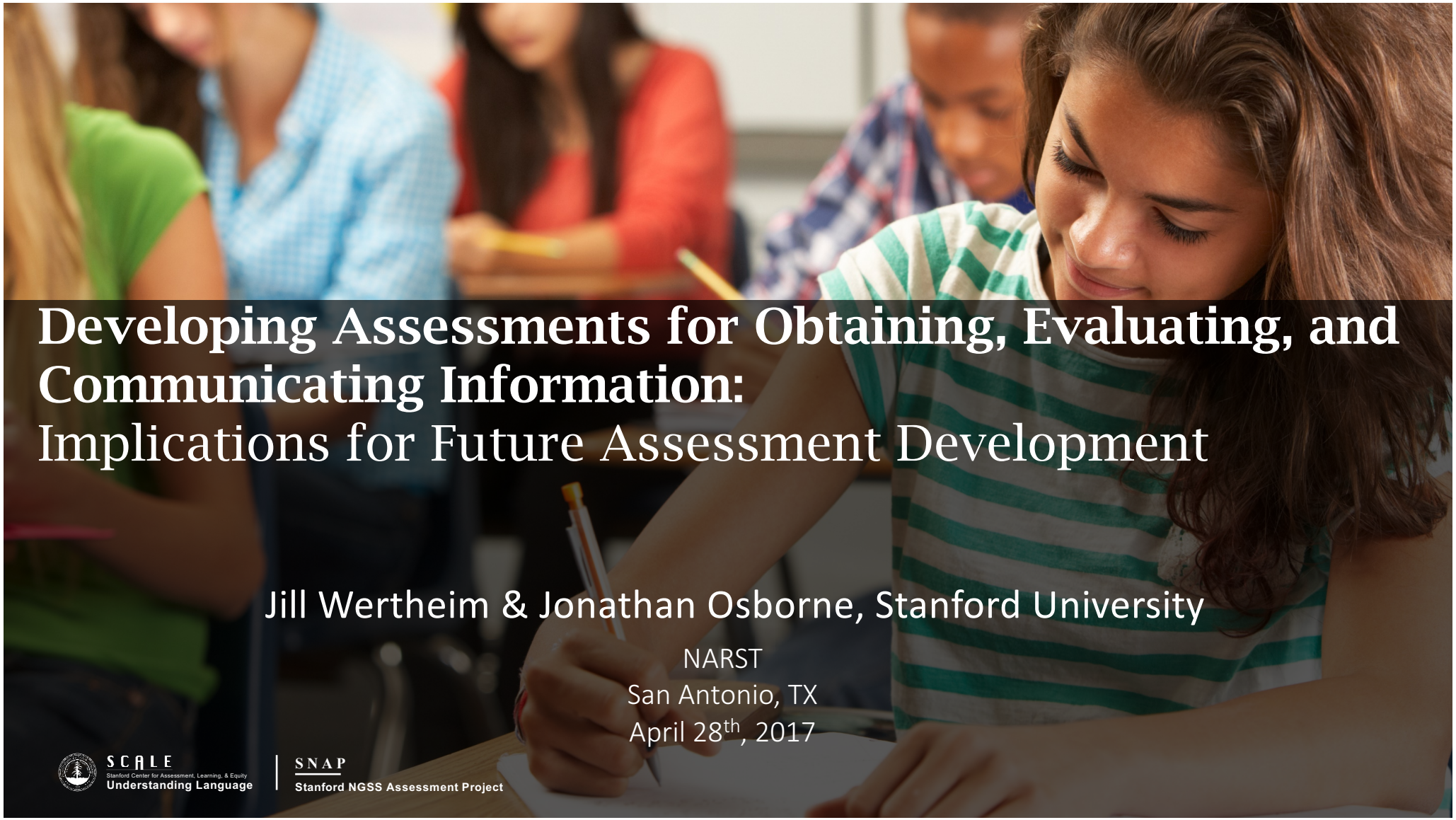

Developing Assessments for Obtaining, Evaluating, and Communicating Information:
Implications for Future Assessment Development

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NARST
San Antonio, TX
April 28th, 2017

SCALE
Stanford Center for Assessment, Learning, & Equity
Understanding Language

SNAP
Stanford NGSS Assessment Project

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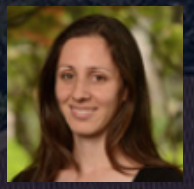

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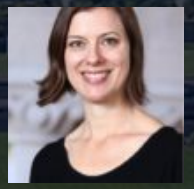

Sara Dozier

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Performance Assessment Development

Lit. review on novice-expert progress along each dimension

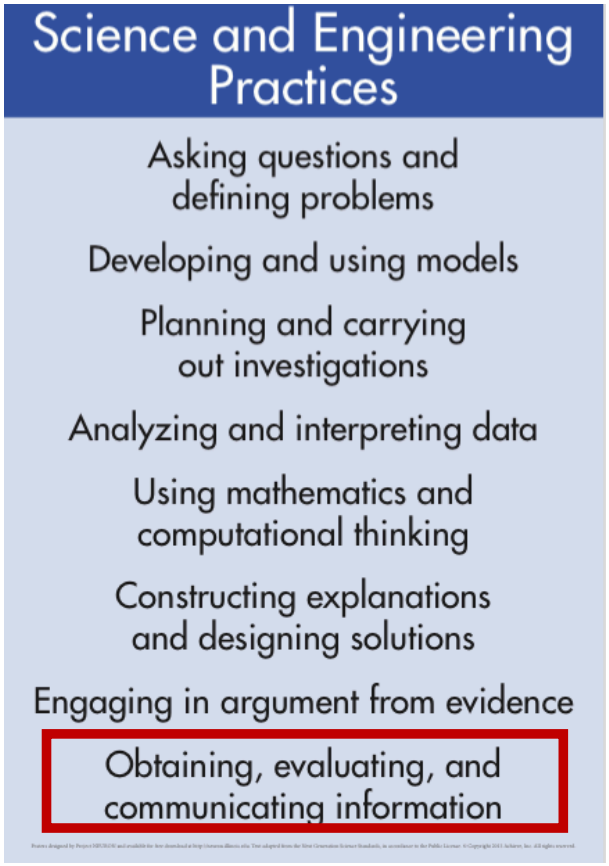
Define progress variables

Develop assessment that elicits evidence across progress variables

Study Overview

Exploratory question: How do Elementary students engage with the NGSS Practice 8: *Obtaining, evaluating, and communicating information*?

- Which components of NGSS Practice 8 do students struggle with and which parts do they find straightforward?
- What are effective ways of eliciting students' proficiency with each component of this practice?



Purpose:

to begin building a knowledge base around assessing the NGSS Science Practice 8: ***Obtaining, evaluating, and communicating information***

NGSS is being assessed

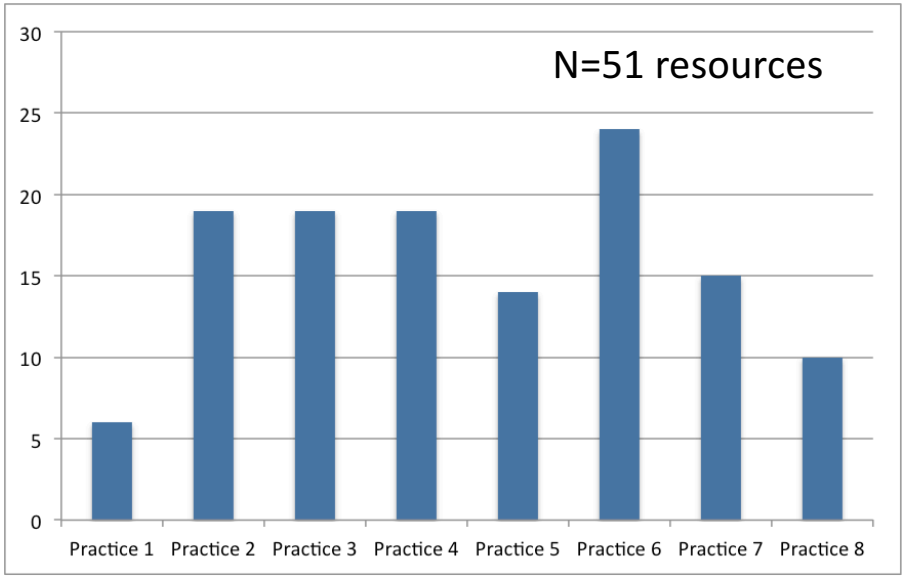
California's timeline:

Year	CA NGSS general assessment	CA NGSS alternate assessment
2017	Pilot test	Pilot test
2018	Field test	Pilot test
2019	Operational test	Field test
2020	Operational test	Operational test

Purpose:

to begin building a knowledge base around assessing the NGSS Science Practice 8: *Obtaining, evaluating, and communicating information*

- NGSS is being assessed
- Some dimensions are better understood than others



From Wertheim et al. (2016)

Purpose:

to begin building a knowledge base around assessing the NGSS Science Practices

- NGSS is being assessed
- Some dimensions are better understood than others
- Variation in the depth of the knowledge base within a practice

Grades K-2	Grades 3-5	Grades 6-8	Grades 9-12
Obtaining, evaluating, and communicating information in K–2 builds on prior experiences and uses observations and texts to communicate new information. • Read grade-appropriate texts and/or use media to obtain scientific and/or technical information to determine patterns in and/or evidence about the natural and designed world(s). • Describe how specific images (e.g., a diagram showing how a machine works) support a scientific or engineering idea. • Obtain information using various texts, text features (e.g., headings, tables of contents, glossaries, electronic menus, icons), and other media that will be useful in answering a scientific question and/or supporting a scientific claim. • Communicate information or design ideas and/or solutions with others in oral and/or written forms using models, drawings, writing, or numbers that provide detail about scientific ideas, practices, and/or design ideas.	Obtaining, evaluating, and communicating information in 3–5 builds on K–2 experiences and progresses to evaluating the merit and accuracy of ideas and methods. • Read and comprehend grade-appropriate complex texts and/or other reliable media to summarize and obtain scientific and technical ideas and describe how they are supported by evidence. • Compare and/or combine across complex texts and/or other reliable media to support the engagement in other scientific and/or engineering practices. • Combine information in written text with that contained in corresponding tables, diagrams, and/or charts to support the engagement in other scientific and/or engineering practices. • Obtain and combine information from books and/or other reliable media to explain phenomena or solutions to a design problem. • Communicate scientific and/or technical information orally and/or in written formats, including various forms of media as well as tables, diagrams, and charts.	Obtaining, evaluating, and communicating information in 6–8 builds on K–5 experiences and progresses to evaluating the merit and validity of ideas and methods. • Critically read scientific texts adapted for classroom use to determine the central ideas and/or obtain scientific and/or technical information to describe patterns in and/or evidence about the natural and designed world(s). • Integrate qualitative and/or quantitative scientific and/or technical information in written text with that contained in media and visual displays to clarify claims and findings. • Gather, read, and synthesize information from multiple appropriate sources and assess the credibility, accuracy, and possible bias of each publication and methods used, and describe how they are supported or not supported by evidence. • Evaluate data, hypotheses, and/or conclusions in scientific and technical texts in light of competing information or accounts. • Communicate scientific and/or technical information (e.g. about a proposed object, tool, process, system) in writing and/or through oral presentations.	Obtaining, evaluating, and communicating information in 9–12 builds on K–8 experiences and progresses to evaluating the validity and reliability of the claims, methods, and designs. • Critically read scientific literature adapted for classroom use to determine the central ideas or conclusions and/or to obtain scientific and/or technical information to summarize complex evidence, concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms. • Compare, integrate and evaluate sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a scientific question or solve a problem. • Gather, read, and evaluate scientific and/or technical information from multiple authoritative sources, assessing the evidence and usefulness of each source. • Evaluate the validity and reliability of and/or synthesize multiple claims, methods, and/or designs that appear in scientific and technical texts or media reports, verifying the data when possible. • Communicate scientific and/or technical information or ideas (e.g. about phenomena and/or the process of development and the design and performance of a proposed process or system) in multiple formats (i.e., orally, graphically, textually, mathematically).

From NGSS Appendix F

Project overview

Assess PE with SEP Obtain, combine, and communicate information

5-ESS3-1 Earth and Human Activity

Students who demonstrate understanding can:

5-ESS3-1. **Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment.**

The performance expectation above was developed using the following elements from the NRC document *A Framework for K- 12 Science Education*:

Science and Engineering Practices

Obtaining, Evaluating, and Communicating Information

Obtaining, evaluating, and communicating information in 3–5 builds on K–2 experiences and progresses to evaluating the merit and accuracy of ideas and methods.

- Obtain and combine information from books and/or other reliable media to explain phenomena or solutions to a design problem.

Disciplinary Core Ideas

ESS3.C: Human Impacts on Earth Systems

- Human activities in agriculture, industry, and everyday life have had major effects on the land, vegetation, streams, ocean, air, and even outer space. But individuals and communities are doing things to help protect Earth's resources and environments.

Crosscutting Concepts

Systems and System Models

- A system can be described in terms of its components and their interactions.

Connections to Nature of Science

Science Addresses Questions About the Natural and Material World.

- Science findings are limited to questions that can be answered with empirical evidence.

Project overview

- Assess PE with SEP Obtain, combine, and communicate information
- Construct performance outcomes

Practice 8: Obtaining, evaluating, and communicating information (Appendix F)

8-1 **Read** and comprehend **grade-appropriate complex texts and/or other reliable media to** summarize and **obtain scientific and technical ideas** and describe how they are supported by evidence.

8-2 Compare and/or **combine across complex texts and/or other reliable media to support the engagement in other scientific** and/or engineering **practices**.

8-3 **Combine information in written text with that contained in corresponding tables, diagrams, and/or charts to support the engagement in other scientific and/or engineering practices**

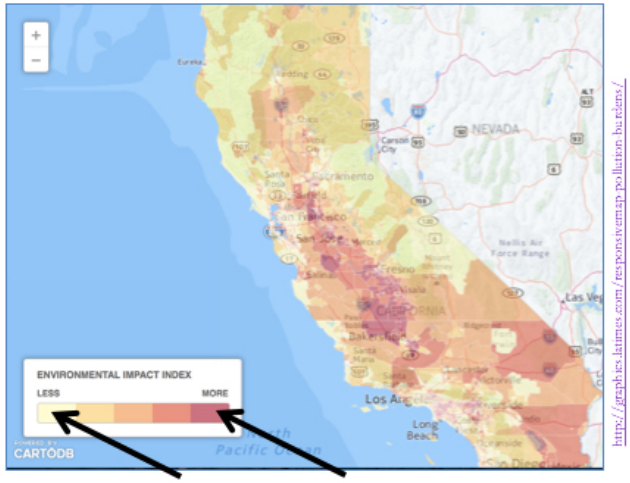
8-4 **Obtain and combine information from books and/or other reliable media to explain phenomena** or solutions to a design problem.

8-5 **Communicate scientific and/or technical information** orally **and/or in written formats**, including various forms of media as well as tables, diagrams, and charts.

Project overview

- Assess PE with SEP Obtain, combine, and communicate information
- Construct performance outcomes
- Create performance task

Scientists studied pollution in California and created the map below to show how much pollution they found in different places.



Lightest yellow: least Darkest red: most

Your job is to create an announcement (message) about a place we are calling Center City. Center City is a community in Los Angeles, California where there are a lot of *toxic releases*. Toxic releases are a type of air pollution.

This message needs to convince people to take action to improve the environment in Center City.

On the next few pages you will find:
1) resources that you can use to find information to include in your message, and
2) questions that will help you write and share your message.

Project overview

- Assess PE with SEP Obtain, combine, and communicate information
- Construct performance outcomes
- Create performance task
- Pilot with students in high ELL populations

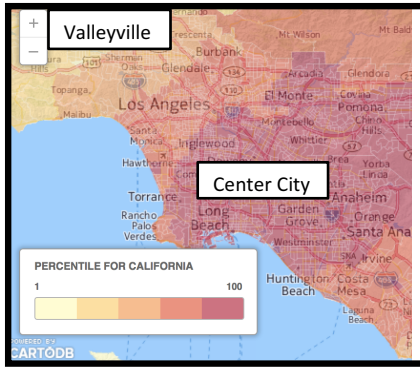
Phase II student population

	Grade	Number of students	% FRL (school)	% ELL (school)
California School 1	6	94	75	32
California School 2	5	33	83	39

15% of students reported only speaking English

Results

Practice 8-1 Read and comprehend grade-appropriate complex texts and/or other reliable media to …obtain scientific…ideas



Communities in Los Angeles (not their real names)	Amount of air pollution	
	Toxic Releases (concentration)	Ozone (ppm)
Outer City	555.9	0.11
Center City	9,244.7	0
Farmland	827.3	0.3
Lower Beach	9,815.0	0
Middle Beach	476.3	0.01
Upper Beach	2,141.0	0
Valleyville	27.2	0.16

Level 1	Level 2	Level 3
4%	31%	67%

one effect of toxic releases is that "we can die from it."

1. Use information from the resources above to complete this table.		
Amount of toxic releases in Center City:	List 2-3 things that can cause toxic releases in a large city.	List 2 ways that high air pollution could affect the people and the environment in a large city.
Amount of toxic releases in Valleyville:		

Results

Practice 8-2 Combine across complex texts and/or other reliable media to support the engagement in other scientific practices.

2. What could cause two parts of a large city, such as Center City and Valleyville, to have such a different amount of toxic releases?

Level 1	Level 2	Level 3	Level 4
24%	29%	9%	39%

"It might be that Center City has a bigger or larger population. Since the population is higher the city might have more cars, buses, airplanes, and factories and that might increase the toxic releases."

Results

Practice 8-2 Combine across complex texts and/or other reliable media to support the engagement in other scientific practices.

2. What could cause two parts of a large city, such as Center City and Valleyville, to have such a different amount of toxic releases?

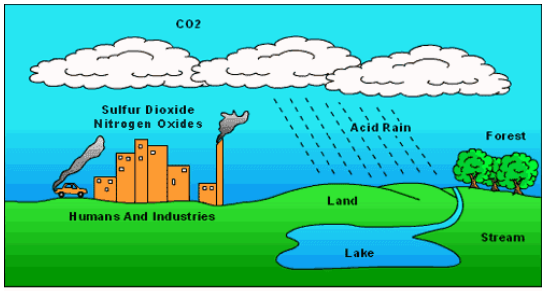
Level 1	Level 2	Level 3	Level 4
24%	29%	9%	39%

"More cars factories sewage treatment"

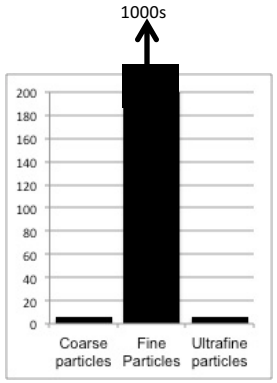
Results

Practice 8-3/4 Obtain… and combine in written text information contained in tables, diagrams, and/or charts to explain phenomena.

4. …Help people in California understand how air pollution in a few places could affect everyone in the state. Use information from the picture, data and what you know about air pollution to support your explanation



Acid Rain



Level 1	Level 2	Level 3	Level 4	Level 5
43%	32%	16%	7%	2%

"The smoke of cars or smoke from the factories or wild fires those are really toxic releases that effect the air and we can get sick, the smoke would go to the air and go to the clouds and that would make acid rain so if it goes to a lake or mountains or sea we al can get sick even you"

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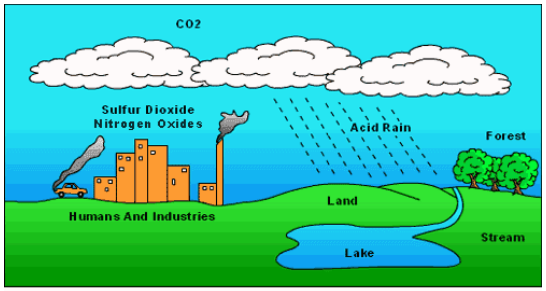
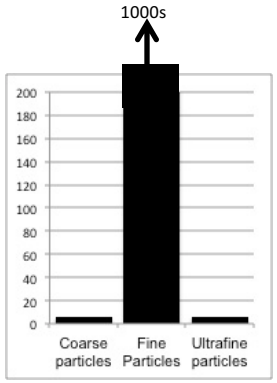
Results

Obtain (8-4) and combine (8-3) in written text information contained in tables, diagrams, and/or charts to explain phenomena.

4. …Help people in California understand how air pollution in a few places could affect everyone in the state. Use information from the picture, data and what you know about air pollution to support your explanation



Acid Rain



Level 1	Level 2	Level 3	Level 4	Level 5
43%	32%	16%	7%	2%

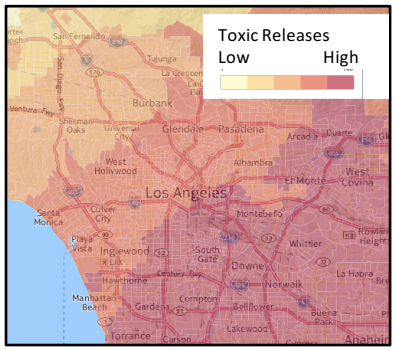
"When we go to work at a factory we go in our cars and that pollutes the air and factories let out sulfur dioxide and nitrogen oxide and that goes into the air then acid rain falls it goes to streams and lakes"

Results

8-3 Combine and... **8-5** communicate scientific and/or technical information … in written formats…

4…..Your announcement should:

- compare the amount of toxic releases in Center City to less polluted places,
- describe causes or effects of a large amount of toxic releases,
- suggest ways that communities can fix this problem



Level 1	Level 2	Level 3	Level 4
31%	20%	22%	27%

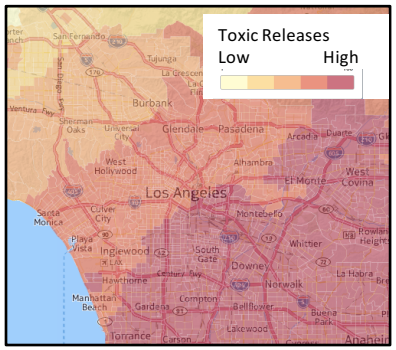
"Did you know that there are many cities with a lot of toxic releases. Your city can be one of them. What can cause this effect is cars, buses, building, or factories. To have less toxic releases, instead of driving you can walk, this is only one example but theres more. I hope you can try this your self! "

Results

8-3 Combine and... **8-5** communicate scientific and/or technical information … in written formats…

4…..Your announcement should:

- compare the amount of toxic releases in Center City to less polluted places,
- describe causes or effects of a large amount of toxic releases,
- suggest ways that communities can fix this problem



Level 1	Level 2	Level 3	Level 4
31%	20%	22%	27%

"As everyone can see center city has 9,244.27 toxic releases, "not as bad as lower beach," but still center city needs to go as low as valleyville. Mabey we can not have Damages to trees and plants! Center cities toxic releases are really high."

Implications for assessment (and instruction) of Practice 8:
Obtaining, Evaluating, and Communicating Information

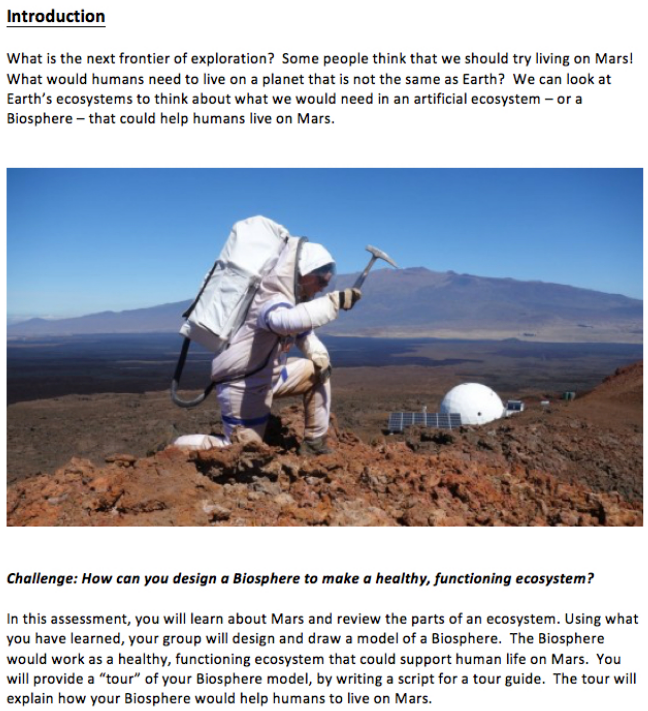
1. Assessments that require students to obtain and use information are unlikely to be confounded by difficulties obtaining information.
2. Many elementary students can use information they obtain to support reasoning about phenomena, but…
3. Assessments should be sensitive to most elementary students' limits of using one or two pieces of information.
4. These limits applied to all elementary students, not just ELLs.
5. Different components: obtaining, combining, and communicating information do not necessarily co-vary, consider measuring separately .

Contact

For more information about:

- This study
- Performance assessment for NGSS
- The Stanford NGSS Assessment Project

Please contact me: jwerthei@stanford.edu



Introduction

What is the next frontier of exploration? Some people think that we should try living on Mars! What would humans need to live on a planet that is not the same as Earth? We can look at Earth's ecosystems to think about what we would need in an artificial ecosystem – or a Biosphere – that could help humans live on Mars.

Challenge: How can you design a Biosphere to make a healthy, functioning ecosystem?

In this assessment, you will learn about Mars and review the parts of an ecosystem. Using what you have learned, your group will design and draw a model of a Biosphere. The Biosphere would work as a healthy, functioning ecosystem that could support human life on Mars. You will provide a "tour" of your Biosphere model, by writing a script for a tour guide. The tour will explain how your Biosphere would help humans to live on Mars.

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