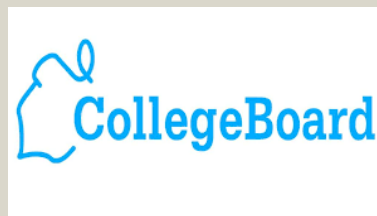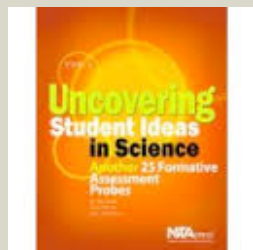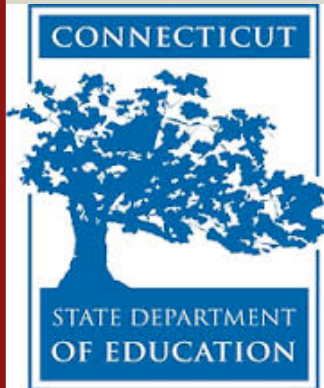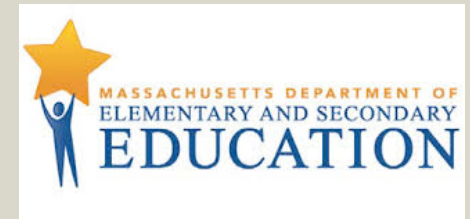# The SNAP Item Landscape Analysis:
Four considerations for new item development for NGSS

Jill Wertheim
Stanford University/SCALE

NARST
Baltimore, 2016

Landscape Analysis: What lessons can we learn from what already exists to guide the development of the next generation of assessments?

SNAP Assessment Landscape Analysis

Review criteria to evaluate suitability for NGSS

Database with over 200 resources

- Incl. PISA, IB, released state assessments, NAEP item bank, PALS, etc.
- Short response & performance tasks
- Reviewed a sample of 51 resources (~400 items)

Quantitative & qualitative analysis

Overview of the SNAP Task Bank

N=51 assessments

N=51 assessments
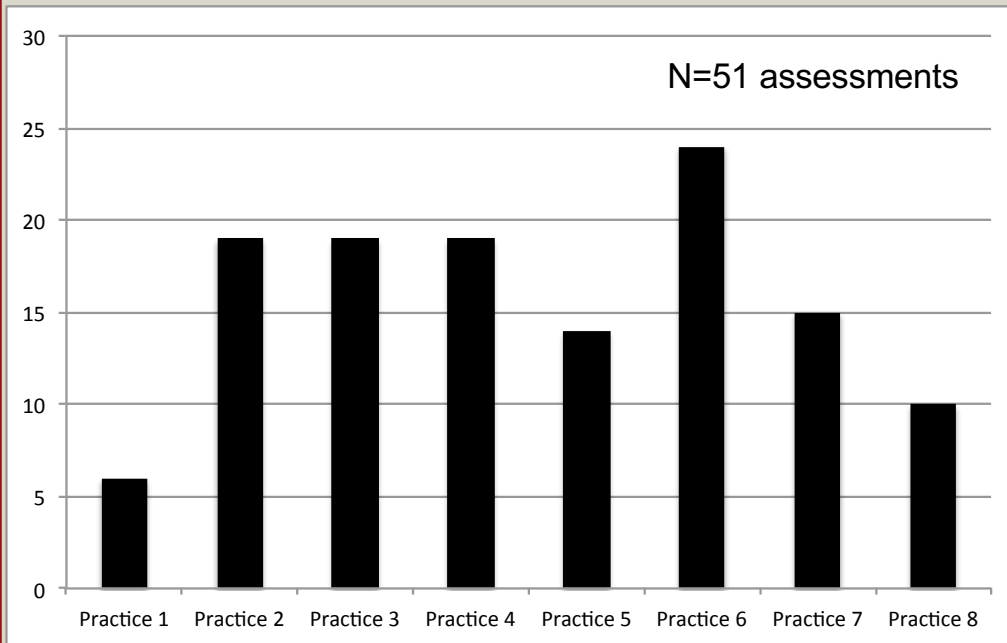
1: asking questions and defining problems
2: developing and using models
3: planning and carrying out investigations
4: analyzing and interpreting data
5: using mathematical and computational thinking
6: constructing explanations and designing solutions
7: engaging in argument from evidence
8: obtaining, evaluating, and communicating information

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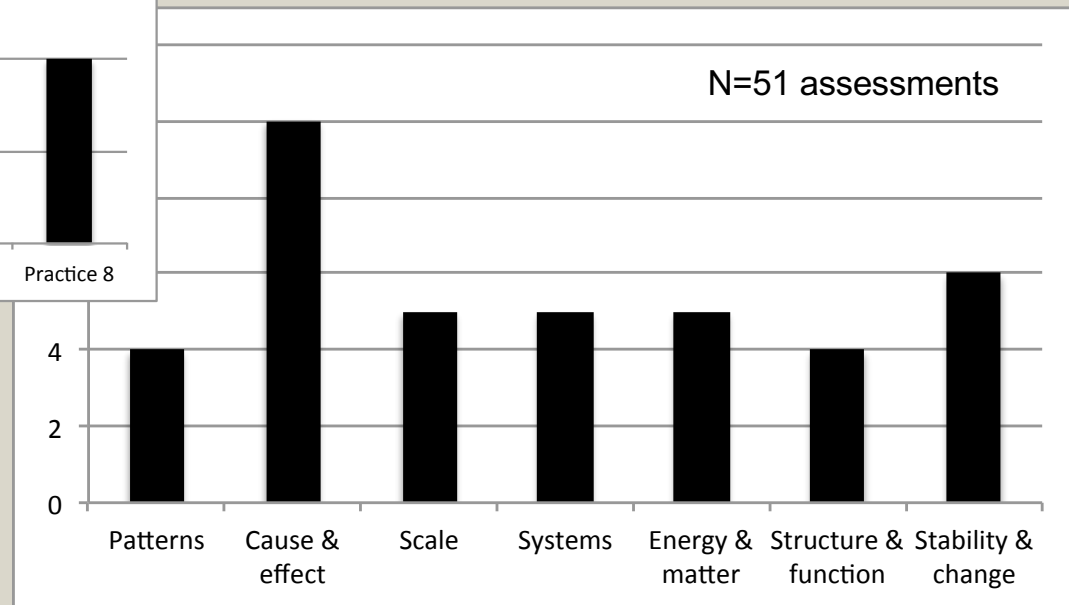
Trends in existing assessments, and
Lessons for development of the next generation of assessments

Lessons for development of the next generation of assessments:
Tasks must fully integrate multiple dimensions

Example of a typical task with unintegrated dimensions:

5. A class investigating the motion of a tire swing collected the data in the table below. The students were able to draw conclusions about the factors that affect the motion of a swing. Two students from the class decide to use the class data to build a different-size tire swing in their backyard. They build the tire swing shown in the diagram.

Tree Branch — Rope — Tire
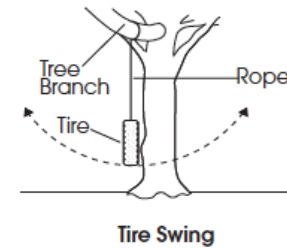
Tire Swing

	Tire Swing Investigation Data		
Swing	Length of Rope (meters)	Mass of Tire (kilograms)	Time it Takes for the Tire Swing to Move Back and Forth Once (seconds)
1	2	10	2.8
2	2	20	2.8
3	4	10	4.0
4	4	20	4.0

After testing the swing, they decide that they want to make it swing faster.

Based on the data from the class investigation, what could the students do to make their tire swing move back and forth faster?

A. use a shorter rope
B. use a longer rope
C. use a less massive tire
D. use a more massive tire

Ohio Grade 8

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Lessons for development of the next generation of assessments:
Tasks must fully integrate multiple dimensions

Example of a typical task with unintegrated dimensions
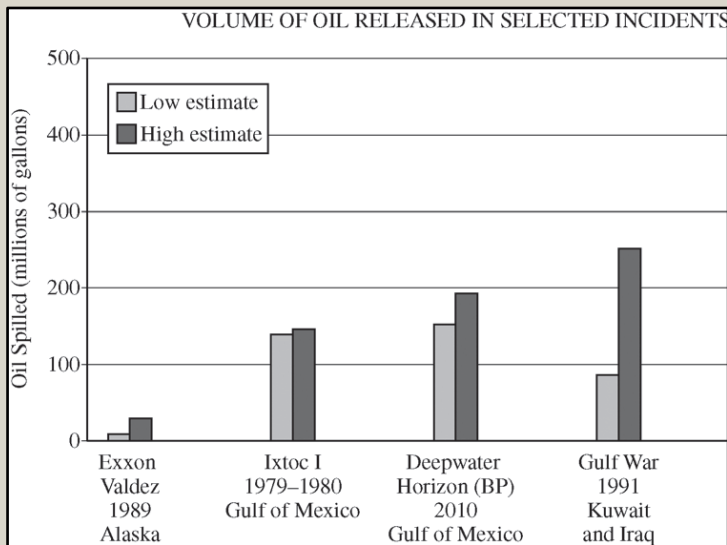
Advanced Placement Environmental Science College Board, 2015

Oil spills can be devastating in scope and damage. Since 1900, there have been many oil spills around the world that have had significant ecological and economic impacts.

(a) Using the data in the graph above, **determine** the maximum volume of oil estimated to have been spilled during the Deepwater Horizon (BP) incident.

(b) **Describe** TWO environmental problems that can result from oil spills in coastal areas.

(c) **Identify** one economic impact that results from oil spills in coastal areas.

(d) Chemical dispersants have been used in cleanup efforts following major oil spills.
(i) **Discuss** both one advantage and one disadvantage of the use of chemical dispersants for oil spill cleanup.
(ii) **Identify** either one biological or one physical method (other than chemical dispersal) used for oil spill cleanup in coastal waters or on beaches and **describe** how the method is used.

Integration of multiple dimensions: model

This simulation assumes that gases are made of tiny particles. Set up the model in various ways, simulating what you just did with the real syringe, to see how well a particle model might explain your observations.
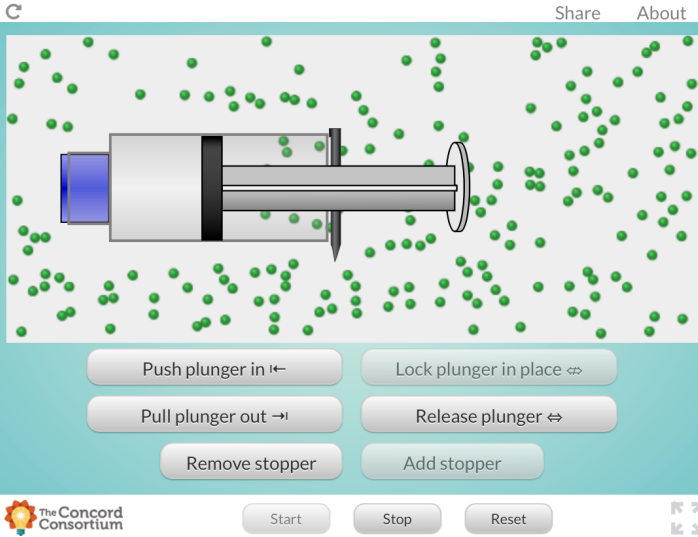
Question #11

Revisit your initial model of a gas (the first question of this activity). Do the components of your initial model explain your observations of gas being compressed in the syringe? If not, what revisions would you make to your model?

Type answer here

Share   About

Push plunger in ⊢←   Lock plunger in place ⇔

Pull plunger out →⊢   Release plunger ⇔

Remove stopper   Add stopper

The Concord Consortium   Start   Stop   Reset

Question #12

Write a scientific explanation that answers the question, *How is it possible to compress a given amount of air into a smaller space?* In your explanation be sure to include the following:

- Claim - your answer to the question

- Evidence - observations or data

- Reasoning - thinking that includes ideas the class has agreed on and connects your evidence to your claim

http://mw.concord.org/nextgen/

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Lessons for development of the next generation of assessments:
Tasks must focus on the big ideas for science

Typical item

The uterus (womb) is part of the reproductive system in mammals.
Name one function of the uterus.

TIMSS 2011

LS1: In multicellular organisms, the body is a system of multiple interacting subsystems. These subsystems are groups of cells that work together to form tissues and organs that are specialized for particular body functions.

DCI

MS-LS1-3 Use argument supported by evidence for how the body is a system of interacting subsystems composed of groups of cells.

Performance Expectation

Lessons for development of the next generation of assessments:
Tasks must probe the full range of science and engineering practices

Unpacking **Planning and Carrying out Investigations**
From the Next Generation Science Assessment Project

Component	Planning investigations	Carrying out investigations	Evaluating investigations
Tools and instruments	**Identify** tools/instruments required to gather data	**Set up and use** tools/instruments	**Determine** whether and **describe** why tools were/were not appropriately identified or correctly used
Measurement procedure	**Determine** what measurement methods will be used	**Make** measurements using tools/instruments	**Determine** whether and **describe** why appropriate measurement methods were/were not used or measurements were/were not correctly made
Measurement reliability	**Determine** how much data are needed to produce reliable measurements	**Collect** enough data for reliable measurements	**Determine** whether and **describe** why an appropriate amount of data were/were not collected
Sources of error	**Identify** potential sources of error		**Determine** whether and **describe** why potential sources of error were/were not correctly identified
Step-by-step procedures	**Describe** a step-by-step procedure for carrying out the investigation	**Execute** a step-by-step procedure for carrying out the investigation	**Determine** whether and **describe** why procedures were/were not appropriately described or correctly executed
Components for investigations that determine relationships among system variables			
Identifying variables	**Identify** relevant variables		**Determine** whether and **describe** why relevant variables were/were not appropriately identified
Dependent/ independent variables	**Identify** dependent and independent variables		**Determine** whether and **describe** why dependent and independent variables were/were not appropriately identified
Controlled variables	**Identify** what variables should be controlled		**Determine** whether and **describe** why controlled variables were/were not appropriately identified
Confounding variables	**Identify** potentially confounding variables		**Determine** whether and **describe** why potentially confounding variables were/were not appropriately identified

Lessons for development of the next generation of assessments:
Tasks must probe the full range of science and engineering practices

Typical

Dan and Dawn want to know if there is any difference between the mileage expected from bicycle tires from two different manufacturers. Dan will put one brand on his bike and Dawn will put the other brand on her bicycle. Which of the following variables would be MOST important to control in this experiment?

a) The time of day the test is made.
b) The number of miles traveled by each type of tire.
c) The physical condition of the cyclist.
d) The weather condition.
e) The weight of the bicycle used.

Iowa Assessment Handbook
Enger & Yager, 1998

Model

Kayra and Emre are studying plants. They have learned that characteristics such as the height of plants and the color of fruit are inherited.

They are looking at some green and red peppers.
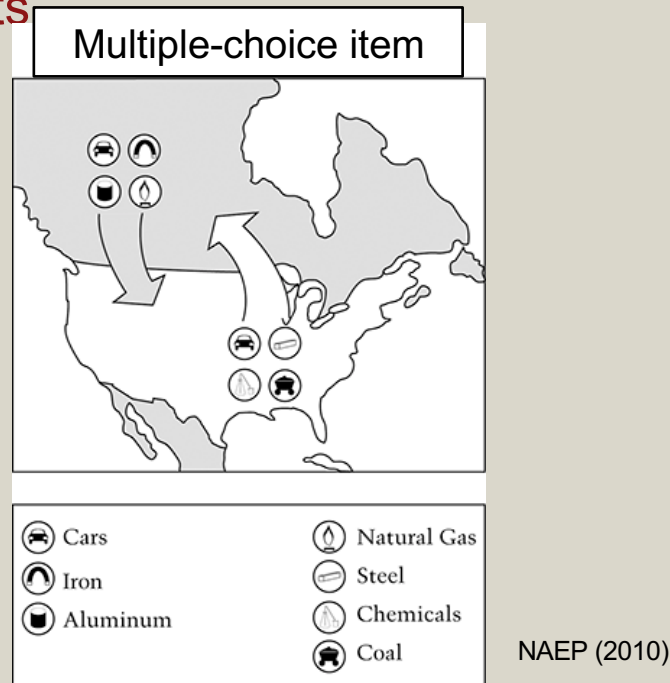

green peppers   red peppers

Kayra thinks they are different kinds of peppers, because they are different colors.

Emre thinks that they are the same type of pepper, and red peppers are red because they have been left on the plant longer and have ripened.

Describe how you could set up an investigation to decide whether Kayra or Emre is correct.

TIMSS 2011

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Lessons for development of the next generation of assessments:
Need diversity in task formats

Multiple-choice item

Cars — Natural Gas
Iron — Steel
Aluminum — Chemicals
Coal

NAEP (2010)
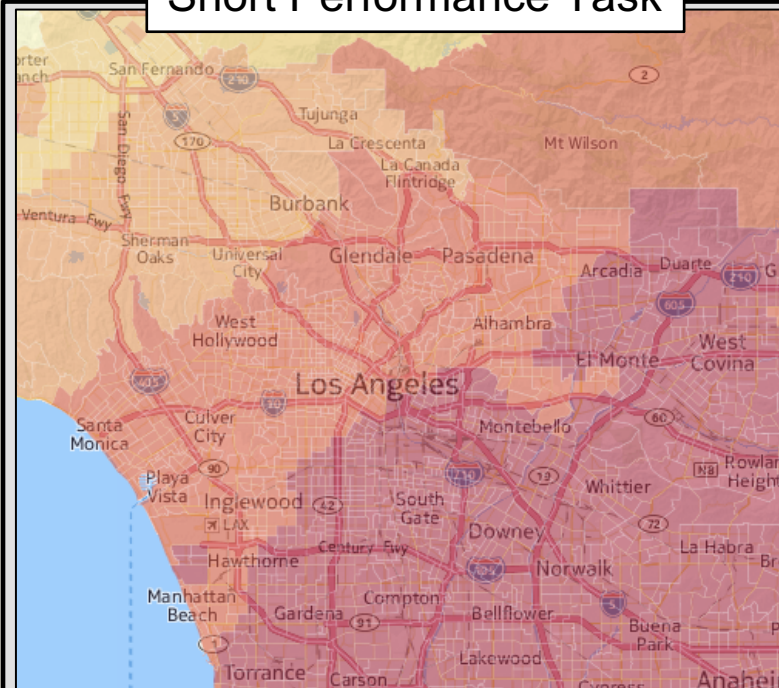
According to the map above, which of the following does the United States both export to Canada and import from Canada
A. Cars
B. Iron
C. Aluminum
D. Coal

-Retrieve information from a map

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Short Performance Task

Communities in Los Angeles	Types of air pollution	
	Toxic Releases	Ozone
Burbank	555.91	0.11
Compton	9,244.7	0
Glendora	827.29	0.3
Long Beach	9,815	0
Malibu	476.32	0.01
Santa Monica	2141	0
Simi Valley	27.17	0.16

Write sentences here:

-Retrieve information from multiple sources (table, journal, report)
-Combine information and knowledge to communicate a message

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Curriculum-embedded performance task
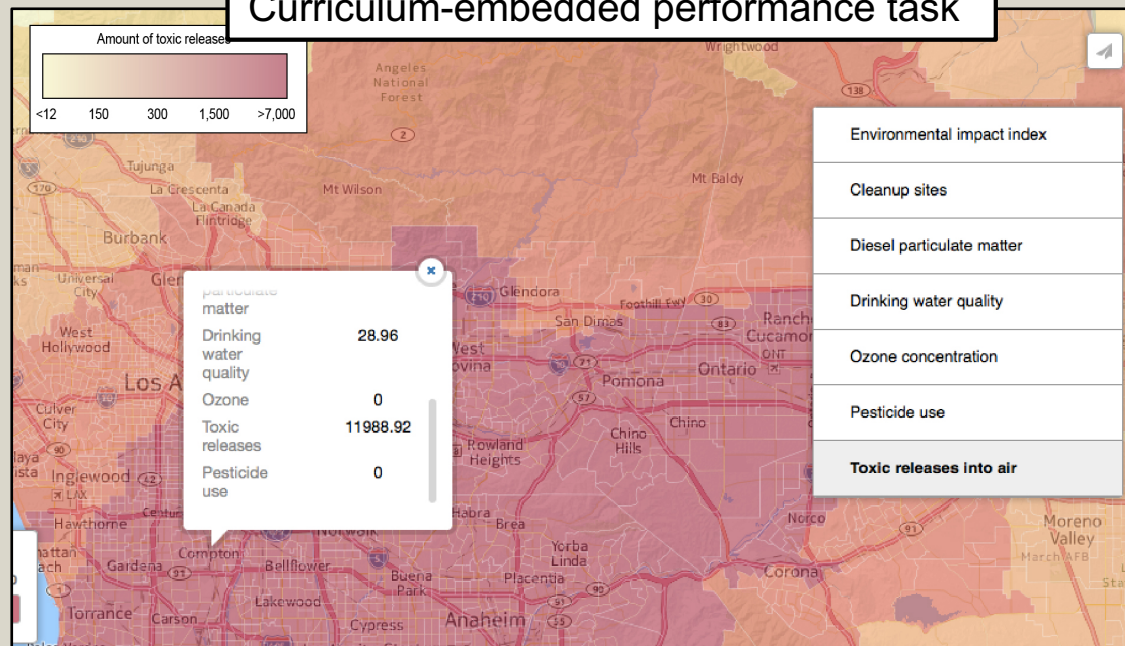
-Articulate a research question
-Retrieve information from multiple sources (map, journal, report)
-Analyze data
-Develop and justify an interpretation of analysis
-Construct and present an argument
-Evaluate an argument
-Develop a system model
-Combine information to create a compelling and convincing communication

Please visit **snapgse.stanford.edu** for:

- the full report with many more example and model items
- example item reviews
- SNAP's model short items, short performance tasks, and curriculum-embedded tasks with scoring guides and student work (in progress)

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