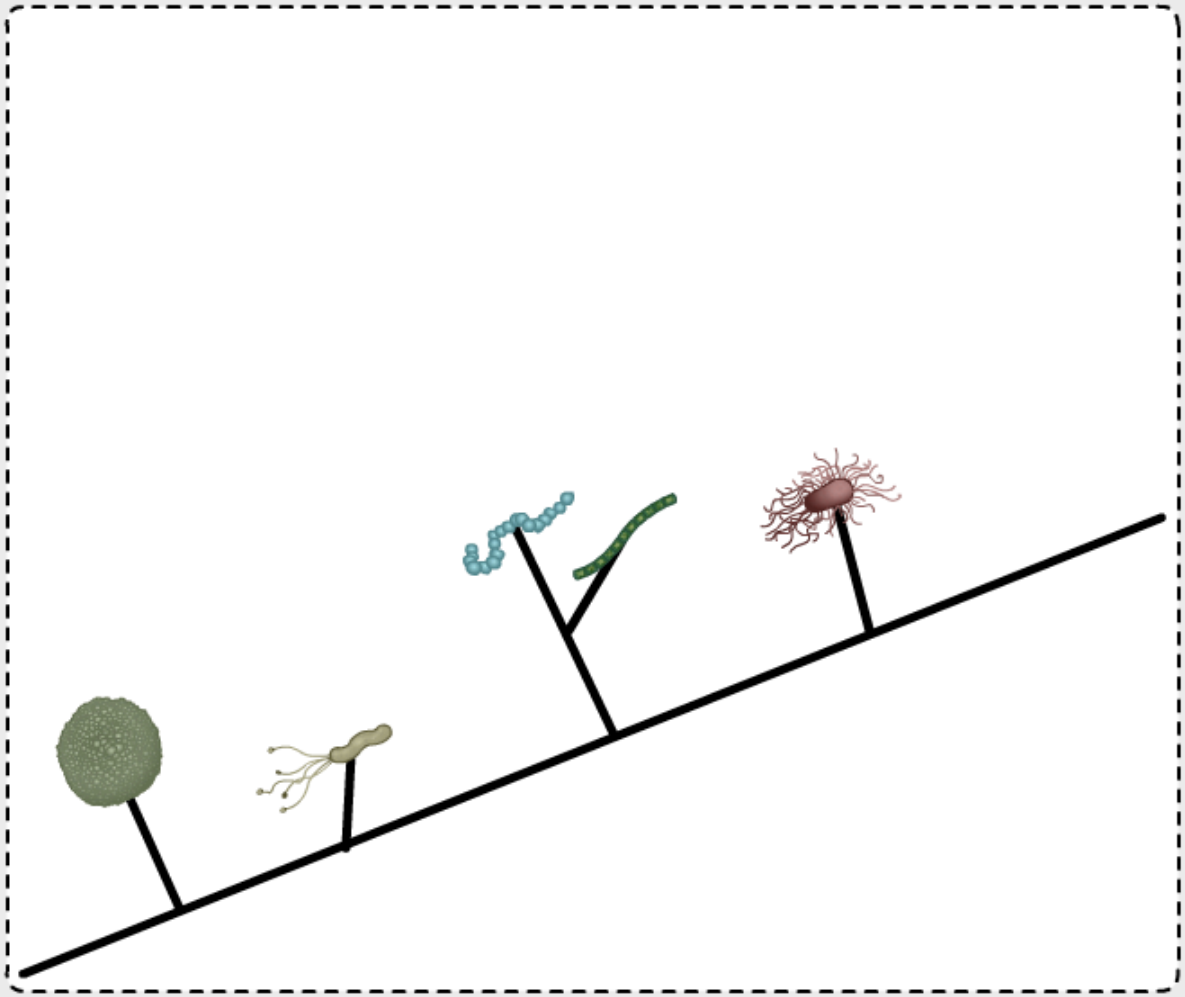





Thank you

Use the amino acid differences to make a cladogram for the bacteria.

| | Bacteria | Position 11 | 52 | 79 |
|---|---|---|---|---|
| Known |  | W | E | K |
| New |  | V | P | R |
| |  | V | E | R |
| |  | W | E | R |
| |  | V | E | R |

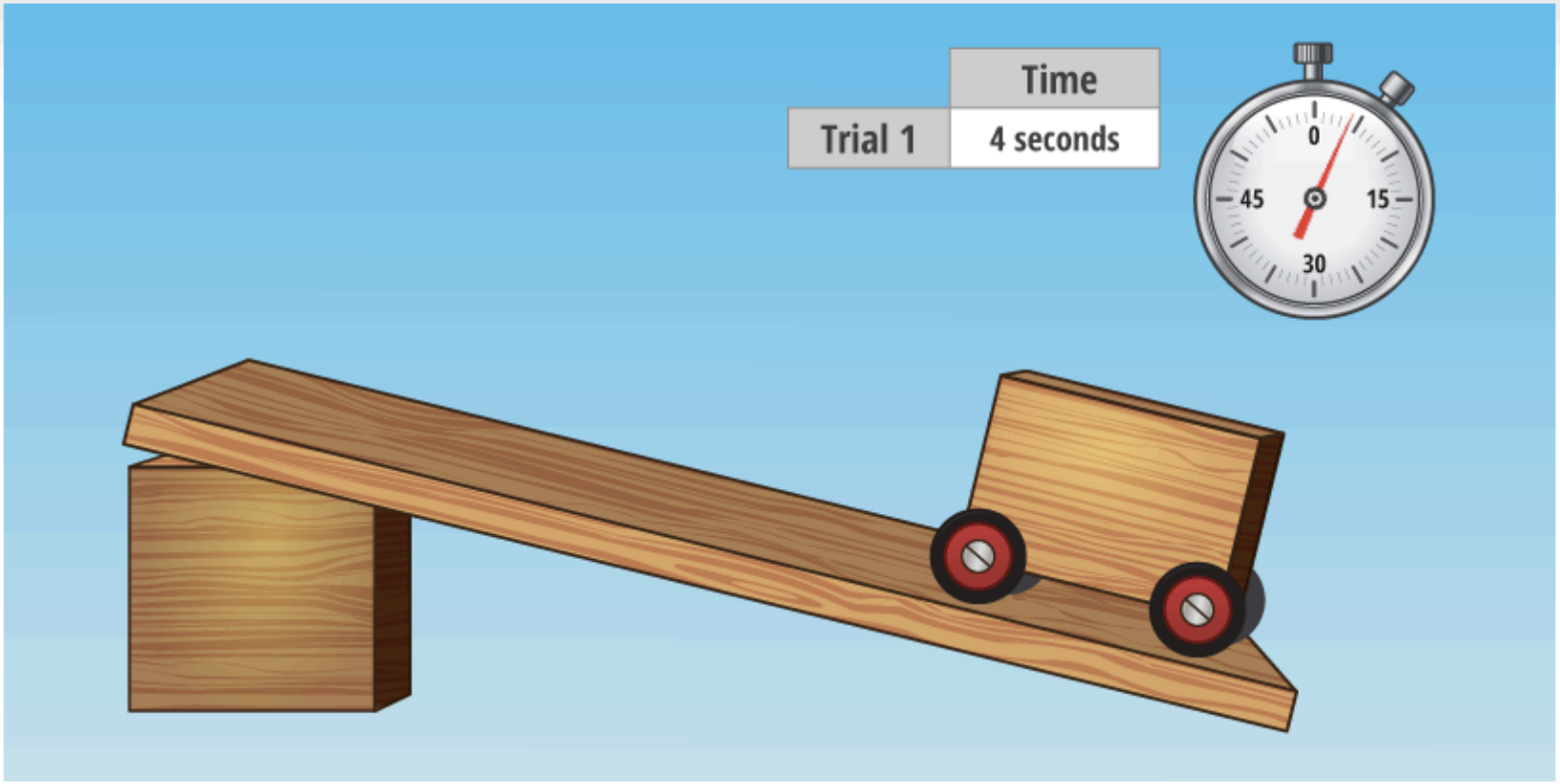


Question: 1 of 1

Scene: 4 of 4

English

# Ramp Experiment – Middle School



ENGLISH
TRANSLATE

Set up an experiment to test how cart weight affects time down the ramp.

?







ENGLISH
TRANSLATE

Set up an experiment to test how cart weight affects time down the ramp.

?

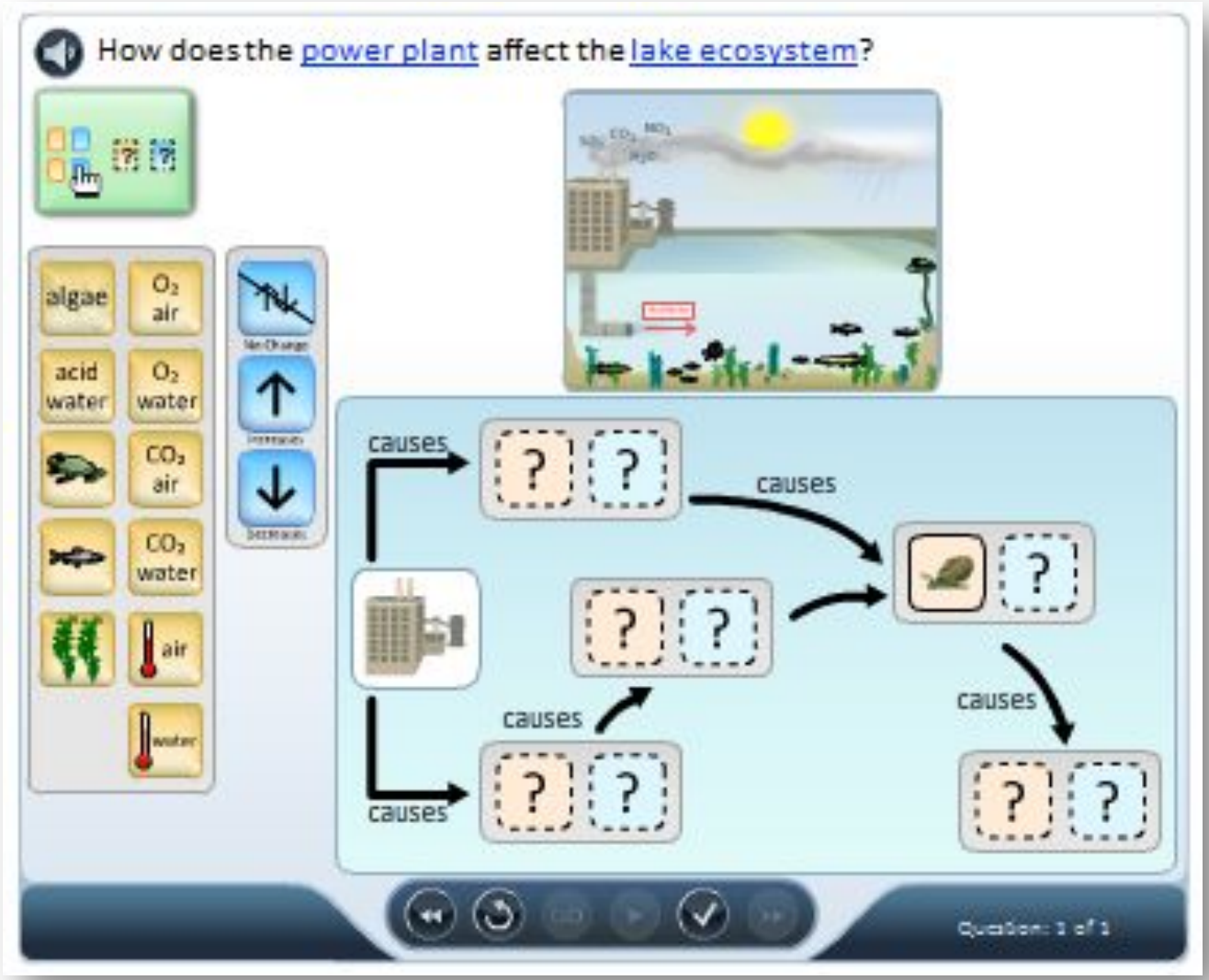




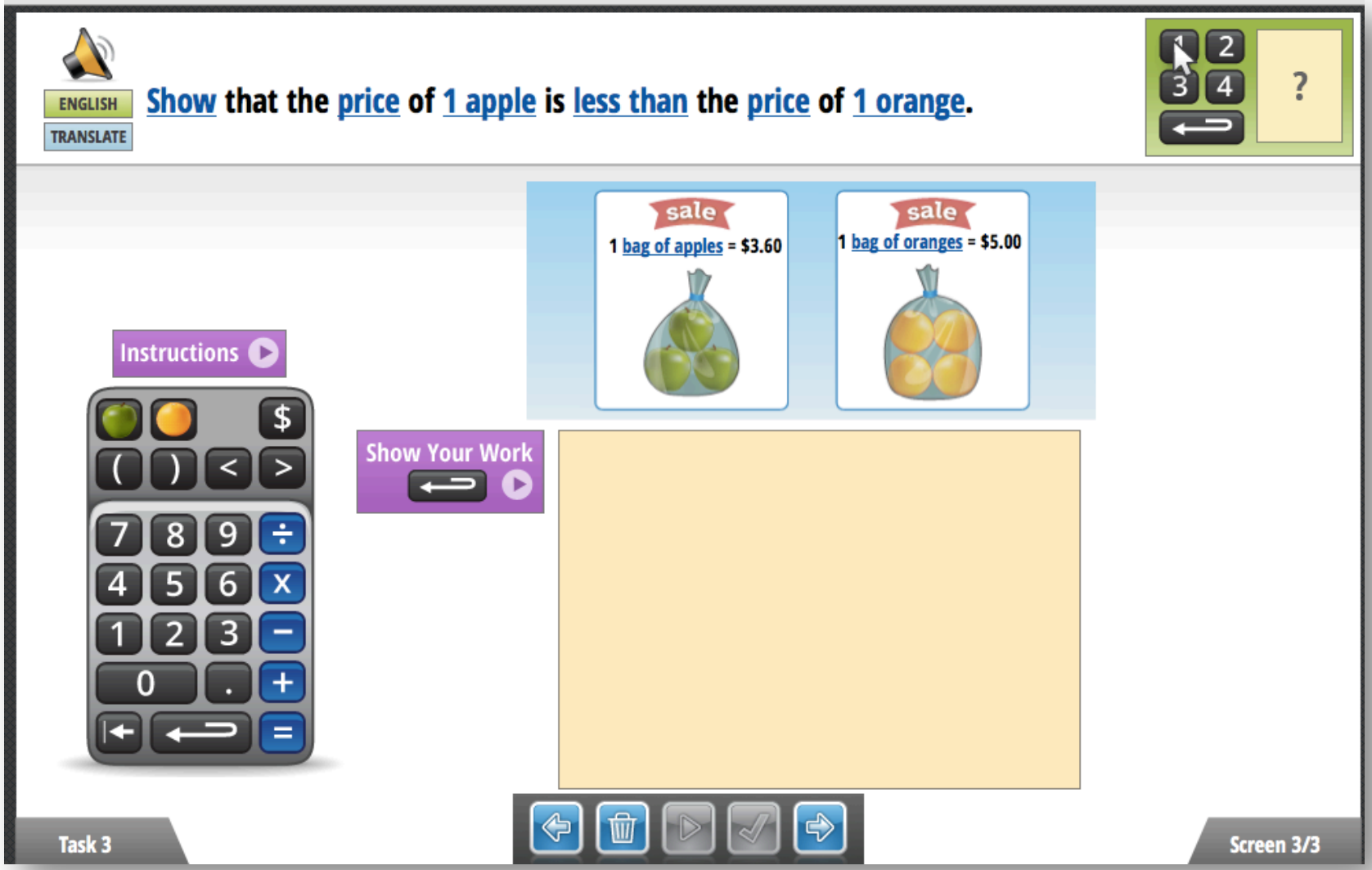




# Power Plant – Middle School



# Apples and Oranges – Elem Math



ENGLISH
TRANSLATE

Show that the price of 1 apple is less than the price of 1 orange.

1 2 3 4 ?

sale
1 bag of apples = $3.60

sale
1 bag of oranges = $5.00

Instructions

$ ( ) < >
7 8 9 ÷
4 5 6 x
1 2 3 −
0 . +
= 

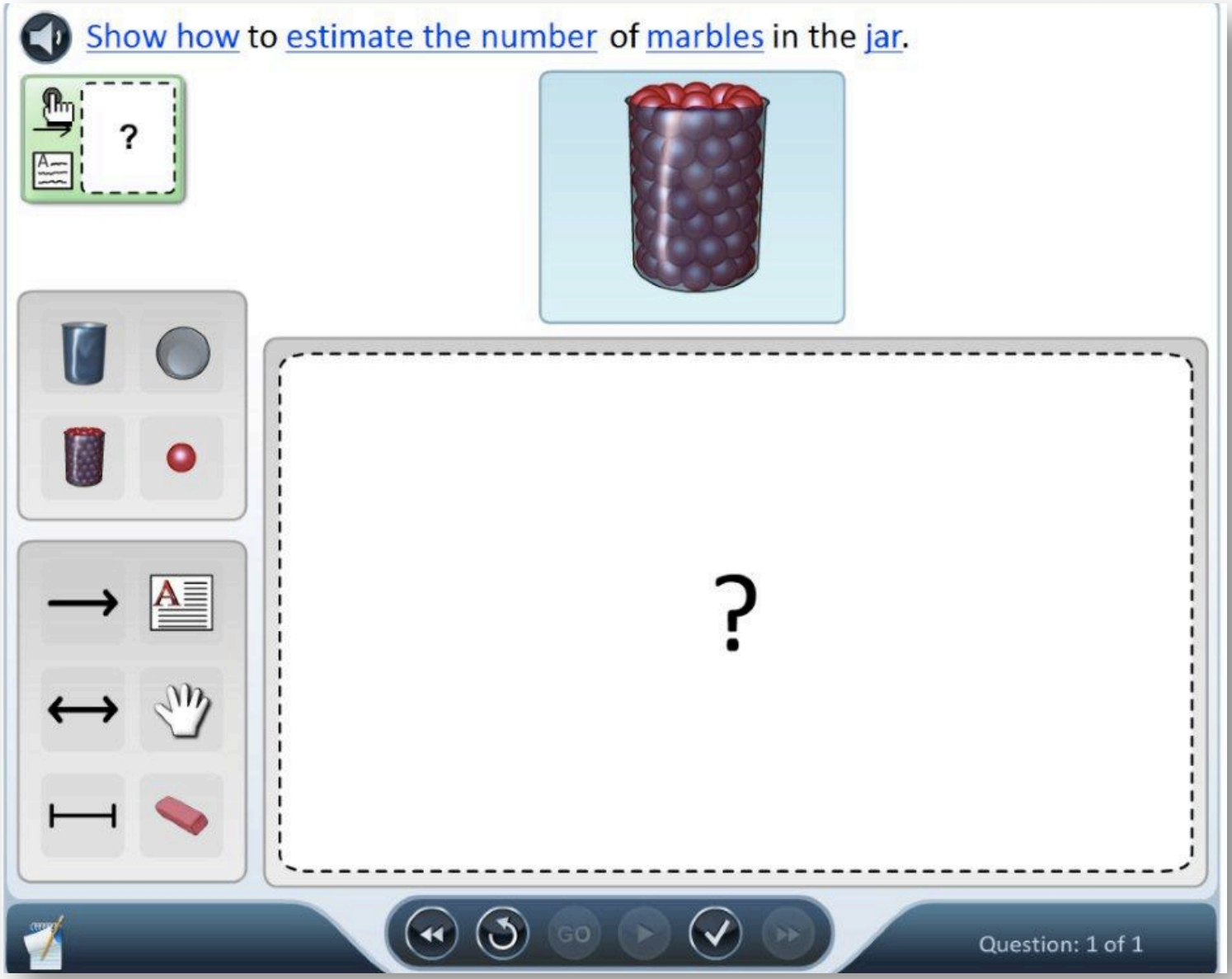
Show Your Work

3 =3.6
3.6/3=1.2
4 =5
5/4=1.25
1.2<1.25
 < 

Task 3

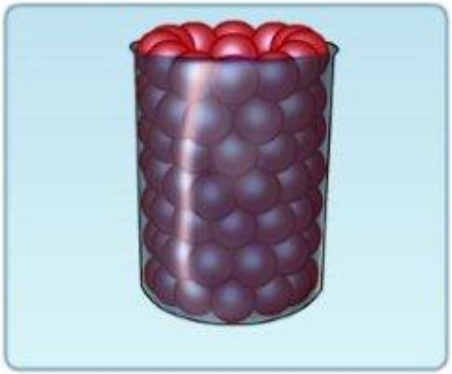
Screen 3/3

# Marbles Volume – MS Mathematics



Show how to estimate the number of marbles in the jar.

?



12 marbles per layer

6 layers

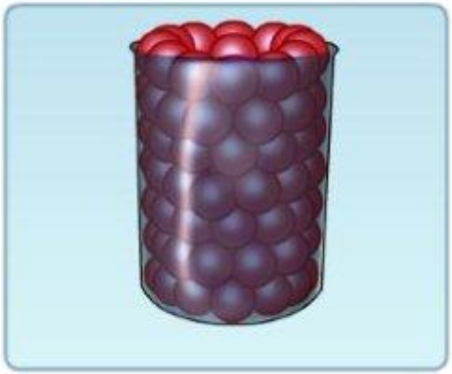
12*6 = 72

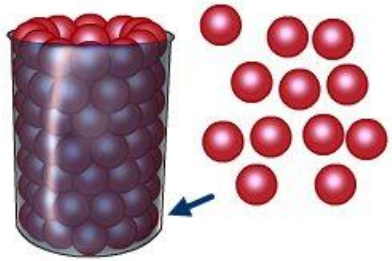
GO

Question: 1 of 1

Show how to estimate the number of marbles in the jar.

?





12 marbles on the bottom row

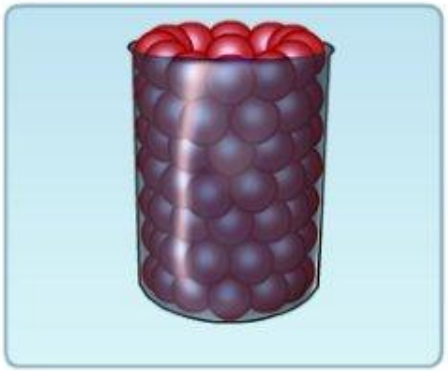
there are about 7 rows in the jar

12x7=84 marbles

GO

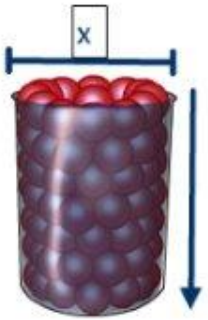
Question: 1 of 1

Show how to estimate the number of marbles in the jar.



Count the number of marbles on the top of the jar, then multiply by the amount of

rows of marbles in the jar



# For More Information

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**Thank you!**

INSTITUTE for innovative ASSESSMENT

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