



# Welcome!

## NSTA Virtual Workshop: Making Sense of Three-Dimensional Teaching and Learning

### Implementing Pilot Units (Storylines)

March 7, 2022  
2:00 pm – 5:00 pm ET

# Meet Today's Presenters

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**Marisa Miller**

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Learning Specialist  
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# Building Community



Which punctuation mark best describes you and why? You can choose *any* punctuation mark.



# Collection of Resources



Collections

Resources

Professional Learning

## New Brunswick Public Schools \_Grades 3-5 Pilot Units Collection

PRIVATE

4 items

General Science

Elementary

Edit

Share

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## Resources in “New Brunswick Public Schools \_Grades 3-5 Pilot Units” Collection

	Title	Resource Type	
1	<a href="#">Grade 3 Playground Forces (Unit)</a> A Project of CA NGSS K-8 Early Implementation Initiative	Web Page	<a href="#">Open in Library</a>
2	<a href="#">Why Do Fireflies Light Up? Grade 4 Life Science Playlist</a> This playlist features a fourth-grade, life science unit and includes all teacher and student materials. In the unit, students answer the following driving question: Why do fireflies light up?	Web Page	<a href="#">Open in Library</a>
3	<a href="#">Grade 5 Garbage Unit</a> NYU SAIL Research Lab Unit 1. Physical Science: What Happens to Our Garbage?	Web Page	<a href="#">Open in Library</a>

[https://my.nsta.org/collection/HWzoOtl3dPo\\_E](https://my.nsta.org/collection/HWzoOtl3dPo_E)





# Learning Community Classroom Norms



**Committed to our  
community**

We learn  
together

**Moving our  
science thinking  
forward**

We work to figure  
things out

- We come prepared to work toward a common goal.
- We share our own thinking to help us all learn.
- We use and build on other's ideas.
- We use evidence to support our ideas, ask for evidence from others, and suggest ways to get additional evidence.

From [OpenSciEd Classroom Norms](#)

# Camera and Microphone Norms



**Please turn off camera and microphone when we are in our whole-group setting.**



We'll collaborate using the chat window and digital tools in the main room (whole group).

You will be invited to turn on camera and/or microphone while in unit-specific Zoom rooms.

# Access to Science Literacy for ALL Students<sup>7</sup>

economically disadvantaged

English learners/multilingual learners

race and ethnicity



gifted and talented

girls

students with disabilities

alternative education programs

# Science Instructional Shifts



Shift 1.

**Explain phenomena** and design solutions to problems

Shift 2.

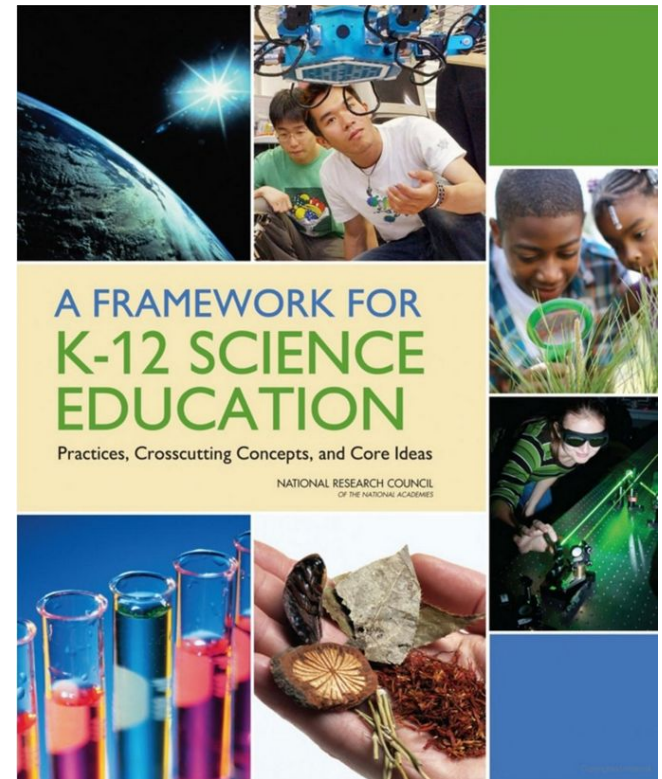
***Doing science***

(three-dimensional learning)

Shift 3.

**Coherent learning**

**progressions over time**



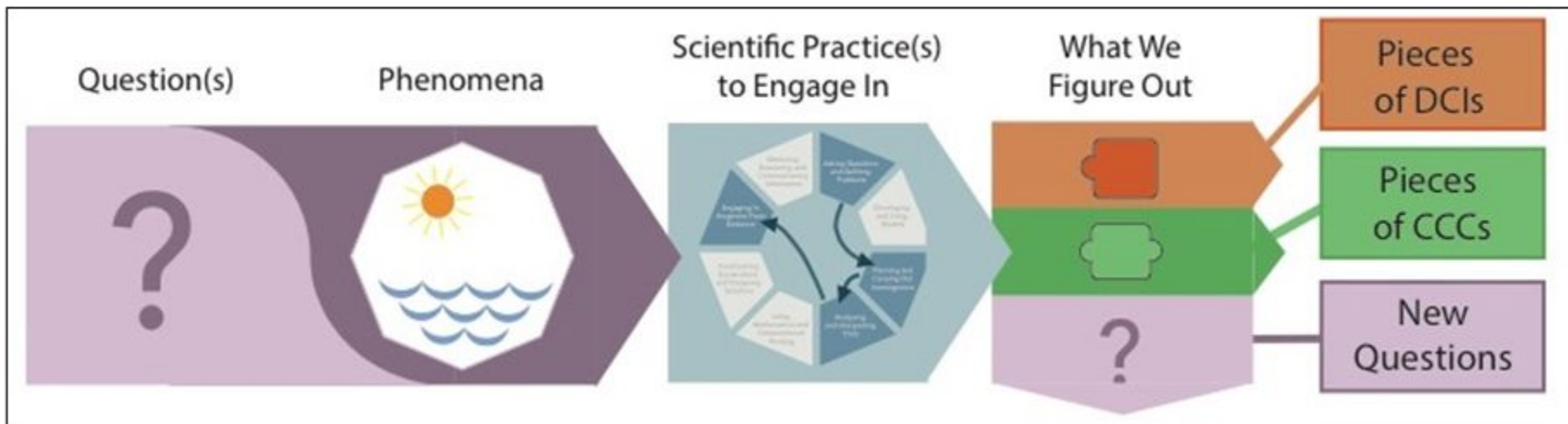
# How Students *Experience* Sensemaking



- Students experience a **phenomenon**;
- engage in **science and engineering practices** and
- **share ideas** to develop or apply the
- **science ideas** and **crosscutting concepts** needed to explain how or why the phenomenon occurs.



# How Students *Experience* Sensemaking





# Coherent Storylines from the Students' Perspective



**Anchor  
Phenomenon**

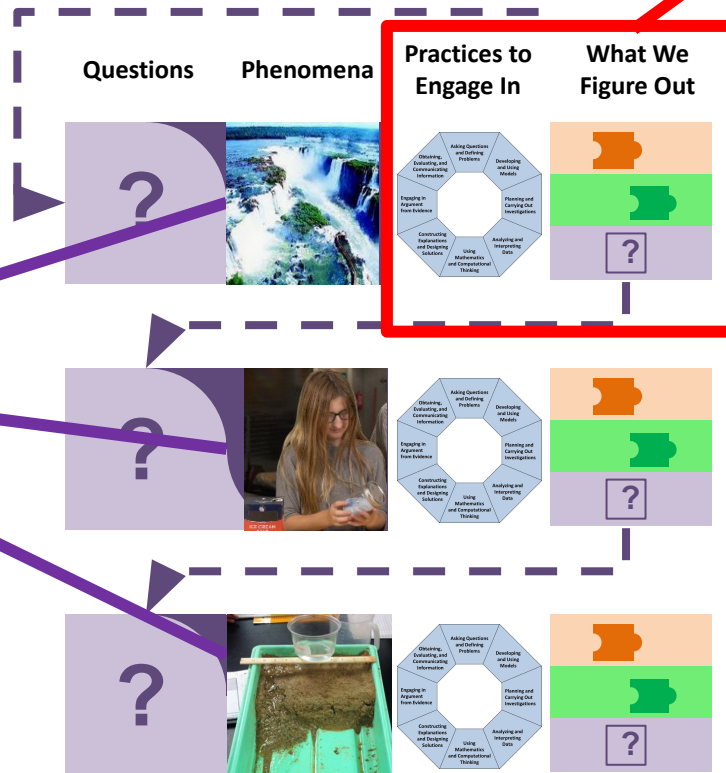


**Driving  
Questions**

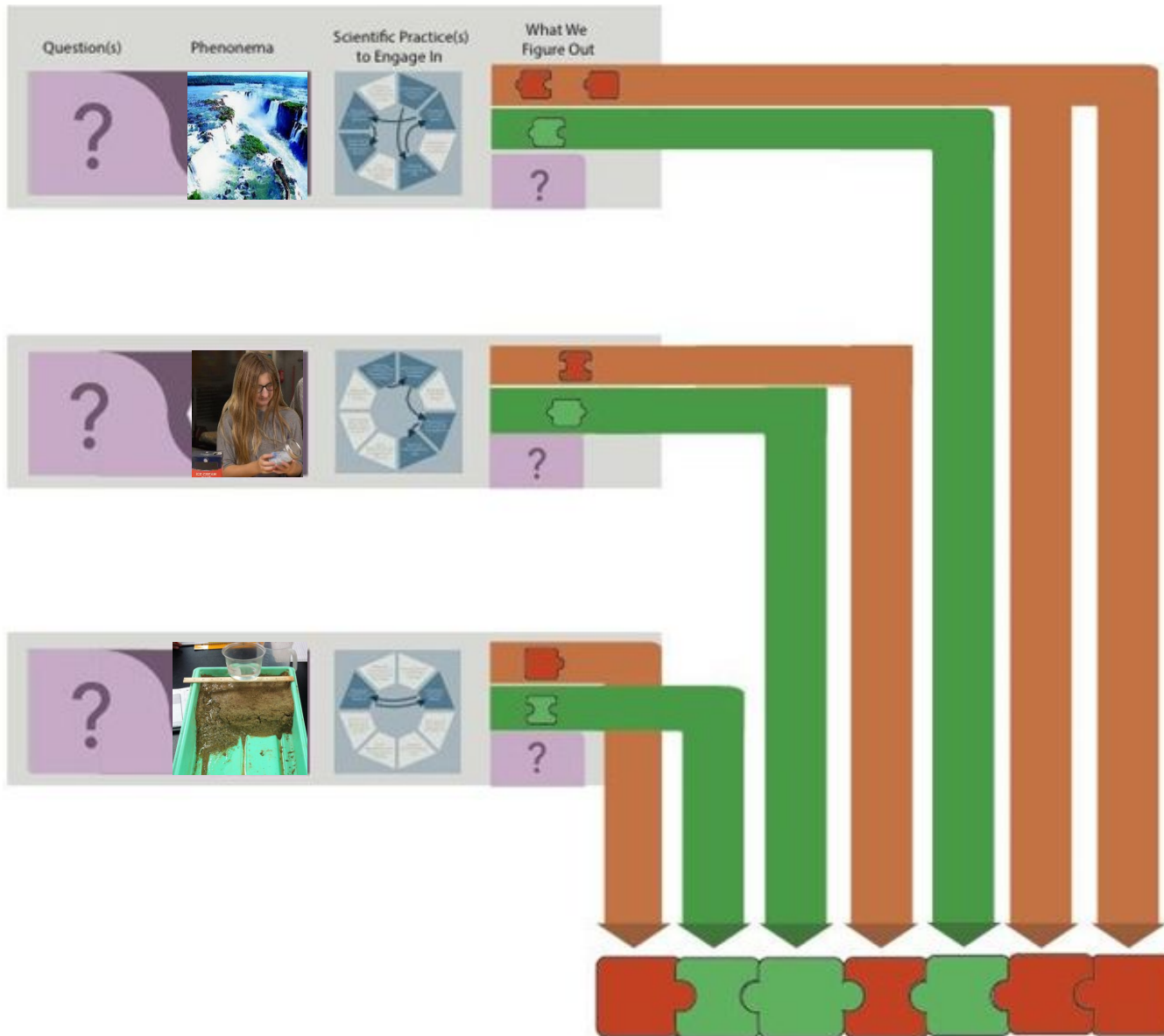


**3D**

**Investigative  
Phenomenon**



# Students Build Understanding Piece by Piece



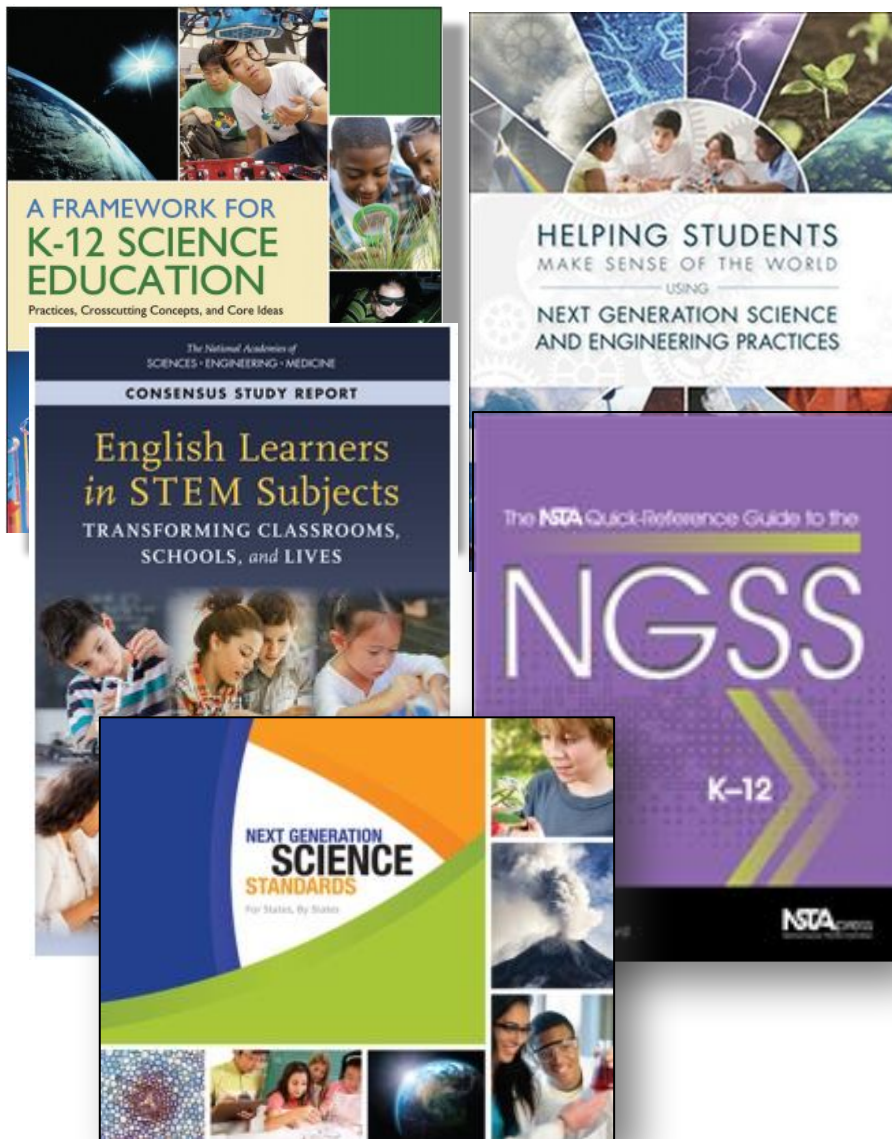
# How We *Design* for Sensemaking



- Phenomenon (Problem) 2
- Science and Engineering Practices 3
- Student Ideas 3
- Science Ideas 1



# Third-Point References



A *third-point reference* is a document based on contemporary research that educators can use to drive decisions about what students should know and be able to do at different grade levels (bands), serve as a common ground from which to communicate with other educators, and/or reach consensus.



# Grade-Level Storylines



## 3 Playground Forces



### Overview

After completing this unit, students will never look at recess or physical education the same way again. The anchoring phenomenon for this unit is objects move in different ways during physical activities on the playground. This unit is the first half of the third grade Physical Science standards and addresses the first two Performance Expectations only. In this unit, students identify forces and that forces have strength and direction. While exploring the playground, students observe the action of contact forces by investigating how balanced and unbalanced forces cause motion as well as how speed and direction changes are caused by the



Grade 3

CONTENT AREA  
**SCIENCE** GRADE  
**5**



The Garbage Unit

LESSON PLANS

## Why Do Fireflies Light Up?

By Rita Januszyk and Alison Haas

[Share](#) [Add to library](#) [Start a Discussion](#)



Grade 4

## 3 Playground Forces



### Overview

After completing this unit, students will never look at recess or physical education the same way again. The anchoring phenomenon for this unit is objects move in different ways during physical activities on the playground. This unit is the first half of the third grade Physical Science standards and addresses the first two Performance Expectations only. In this unit, students identify forces and that forces have strength and direction. While exploring the playground, students observe the action of contact forces by investigating how balanced and unbalanced forces cause motion as well as how speed and direction changes are caused by the



Grade 3



# Welcome!

## NSTA Virtual Workshop: Teaching the Grade 3 Playground Forces Unit



**March 7, 2022**

**Session will be recorded.**

Think back to your recess time as an elementary student.

- *What games or play equipment did you like most?*
- *What was is about the motion you experienced in that game or on that play structure that appealed to you?*

## Talk Tools

### Go Around with Paraphrasing

Person 1: Share your one sentence answering this question.

Person 2: Paraphrase person 1 then add your own idea.

**STEM**  
teaching tools

### Talk Science Resource Card Listening Carefully to One Another

#### Why is this Practice Important?

- Hearing ideas in many ways, from both teachers and peers, helps students improve their learning.
- Students feel their ideas are respected and are more willing to take the risk of sharing their thinking, thus allowing them more opportunities to develop science talk practices.

#### Other Notes

- Students can also be encouraged to use the talk options on the other side of this card among one another in group talk.

### In the Classroom

#### 1. Paraphrasing

- a. "Who can rephrase or repeat?"
- b. "Who can repeat what Javon just said or put it into their own words?"
- c. After partner talk: "What did your partner say?"

#### 2. Agree/Disagree and Why?:

- a. "Do you agree/disagree? (And why?)"
- b. "Are you saying the same thing as Jelya or something different, and if it's different, how is it different?"
- c. "What do people think about what Vannia said?"
- d. "Does anyone want to respond to that idea?"

# Who Am I?

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Kristen Moorhead

NSTA Professional  
Learning Facilitator

@kristenmoorhead



# 3 Playground Forces



## Overview

After completing this unit, students will never look at recess or physical education the same way again. The anchoring phenomenon for this unit is objects move in different ways during physical activities on the playground. This unit is the first half of the third grade Physical Science standards and addresses the first two Performance

Expectations only. In this unit, students identify forces and that forces have strength and direction. While exploring the playground, students observe the action of contact forces by investigating how balanced and unbalanced forces cause motion as well as how speed and direction changes are caused by the strength and the direction of the force. Students also incorporate their observations of patterns to predict the future motion of objects when a force is applied. The students complete this unit by using their knowledge of force and motion on the playground to design a new playground structure or activity.



A Collaboration of the K-12 Alliance @ WestEd, Aspire Public Schools, Galt JUSD, High Tech High, Kings Canyon USD, Lakeside USD, Oakland USD, Palm Springs USD, San Diego USD, Tracy USD, Vista USD, Achieve, and the California Department of Education

with funding from the S.D. Bechtel, Jr. Foundation and Hastings-Quillin Fund





## Anchoring Phenomenon

Objects move in different ways during physical activities on the playground.

Balanced and unbalanced forces act on an object.

## Investigative Phenomena or Identified Problem

A school can't reopen the playground until it receives a design for a new playground structure.

A basketball on the playground moves when it is thrown.

A kicked soccer ball on the playground didn't make it all the way into the goal.

Small children on the playground win a tug-of-war challenge against a group of bigger children.

A school can't reopen the playground until it receives a design for a new playground structure.

PS1.A, PS2.A

Playground games and equipment demonstrate the concepts of force and motion.

PS1.A, PS2.A

Forces (including gravity) have strength and direction. Objects have multiple forces acting on them.

PS2.A

An unbalanced force can cause changes in direction or distance. Patterns can be used to predict future motion.

PS1.A, PS2.A

Balanced and unbalanced forces act on an object with strength and direction. Objects in contact exert forces on each other.

PS1.A, PS2.A

Playground designs are based on force and motion concepts that meets criteria and constraints. Designs are compared and improved.

ETS1.A

Asking questions and defining problems

Developing and using models

Engaging in argument from evidence

Analyzing and interpreting data

Developing and using models

Constructing explanations and designing solutions

Planning and carrying out investigations

Constructing explanations and designing solutions

Obtaining, evaluating, and communicating information

Engaging in argument from evidence

Patterns

Cause and Effect



# Agenda

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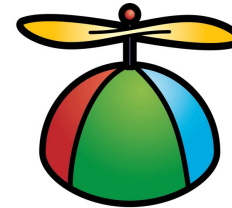


- Experience Lesson 1
- Reflect
- Experience Lesson 2 Part 1
- Reflect
- Read/Do/Share a Lesson Part
- Break
- Experience Lesson 5
- Reflect and Wrap Up

# Perspectives



Student Hat: Think as the authentic learner you are.

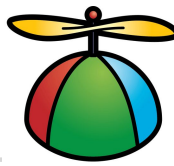


Student/Teacher Hat: Think like a student, but note teacher guidance.



Teacher “Hat”: Reflect on student experience and educator moves.

# Immersion Experience: Lesson 1 Engage



Toolbox 3.1

Resource

3.1.R1

## Design a Playground

A demolition crew removed the playground structure and activity areas. The school wants the students to design a new playground structure and activity area that uses the concepts of force and motion.

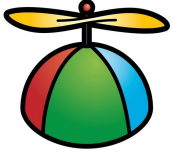


Image via [iStock.com/PhilAugustavo](https://www.iStock.com/PhilAugustavo)



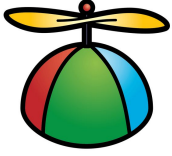
Image via [iStock.com/Spiderplay](https://www.iStock.com/Spiderplay)

# Immersion Experience: Lesson 1 Explore/Explain



Alone Zone:

What do you notice and wonder about the movement you observe on the playground?



# Immersion Experience: Lesson 1 Explore/Explain

Toolbox 3.1

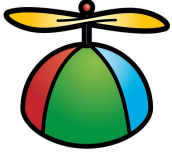
Handout

3.1.H1

## Motion Observation

Alone Zone:  
Choose One  
play ground  
object to write  
and draw about.

Draw and label a model of the playground object when it is not moving:	Draw and label a model of the playground object when it is moving:
What do you notice about how the object doesn't move?	What do you notice about how the object moves?
What do you think caused the object to not move?	What do you think caused the object to move?
What questions do you have about the movement of the object?	



# Immersion Experience: Lesson 1 Explore/Explain

How can you describe the motion of the objects that moved?

Sharing  
Our  
Ideas

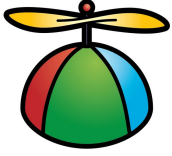
What similarities or patterns did you see in the movement or non movement of the object?

What cause the objects to move?

Jamboard:

[https://jamboard.google.com/d/15GarV1On2ULptRf6Mu\\_CEUxFxcPyyGa6JeHee8l7uj4/edit?usp=sharing](https://jamboard.google.com/d/15GarV1On2ULptRf6Mu_CEUxFxcPyyGa6JeHee8l7uj4/edit?usp=sharing)





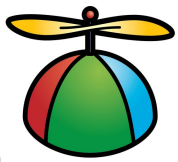
# Immersion Experience: Lesson 1 Explore/Explain

## Recording In Our Science Notebooks

What was the movement?

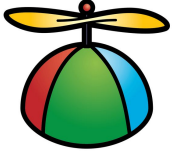
What caused it to move?

How does it apply to our problem?



## Criteria for Our Engineering Designs

How can we use what you know about force and motion to create the criteria for the playground design?



# Immersion Experience: Lesson 1 Explore/Explain

Toolbox 3.1

Chart

3.1.C1

## Basketball

What Questions Can We Investigate About Movement?	What Evidence Can We Gather That Will Support Our Design?

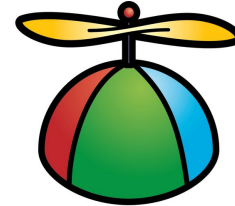
Jamboard:

[https://jamboard.google.com/d/15GarV1On2ULptRf6Mu\\_CEUnFxcPyyGa6JeHee8l7uj4/edit?usp=sharing](https://jamboard.google.com/d/15GarV1On2ULptRf6Mu_CEUnFxcPyyGa6JeHee8l7uj4/edit?usp=sharing)

# Reflecting on the Lesson

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What was this experience like for you as learner?



Teacher Perspective:

How did the lesson and teaching strategies involve you in the lesson?

# Reflecting on SEPS

## Lesson 1

A school can't reopen the playground until it receives a design for a new playground structure.

PS1.A, PS2.A

Playground games and equipment demonstrate the concepts of force and motion.

ETS1.A

Asking questions and defining problems

A basketball on the playground moves when it is thrown.

PS1.A, PS2.A

Forces (including gravity) have strength and direction. Objects have multiple forces acting on them.

Developing and using models

Engaging in argument from evidence

## Lesson 2

## ▼ Learning Sequence 3-Dimensional Progressions

### SEP Progression

SEP PROGRESSION	
Asking Questions and Defining Problems	
<b>Lesson 1</b>	Students ask questions that can be investigated and are given a simple design problem that can be solved through the development of an activity or structure. They identify several initial criteria for success.
<b>Lesson 5</b>	Students continue to use this practice and add in constraints for materials and time.
Developing and Using Models	
<b>Lesson 2</b>	Students build on their K-2 knowledge of developing and using models to collaboratively produce a model as the basis for evidence of the force of gravity.
<b>Lesson 4</b>	Students continue to build their understanding of this practice to show relationships and connections between direction and strength of forces. Students continue to use this practice as they did in Lesson 2 with a focus on using their models as evidence for balanced and unbalanced forces.
<b>Lesson 5</b>	Students continue to use this practice and use their models to develop a prototype to describe and display their activity or structure. They also use their models to show the cause-and-effect relationships or interactions in their designed prototype.

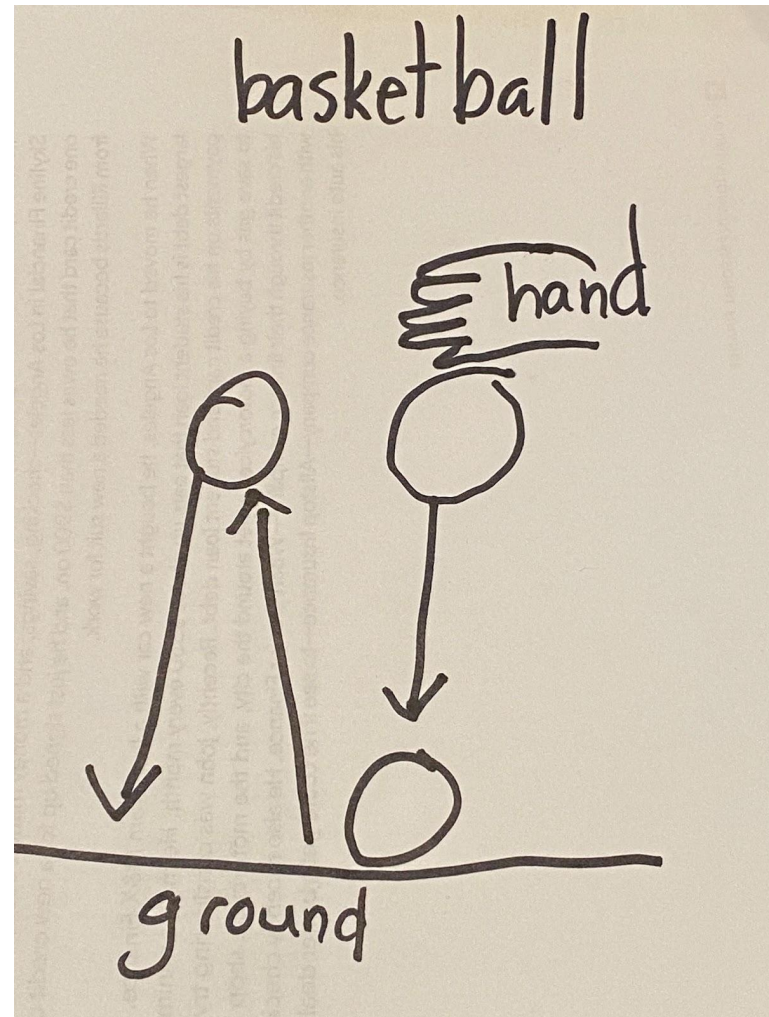
# Immersion Experience: Lesson II Engage



“What do you notice about this example that helps you understand what is happening in this drawing?”

Leading Questions:

- “Is the object moving or not? How can you tell? How was this represented in this drawing?”
- “How are the arrows helping represent what this student observed?”
- “What is happening to the object?”
- “What caused it to move?”





## Observable Features of Models

- **Identification and labeling of the components (parts)**
- **How the components (parts) relate to one another**
- **How the model can be used to form an explanation or to make a prediction**

# Immersion Experience: Lesson II



Alone Zone:  
Developing an Initial Model

Develop a Class Model:  
Build and Use Science Ideas

Alone Zone:  
Revise and add to individual models.  
Write and explanation of the change in motion of the basketball and the forces that cause those changes in the three models.

Share Models:  
Compare and Revise Models

Alone Zone:  
Self-Assess Models

Partner Share:  
Cause and Effect Relationships

# Debrief: Teacher Hat

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## How did students experience sense-making?

- Students experience a **phenomenon**;
- engage in **science and engineering practices** and
- **share ideas** to develop or apply the
- **science ideas** and **crosscutting concepts** needed to explain how or why the phenomenon occurs.



## **Learning Sequence: 3-D Progression**

## **Learning Sequence Narrative- 5 E Instructional Model**

Engage, Explore, Explain, Elaborate Evaluate

## **Assessment**

### **Each Lesson Includes:**

Lesson Overview

Lesson Procedure

Lesson Tool Box

Time

Materials

Advanced Preparation

# Read, Do, Share: Break-Out Rooms

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## **Read and Do: 5 Minutes**

5 Min Alone Zone: Find the Lesson; Read the Lesson; Start Your own Notebook Entries

## **Do and Share: 10 Minutes**

Share what you learned about the lesson; Create a Jamboard frame that teaches the rest of the group about the lesson.

Break-Out Rooms

Group 1 Lesson 2 Part 2 - Use Basketball Video

Group 2 Lesson 2 Part 3- Use Reading Works Code

Group 3 Lesson 2 Part 4- Use Balls and Cups

Jamboard: [https://jamboard.google.com/d/15GarV1On2ULptRf6Mu\\_CEUxFxcPyyGa6JeHee8l7uj4/edit?usp=sharing](https://jamboard.google.com/d/15GarV1On2ULptRf6Mu_CEUxFxcPyyGa6JeHee8l7uj4/edit?usp=sharing)

## **Alone Zone: 3 Minutes**

Do a Gallery Walk of Each Lesson Part.

## **Support/Refute the Claim: 3 Minutes**

Use what you learned from each group to post a response on the Lesson 2 Part 5 Jamboard Frame.

Rubric

An object always moves when a force acts on it.

	4	3	2	1
	agrees and disagrees with the statement	agrees or disagrees with the statement	agrees or disagrees with the statement	no response
Balanced and Unbalanced Forces	agrees because when the forces are unbalanced, the ball will move AND disagrees because if all the forces are balanced, the ball will not move	EITHER agrees because when the forces are unbalanced, the ball will move OR disagrees because if all the forces are balanced, the ball will not move	EITHER agrees because when if someone pushes it, the ball will move OR disagrees because if no one pushes the ball, it will not move.	provides no "because" statement
Strength of Force	In my model if the unbalanced force is strong, the ball moves farther. AND In my model if the balanced forces are all equally strong, the ball won't move.	EITHER In my model if the force is strong, the ball moves farther. OR In my model if the forces are all equally strong, the ball doesn't move.	EITHER Strong pushes make the ball go far. OR Strong pushes on all sides will make the ball stay still and not move.	Hard goes far.
Cause and Effect (if the prompt was used, "because" should be addressed)	My models show that unbalanced forces cause the ball to move. AND My models show that balanced forces caused the ball not to move.	EITHER My models show that unbalanced forces cause the ball to move. OR My models show that balanced forces caused the ball not to move.	EITHER My models show that a push causes the ball to move. OR My models show that if no one gives the ball a push, the ball will not move.	My models show a push moves the ball and that no push makes the ball stay still and not move.



## Anchoring Phenomenon

Objects move in different ways during physical activities on the playground.

Balanced and unbalanced forces act on an object.

## Investigative Phenomena or Identified Problem

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Developing and using models

Engaging in argument from evidence

Analyzing and interpreting data

Developing and using models

Constructing explanations and designing solutions

Planning and carrying out investigations

Constructing explanations and designing solutions

Obtaining, evaluating, and communicating information

Engaging in argument from evidence

Patterns

Cause and Effect

Toolbox 3.1

Resource

3.1.R1

## Design a Playground

A demolition crew removed the playground structure and activity areas. The school wants the students to design a new playground structure and activity area that uses the concepts of force and motion.



Image via [iStock.com/PhilAugustavo](https://www.iStock.com/PhilAugustavo)



Image via [iStock.com/Spiderplay](https://www.iStock.com/Spiderplay)

Your challenge is to use the science concepts about force and motion and the engineering process to design and build a model for a new playground structure or activity.

You must also explain its function. To get started on thinking about our design, let's look at the district's architect's blueprint of the new playground area."

# Immersion Experience: Lesson 5

Toolbox 3.5  
Resource

3.5.R1

Map of New Playground



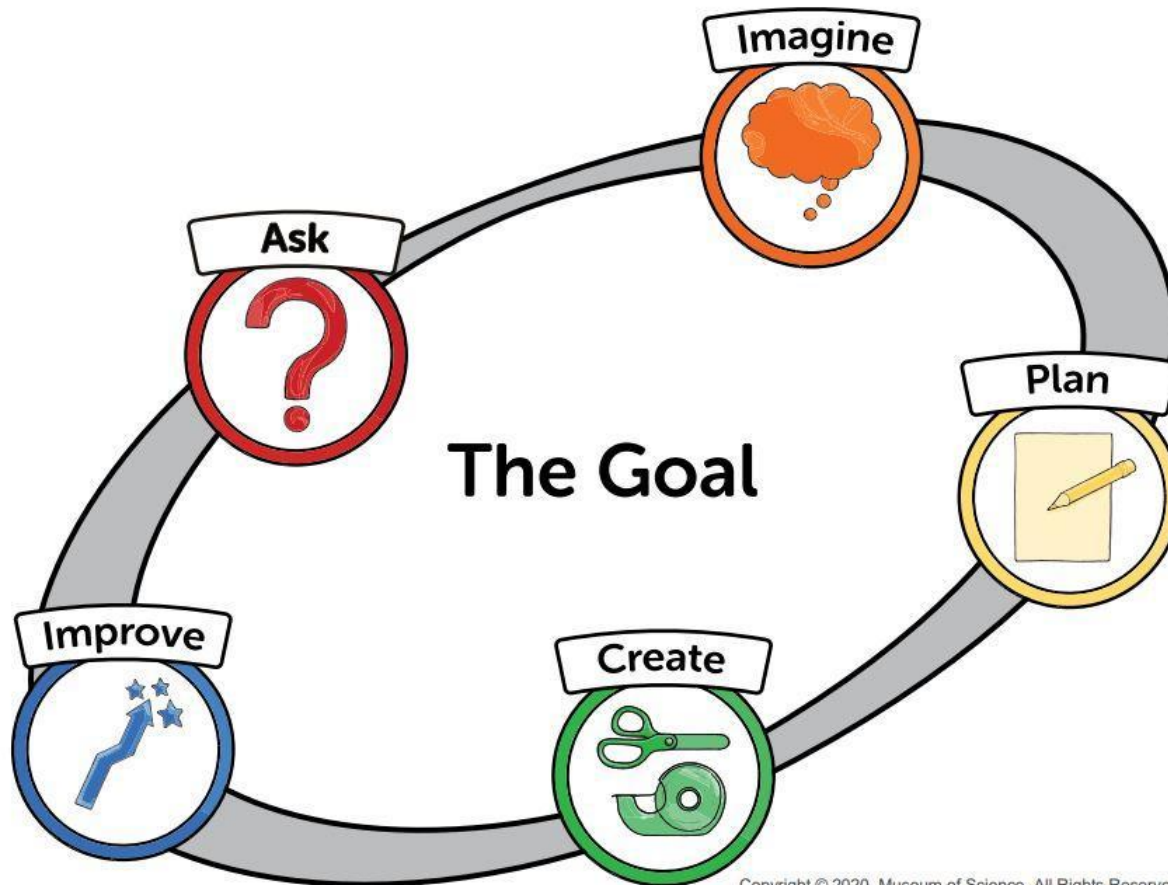
A project of CA NGSS K-8 Early Implementation Initiative.

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3.5.13

# Lesson 5

## EiE Engineering Design Process



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## Criteria and Constraints

### **Criteria**

The design and explanation must:

1. show at least 2 different places where forces will be used to produce movement, and the explanation must describe those forces as balanced and/or unbalanced;
2. include the strength and direction of the forces on the object;
3. include a change in either direction of motion or distance;
4. describe the pattern of motion that would be observed; and,
5. motivate students to want to use the playground structure or activity.

### **Constraints**

The constraints include:

1. materials for prototype are limited to what is available on the supply table like the list above
2. prototype of the playground structure or activity must be limited to the size of your desktop; and
3. prototype of the playground structure or activity must be designed in "x" class periods.



Write a letter to the school board that includes the diagram of your finalized piece of playground structure or activity. The letter must explain:

- how it works and how students would use it.
- why their design should be chosen for a new playground structure or activity based on evidence that it uses force and motion.
- how the causal relationship between the direction and strength of forces are used in their playground structure or activity by creating a change in motion.
- how this created balanced or unbalanced forces and what patterns of motion were observed.
- how they used the engineering design process to create, test, and revise their solution.
- what they learned along the way

## Playground Rubric

Component	4	3	2	1
Overall Design is Based on Sound Scientific Concepts (DCI)	<p>Uses at least two forces, either balanced and unbalanced, or two unbalanced forces</p> <p><b>AND</b></p> <p>includes forces that act on the object with either strength or direction</p> <p><b>AND</b></p> <p>includes a change in either direction of motion or distance.</p>	<p>Uses at least two forces, either balanced and unbalanced, or two unbalanced forces</p> <p><b>AND</b></p> <p>includes forces that act on the object with either strength or direction</p> <p><b>AND</b></p> <p>includes a change in either direction of motion or distance.</p>	<p>Uses at least two forces, either balanced and unbalanced, or two unbalanced forces</p> <p><b>AND</b></p> <p>includes forces that act on the object with either strength or direction</p> <p><b>OR</b></p> <p>includes a change in either direction of motion or distance.</p>	<p>Uses at least two forces, either balanced and unbalanced, or two unbalanced forces</p> <p><b>OR</b></p> <p>includes forces that act on the object with either strength or direction</p> <p><b>OR</b></p> <p>includes a change in either direction of motion or distance.</p>
Explanation of the causal relationship of change (CCC)	<p>Shows comprehension of the fact that a force that is unbalanced causes a change in direction and distance</p> <p><b>AND</b></p> <p>a force that is balanced has no change in motion</p> <p>(a balanced force on an object means it is not moving).</p>	<p>Shows comprehension of the fact that a force that is unbalanced causes change in direction and distance</p> <p><b>OR</b></p> <p>a force that is balanced has no change in motion</p> <p>(a balanced force on an object means it is not moving).</p>	<p>Shows comprehension of the fact that a force causes motion.</p>	<p>Shows comprehension of the fact that a push or pull causes the motion.</p>
Communication of scientific information (SEP)	<p>Communicates information orally</p> <p><b>AND</b></p> <p>in written form using tables, diagrams, and charts.</p>	<p>Communicates information orally</p> <p><b>OR</b></p> <p>in written form using tables, diagrams, and charts.</p>	<p>Communicates information in written form using tables, diagrams, or charts.</p>	<p>Communicates information only in written form.</p>

## Teaching Time Estimate:

3 times a week; 45 min per lesson; 9 weeks

3 times a week; 60 min per lesson; 6 weeks

### Lesson 1



Time

135 minutes

Part I	15 minutes	Engage
Part II	60 minutes	Explore 1/Explain 1
Part III	60 minutes	Explore 2/Explain 2



Time

190–350 minutes: (4–6 lessons)

Part I	60–120 minutes	Engage
Part II	60–120 minutes	Explore/Explain 1
Part III	10–20 minutes	Explain 2
Part IV	30–60 minutes	Elaborate
Part V	30 minutes	Evaluate

What do you most want to remember as you plan and teach this new unit?

LESSON PLANS

## Why Do Fireflies Light Up?

By Rita Januszyk and Alison Haas

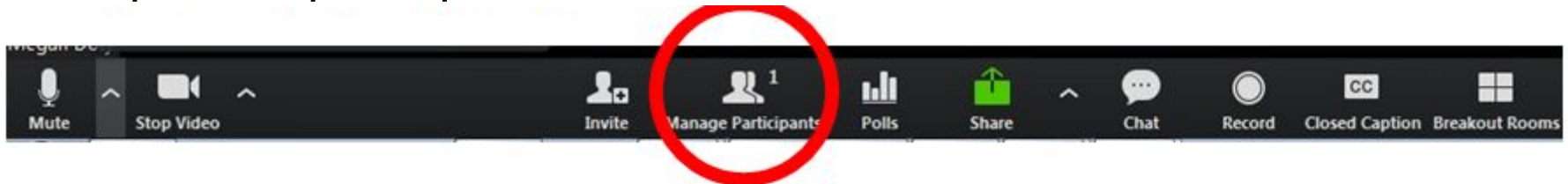
[Share](#) [Add to library](#) [Start a Discussion](#)



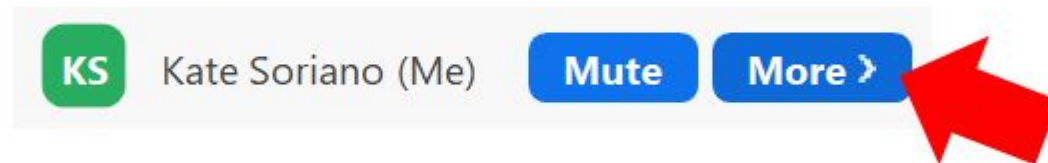
Grade 4

# Rename Based on Grade Level

1. Open the participant window

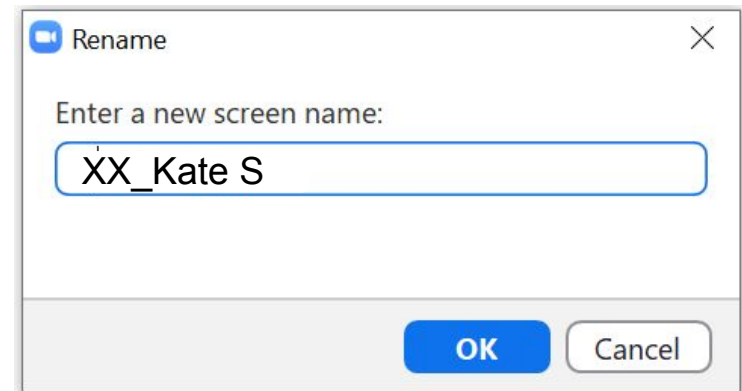


2. Hover the cursor over your name. Select **More** and choose **Rename**.



3. Rename yourself using the following scheme:

<b>XX</b> _Name = School here
<b>ZZ</b> _Name = School here

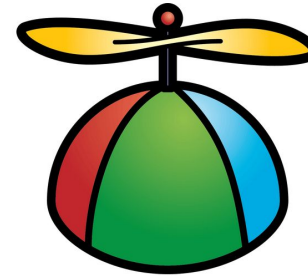




# Student Hat/Educator “Hat”

---

Student Hat: Think like a student.



Student/Teacher Hat: Think like a student, but note teacher guidance.

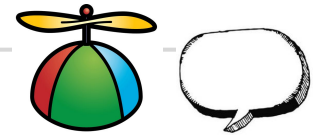


Teacher “Hat”: Reflect on student experience and educator moves.



# Anchor Phenomenon (Lesson 1)

57



1. Watch the video.
2. Share your observations with a partner.
3. Write or draw any observations into your notebook.

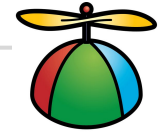


The **observations** you recorded (words and pictures) **are** your **data**.

Video 1 (backyard)

<https://drive.google.com/file/d/1KyBhLZs8KjHKY8WQkJd2CLuNK8zRgR2o/view?usp=sharing>

# Anchor Phenomenon (Lesson 1)



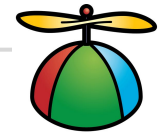
Time-lapse video

1. Watch the video.
2. Share your observations with a partner.
  - What did you observe in the woods?
  - What are your reactions to the video?
  - Did you recognize the animal in the video?

Video 2 (woods)

[https://drive.google.com/file/d/15DiT1SkzuctoTogwN1H178UwAC\\_mORxb/view?usp=sharing](https://drive.google.com/file/d/15DiT1SkzuctoTogwN1H178UwAC_mORxb/view?usp=sharing)

# Anchor Phenomenon (Lesson 1)



## **Alone Zone** (independent thinking time)

What are your questions about what you observed in the videos?

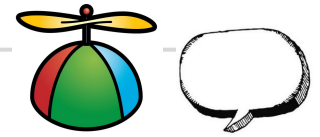
Write each question on a sticky note (only one question on each note).

Find your assigned “desk” on the Grade 4 Jamboard and share your questions with your small group:

[https://jamboard.google.com/d/1BqOQ8K6nWtRbs7z0\\_aVJT\\_XrXiqkY9seTQtF-CwQRmSY/edit?usp=sharing](https://jamboard.google.com/d/1BqOQ8K6nWtRbs7z0_aVJT_XrXiqkY9seTQtF-CwQRmSY/edit?usp=sharing)

# Anchor Phenomenon (Lesson 1)

60



1. Watch the video.
2. Record new questions on your sticky notes (on your Jamboard “desk”).
3. Share your observations with a partner.

Video 3 (nearby to backyard 1)

[https://drive.google.com/file/d/1pZEEASRSDDHbt9htHn\\_05WW91y3alQ16/view?usp=sharing](https://drive.google.com/file/d/1pZEEASRSDDHbt9htHn_05WW91y3alQ16/view?usp=sharing)

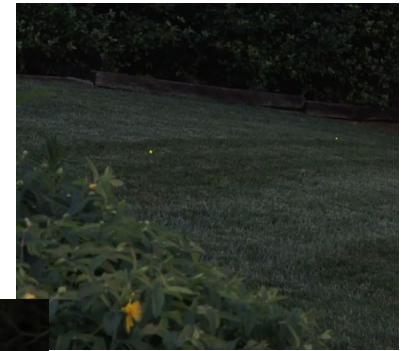
# Anchor Phenomenon (Lesson 1)

---

## Whole Group

Who would like to share an observation?

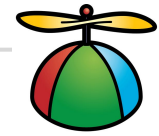
I'll start with three shares.



[https://jamboard.google.com/d/1BqOQ8K6nWtRbs7z0\\_aVJTXrXiqkY9seTQtF-CwQRmSY/edit?usp=sharing](https://jamboard.google.com/d/1BqOQ8K6nWtRbs7z0_aVJTXrXiqkY9seTQtF-CwQRmSY/edit?usp=sharing)



# Anchor Phenomenon (Lesson 1)



## Alone Zone

Record observations of the fireflies (close-up on grass) in the backyard video.

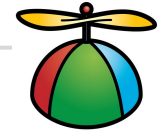


March 7, 2022

What do you observe?

Lined writing area for student observations.

# Anchor Phenomenon (Lesson 2)

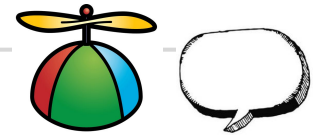


Let's observe fireflies up close!



[https://drive.google.com/file/d/103gL8cLAKRgTthsQGso\\_taVyPFYfwZqR/view?usp=sharing](https://drive.google.com/file/d/103gL8cLAKRgTthsQGso_taVyPFYfwZqR/view?usp=sharing)

# Anchor Phenomenon (Lesson 2)



## Small Group (Jamboard “desk” group)

- Share your reactions and questions with your group members.
- Write any new questions you shared on sticky notes (one question on each sticky note).

## Whole Group

What questions do we have about what we saw or heard in the videos of the backyard, woods, and how fireflies look up-close?

# Anchor Phenomenon (Lesson 2)

---



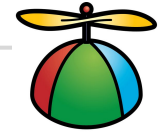
## Why do fireflies light up?

- We made observations.
- We noticed patterns in our observations.
- Many of our questions are about the patterns we noticed.

What is *causing* the pattern?

The answer to the question is a **prediction**.

# Anchor Phenomenon (Lesson 2)



March 7, 2022

Why do fireflies light up?

My prediction is

My reason for the my prediction is

# Anchor Phenomenon (Lesson 2)



March 7, 2022

Why do fireflies light up?

My prediction is the firefly lights up to see a way out of the backyard.

My reason for the my prediction is

# Anchor Phenomenon (Lesson 2)



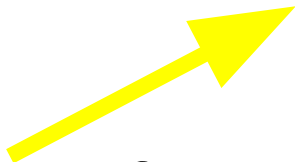
March 7, 2022

Why do fireflies light up?

My prediction is the firefly lights up to see a way out of the backyard.

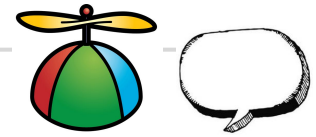
My reason for the my prediction is in the backyard I saw a lot of fireflies flying in different directions.

evidence from our data





# Anchor Phenomenon (Lesson 2)



March 7, 2022

Why do fireflies light up?

Draw your prediction here.

Why do fireflies light up?

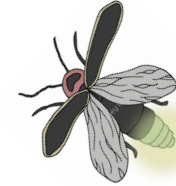
My prediction is

My reason for the my prediction is

# Anchor Phenomenon (Lesson 2)

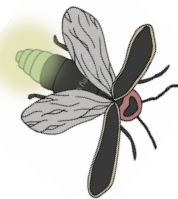
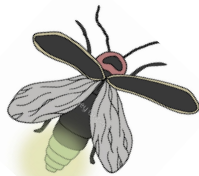


We have several interesting predictions about why fireflies light up.



We need more information about fireflies to investigate these predictions.

Let's start with this first group of question that are about firefly body parts.



# Home Learning (Options)

*Grade 4 Why do fireflies light up?*

Homework  
Observation of Fireflies in My Community

NAME \_\_\_\_\_ DUE DATE \_\_\_\_\_

Go outside as the sun is setting. Look around at home or in your neighborhood for fireflies that spark. Look around the grass or other plants for fireflies that crawl. Record the time and place of your observations like backyard, sidewalk, field. Write or draw your observations.

1. Time of your observations \_\_\_\_\_

2. Place of your observations \_\_\_\_\_

3. Observations of fireflies that spark

4. Observations of fireflies that crawl

5. Count the sparks

How many sparks in 1 minute? \_\_\_\_\_

How many sparks in 5 minutes? \_\_\_\_\_

Draw a diagram to show the location of sparks.

6. Be prepared to share with the class.

*Grade 4 Why do fireflies light up?*

Homework  
Asking Questions about Fireflies in Communities

NAME \_\_\_\_\_ DUE DATE \_\_\_\_\_

Interview a family or community member about their memories of fireflies.

1. Name of person you interviewed \_\_\_\_\_

2. How do you know this person? \_\_\_\_\_

3. Time and place of their observations \_\_\_\_\_

4. Did you see any fireflies lighting up? How did they look?

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

5. Did you see any fireflies crawling? How did they look?

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

6. What else do you remember about fireflies?

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

7. Be prepared to share with the class.

# Why Do Fireflies Light Up?



Search in Drive



My Drive > Daily Do > Scablands, Fireflies, and Ants - Daily Do > Fireflies

Name ↑

4.LS Assesment

4.LS Lesson Videos

4.LS Lesson Plans

4.LS Student Materials and Handouts

4.LS Unit Power Points

4.LS List of Materials.docx

4.LS Storyline.docx

4.LS Unit Map .docx

Light box directions.docx

New

My Drive

Computers

Shared with me

Recent

Starred

Trash

Storage

16.86 GB of 2 TB used

Buy storage

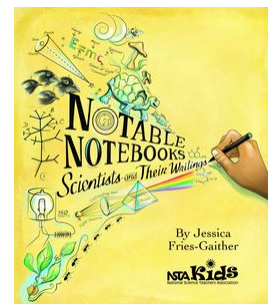
<https://drive.google.com/drive/folders/18HAeTHpo1dhqiGTykDwggq6beuhIH7YSB?usp=sharing>



# Why Do Fireflies Light Up?

Access Lesson 1 from the Fireflies Google Drive folder.

- Read the lesson.
- Note lesson plan structure/teacher supports for implementing the lesson.
- Locate any videos, student materials and handouts, PowerPoint slides, etc., needed to teach Lesson 1.
- Be prepared to share questions about lesson structure, locating lesson resources, etc.



Session 1

# Why Do Fireflies Light Up?

Lesson	Name	Lesson	Name
Lesson 1	ALL	Lesson 6	
Lesson 2		Lesson 7	
Lesson 3		Lesson 8	
Lesson 4		Lesson 9	
Lesson 5		Lesson 10	

# Why Do Fireflies Light Up?

---

## Storyline Task:

- Read the assigned lesson.
- Identify and post (Jamboard) the following information about the lesson:
  - Question students are investigating (see lesson title)
  - Lesson-level phenomenon (or activity) students are trying to figure out/explain
  - What students figure out
  - Navigation to the next lesson (connecting to next lesson in a way that is coherent from the students' perspective)
- Be ready to share findings with whole group.





# Lesson 6: How are we able to see objects?



Object	I <b>CAN</b> See	I <b>CANNOT</b> See	Why?
green monster			
red monster			
purple football			
ape			

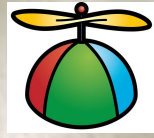


Adapted for use as a “stand-alone” lesson for New Brunswick workshop 2.7.22 (Grade 4 Breakout Session)

We will identify patterns.

What is the same about the objects you **can** see?

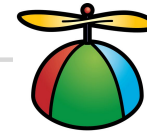
What is the same about the objects you **cannot** see?







# Lesson 6



Object	I <b>CAN</b> See	I <b>CANNOT</b> See	Why?
green monster			
red monster			
purple football			
ape			
black owl whistle			

We will identify patterns.

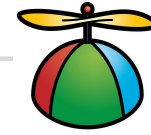
What is the same about the objects you **can** see?

What is the same about the objects you **cannot** see?



# Lesson 6

---



## Small Group

Discuss with your group:

- What is the same about the objects you **can** see?
- What is the same about the objects you **cannot** see?

## Whole Group

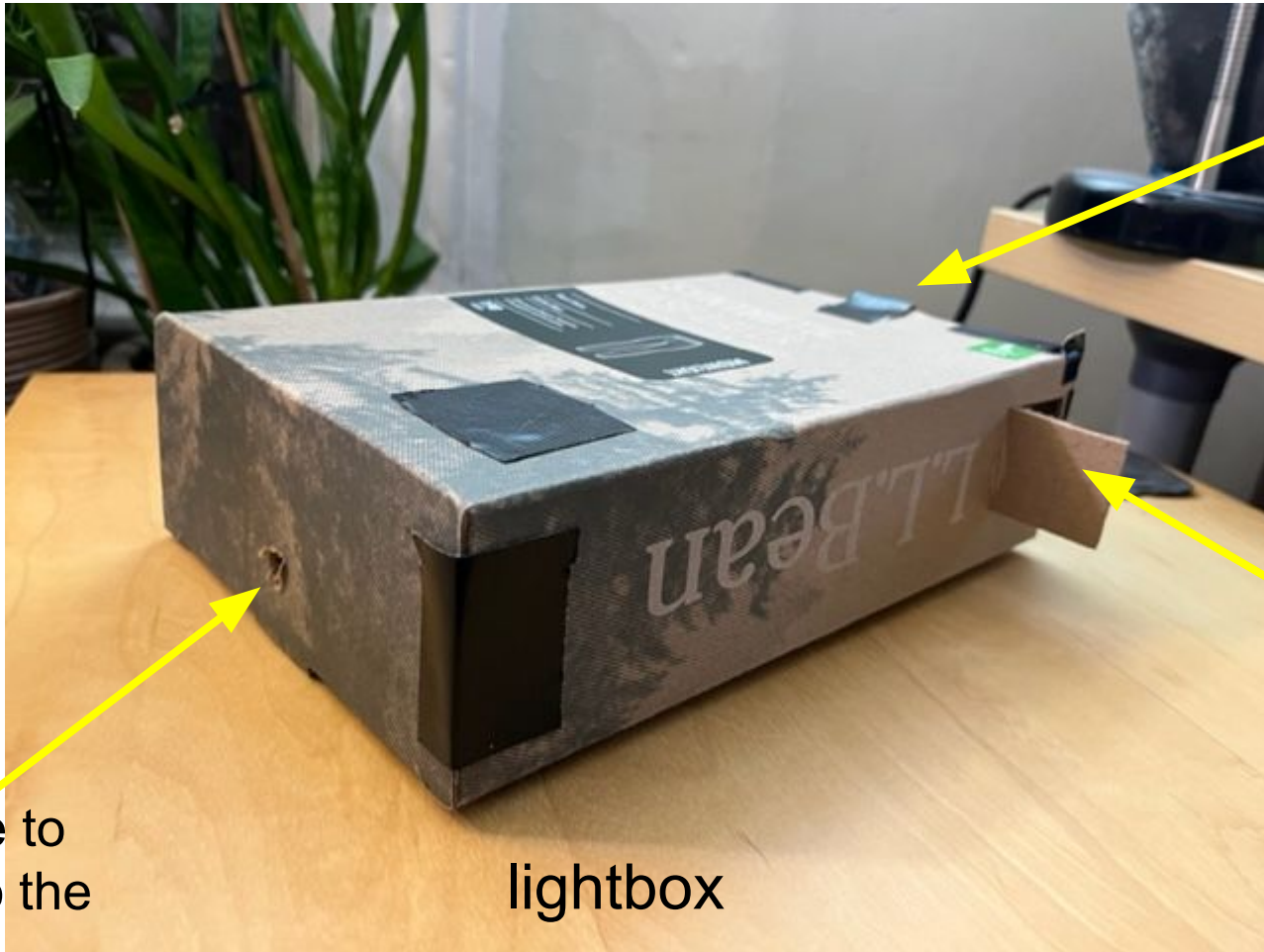
What is the **pattern** between objects we **can** see and objects we **cannot** see?

Conditions to see an object:

- Eye
- Object
- Open space between the eye and object



# Lesson 6



eye hole to  
look into the  
box

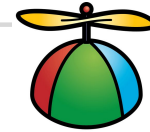
lightbox

end remains  
closed  
throughout  
investigation

flap to  
open and  
close



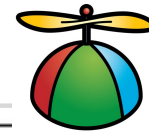
# Lesson 6



There's something inside the box we want to see.

Look into the lightbox and record your observations.

# Lesson 6



<b>Flap Closed</b>	<b>Flap Opened</b>	<b>Flashlight Shining Through Flap Opened</b>
What we observed: Add text here	What we observed: Add text here	What we observed: Add text here

# Lesson 6

---

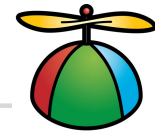


What was the effect of shining the flashlight through the opened flap?

What caused the car to be able to be seen better?

*Please don't share in the chat window until invited.*

# Lesson 6



## Small Group - Part 1

Create a model to explain how we are able to see objects. Use words, pictures, symbols, color, etc., to communicate your thinking.

- What are the **parts** of the model?
- How do the parts **go together**?

*Please do NOT use **pink** sticky notes in your model (**pink** = teacher or peer feedback)*

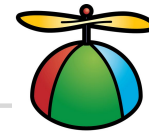
Groups 1-6

<https://jamboard.google.com/d/1sxJ9tDj4q0vSbThRXegWvXOi03q-SJeOUXVSAaQoag/edit?usp=sharing>

Groups 7-12

<https://jamboard.google.com/d/18Ci9nHS4Pgcvj3AfoS2FpXBlyBarGYmMzeshbhsKDQNA/edit?usp=sharing>

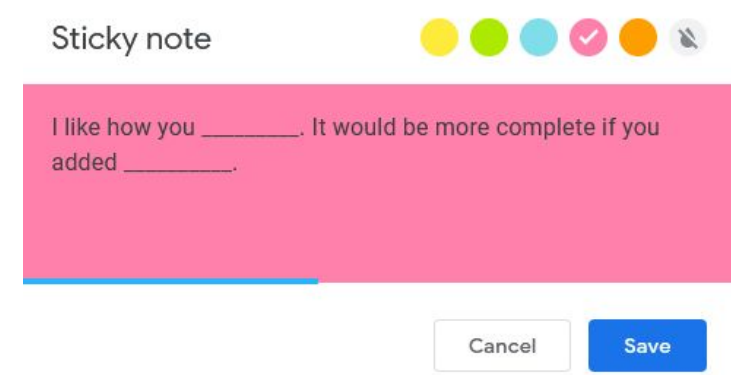
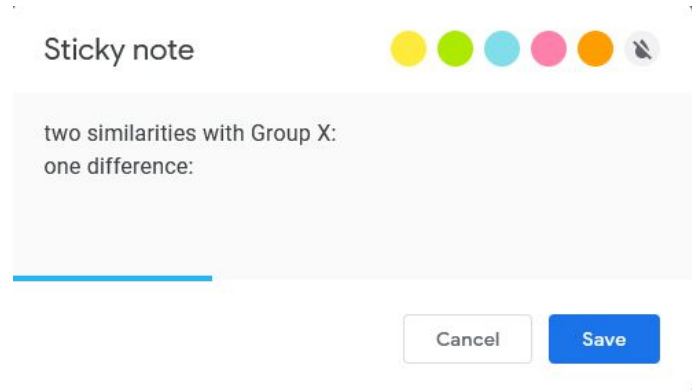
# Lesson 6



## Small Group - Part 2

- Use a WHITE sticky note to identify two similarities and one difference between your model and another group's model.
  
- Use a PINK sticky note to provide feedback to other group using this sentence stem:  

I like how you \_\_\_\_\_. It would be more complete if you added \_\_\_\_\_.



# Giving and Receiving Peer Feedback

## Self Assessment: Giving Feedback

How well did you give feedback today?

Today, I...	YES	NO
Gave feedback that was <b>specific</b> and about <b>science ideas</b> .		
Shared a <b>suggestion</b> to help improve my peer's work.		
Used <b>evidence</b> from investigations, observations, activities, or readings to support the feedback or suggestions I gave.		

One thing I can do better next time when I give feedback is:

## Self Assessment: Receiving Feedback

How well did you receive feedback today?

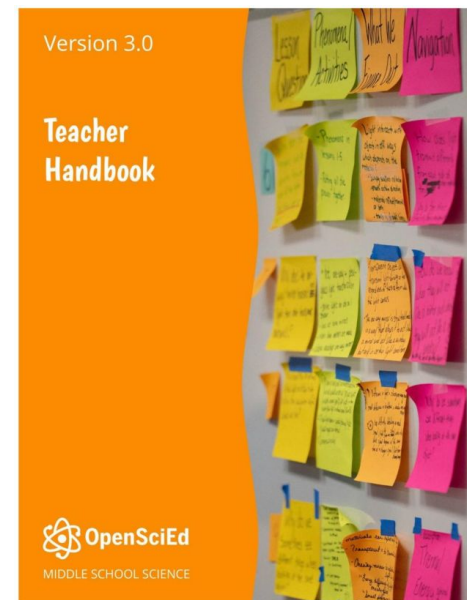
Today, I...	YES	NO
Read the feedback I received carefully		
Asked follow up questions to better understand the feedback I received		
Said or wrote why I agreed or disagreed with the feedback		
Revised my work based on the feedback		

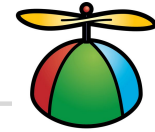
What is one piece of feedback you received?

---

What did you add or change to address this feedback?

---





## Whole Group: Building Class Consensus

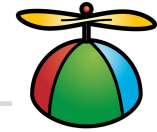
What can we agree to that are the parts or components of the model?

- eye
- object
- light source



# Lesson 6

---



We disagree about *how* the light allows us to see the object (car), does it make sense to investigate this next?

# Why Do Fireflies Light Up?

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# Welcome!

## NSTA Virtual Workshop: Unpacking Grade 5 SAIL Unit: What happens to our garbage?

March 7, 2022

Promoting excellence and innovation in science teaching and learning for all



# Icebreaker

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Drop in the chat...

What is your favorite springtime activity?





# Who Am I?

---

Marisa Miller

NSTA Professional  
Learning Facilitator

@marismiller6



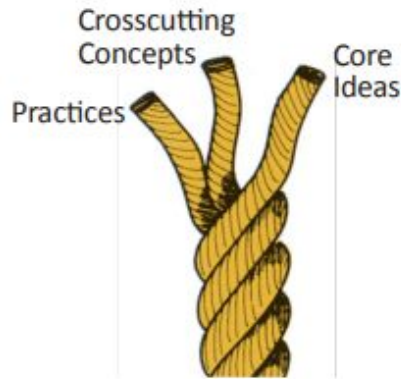
# What is SAIL?

## NYU SAIL RESEARCH LAB

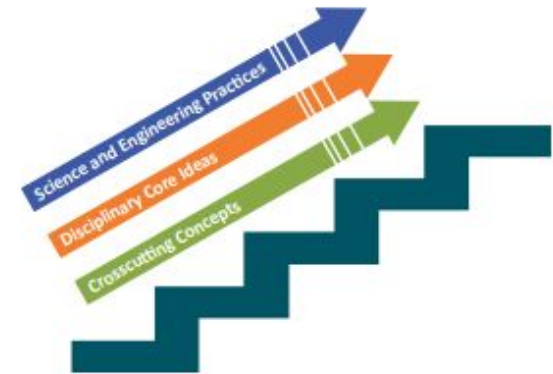
Doing Science, Using Language



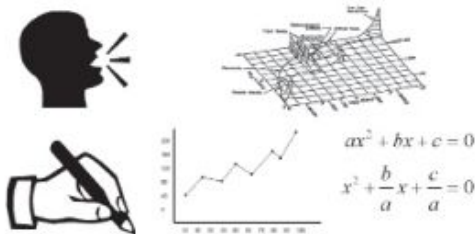
Phenomenon



Three-dimensional Learning



Learning Progressions



Modalities



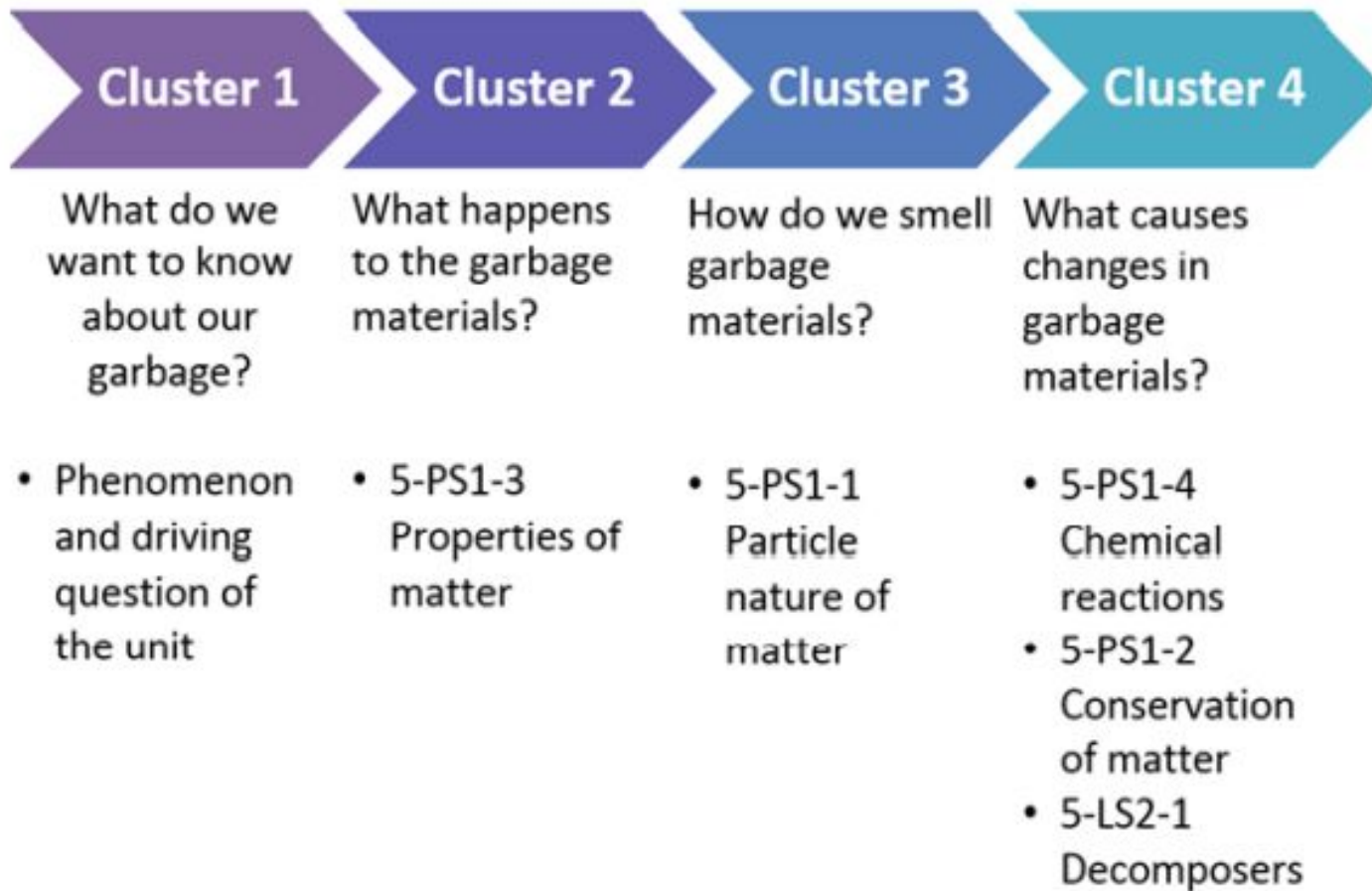
Registers



Interactions



## What happens to our garbage?



# Immersion Experience: Anchor Phenomenon<sup>98</sup>

## What happens to our garbage?

Cluster/Lesson 1: 4 class periods

Students make observations of the properties of materials in the lunch garbage to identify materials and decide how to sort the materials into categories.

Students make predictions about what will happen to the materials in each garbage category over time based on observed patterns of properties within the categories.

Students ask questions to investigate what happens to the properties of materials in the lunch garbage system over time.

Reviewed By:



EQuIP Examples

CONTENT AREA  
**SCIENCE**

GRADE  
**5**

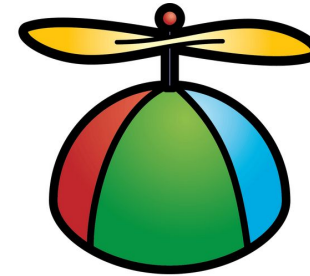


The Garbage Unit

# Student Hat/Educator “Hat”

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Student Hat: Think like a student.



Student/Teacher Hat: Think like a student, but note teacher guidance.



Teacher “Hat”: Reflect on student experience and educator moves.

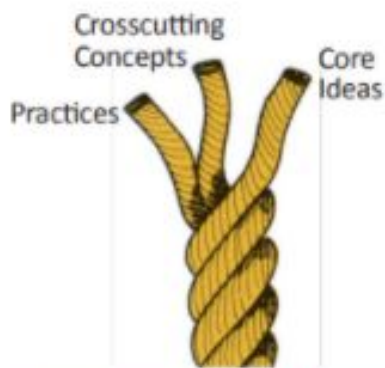
# Student Hat/Educator “Hat”

## NYU SAIL RESEARCH LAB

Doing Science, Using Language



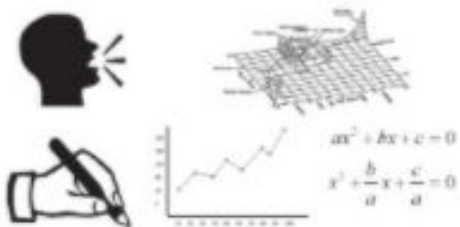
Phenomenon



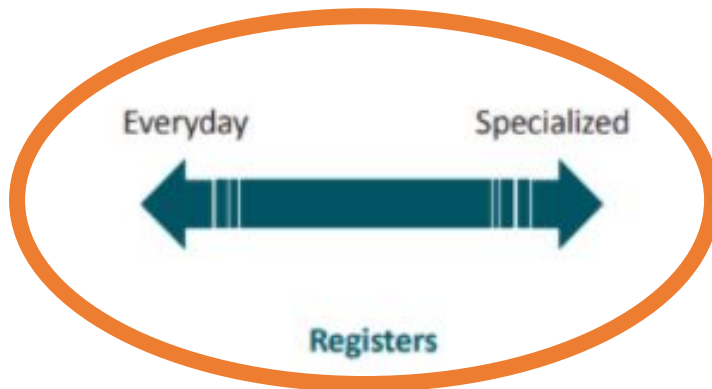
Three-dimensional Learning



Learning Progressions



Modalities



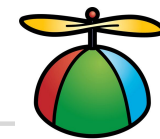
Registers



Interactions

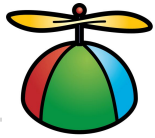


# Notice and Wonder



In the chat, share an observation and a question.

# Sorting Garbage



With your breakout group, sort the trash into categories on the following Jamboard:

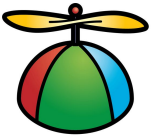
<https://jamboard.google.com/d/1xW-g7WCJIWQC9n9cU3uoSpY1W7HsO5WC94HSxJJtY5o/viewer?f=0>

Group 1 Trash Sort



# Sorting Garbage

---

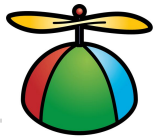


Think about the items in one of your groups of trash. What are the properties of this category?

Make a prediction about what will happen to the materials in this category.



# Virtual Field Trip: Landfill



While watching the video, note observations and questions. Put your questions on pages 3 or 4 of the Jamboard:

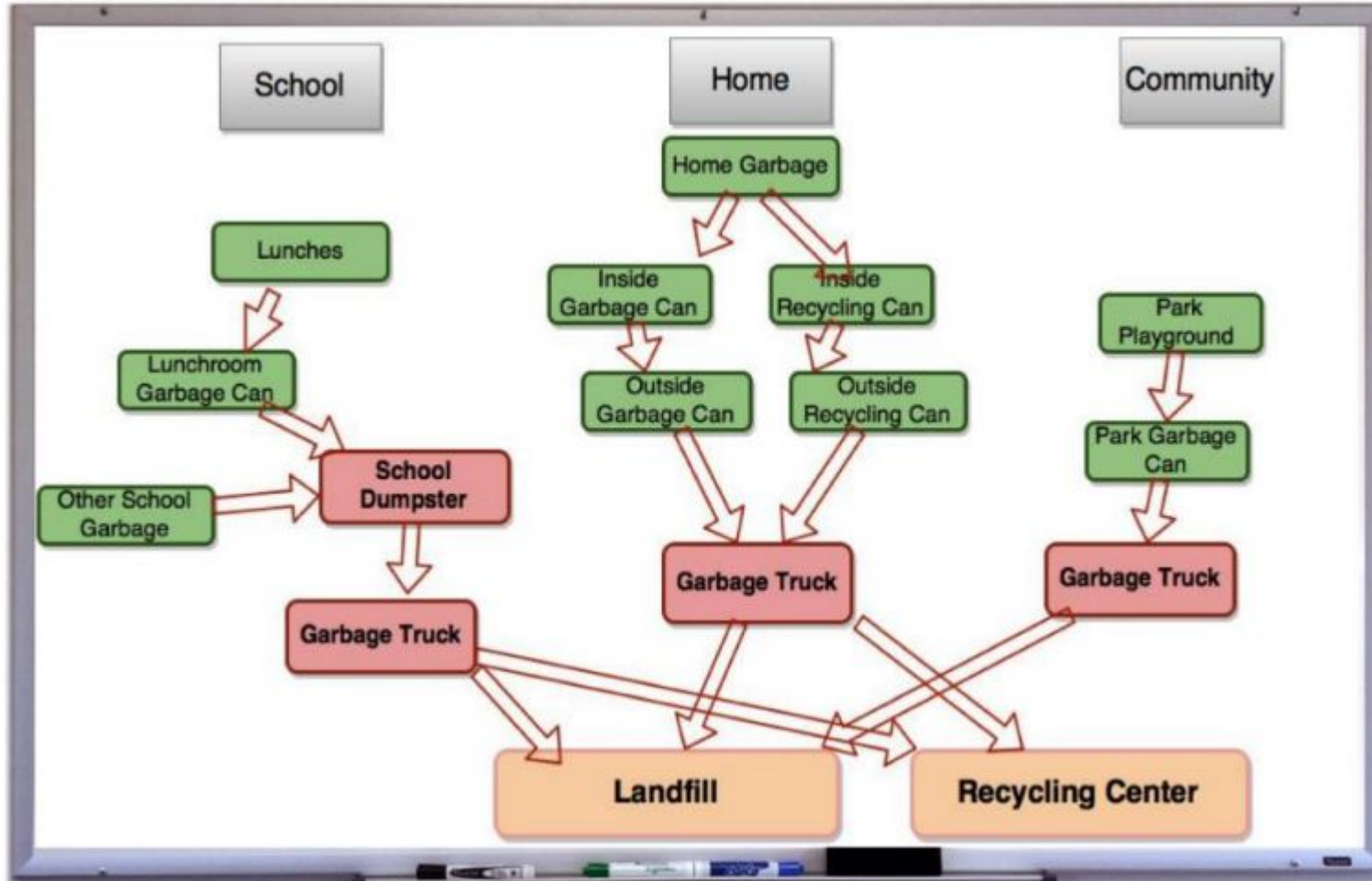
<https://jamboard.google.com/d/1xW-g7WCJIWQC9n9cU3uoSpY1W7HsO5WC94HSxJJtY5o/edit?usp=sharing>



# Virtual Field Trip: Landfill



# Day 3: Systems and System Models



Generate questions and add them to your group's Jamboard page.

# Making our Driving Question Board (DQB)



Read over the questions in your Group Question Jamboard.

<https://jamboard.google.com/d/1xW-g7WCJIWQC9n9cU3uoSpY1W7HsO5WC94HSxJJtY5o/viewer?f=0>

Identify questions that can be investigated at school.

# Making our Driving Question Board

---

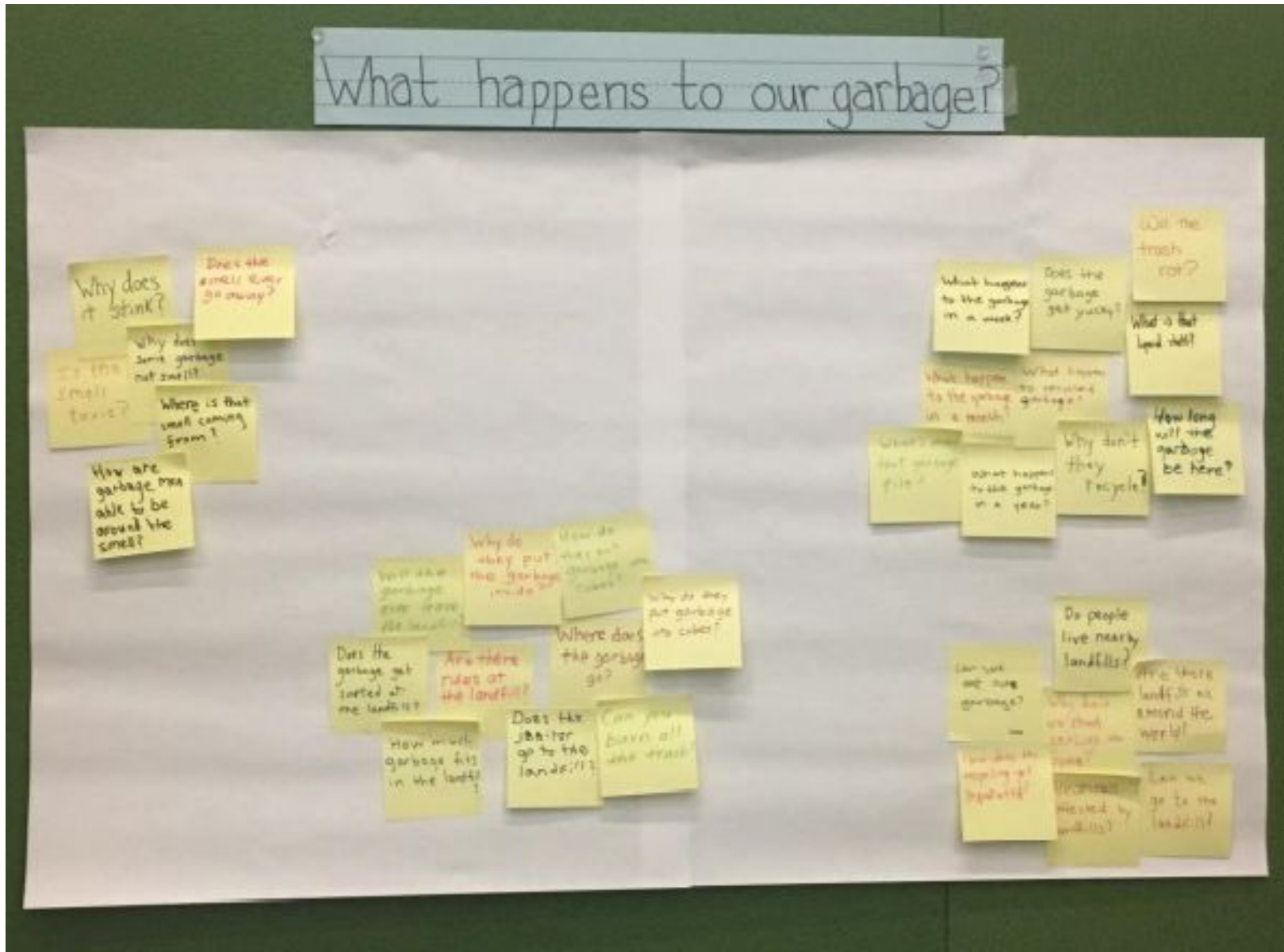
Choose a question you want to investigate further. Copy the question to a sticky note on p. 5 of the Jamboard. But do NOT save yet.

When prompted save your question. Place it near similar questions.

Is there one big question that connects all the questions?



# Sample Driving Question Board



# Debrief Break: Teacher Hat

How does this phenomenon attend to equity and science ideas?

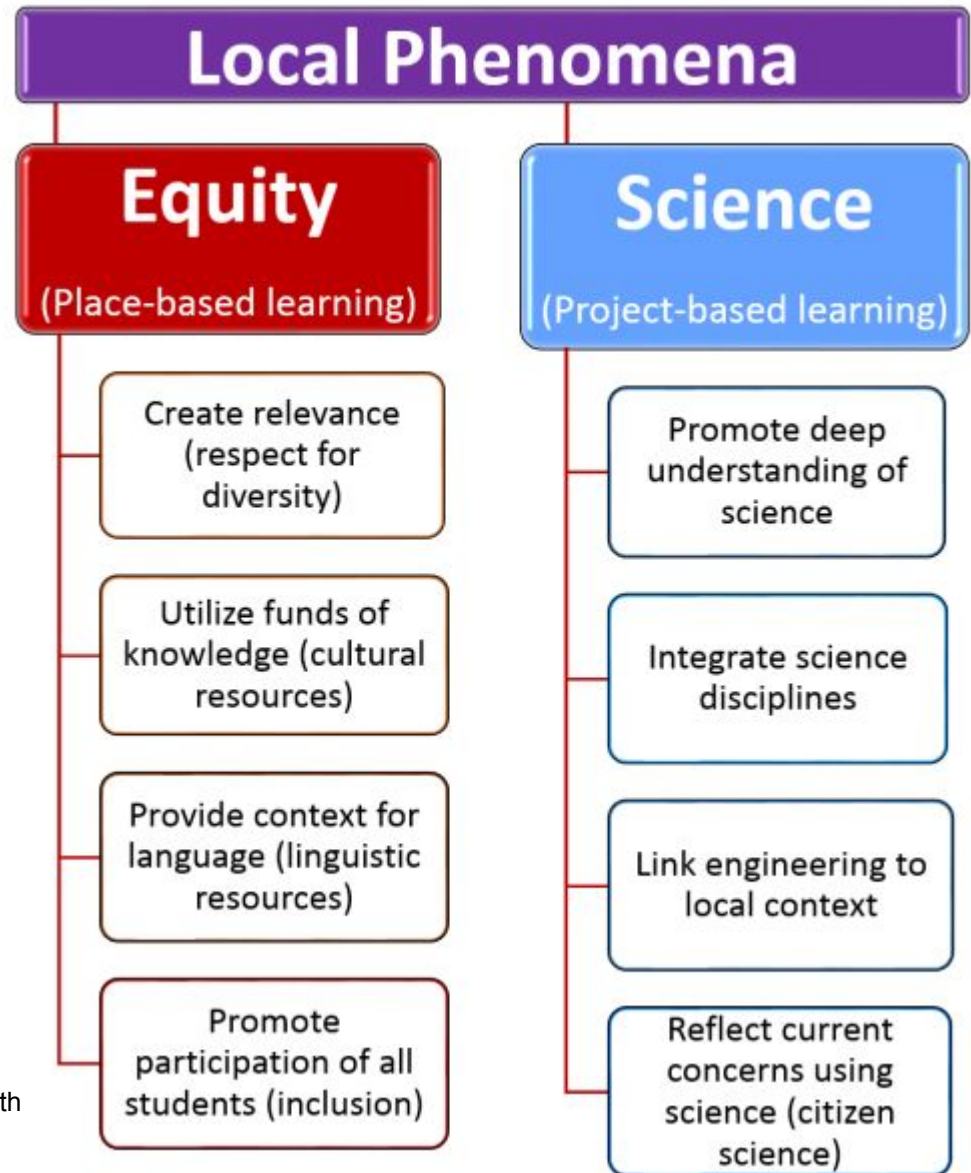


Figure 3. Components in selecting and using local phenomena with diverse student groups in the SAIL curriculum.



# Read Teacher Guide for Lesson 1

---

Can be found on Collections page. Resource #5

Read p. 1 - 2 (Overview)

Read p. 14 - 18 (Day 4 - Driving Question Board)

Jamboard page 6: What has you excited? What questions or ideas are bubbling up to the top of your mind?

# Break!

---



Can be found on Collections page. Resource #7

Read over the Unit 1 Overview Document.

In the Jamboard (p. 7), share for each lesson:

- One observation
- One question

Did you notice your questions from the Driving Question Board answered in the unit?

# Immersion Experience: Lesson 3-2

## WHAT HAVE WE FIGURED OUT?

Do materials change if they are crushed?

When materials are crushed, the type and amount of material do not change.

What happens to materials that we can't see anymore?

Even though we cannot see the material, the material is still there.

Do garbage materials change in a landfill bottle at time point 2?

The properties of the food materials changed, but the properties of the non-food materials did not change.

The weight of the open system went down a little bit, but the weight of the closed system stayed the same.

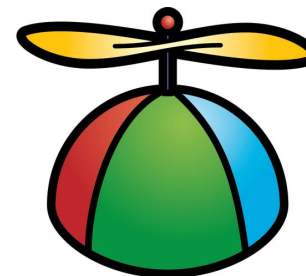
What is that smell?

The smell coming from our landfill bottles is a gas made of particles that are too small to see.

# Student Hat/Educator “Hat”

---

Student Hat: Think like a student.



Student/Teacher Hat: Think like a student, but note teacher guidance.



Teacher “Hat”: Reflect on student experience and educator moves.

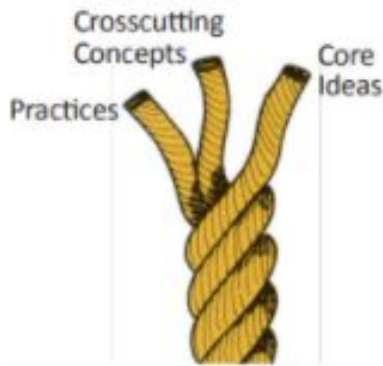
# Student Hat/Educator "Hat"

## NYU SAIL RESEARCH LAB

Doing Science, Using Language



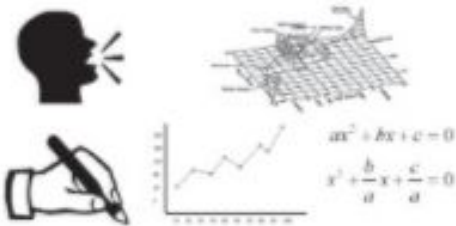
Phenomenon



Three-dimensional Learning



Learning Progressions



Modalities

Everyday                      Specialized



Registers



Interactions





# Driving Question Board: What is that smell?

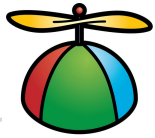
11  
7



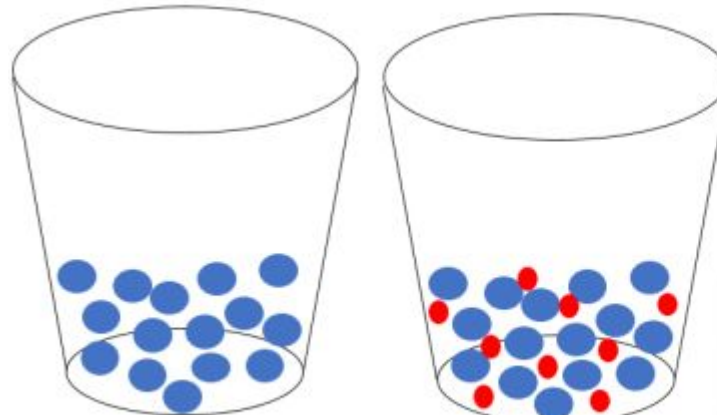
When we made observations of properties of the materials in our landfill bottles, we observed an odor or smell and added questions about smell to the Driving Question Board.



# How do you notice the scent?





In your Science and Engineering Notebook (SEN):  
Develop an initial model to show your ideas about the  
smell and the air.



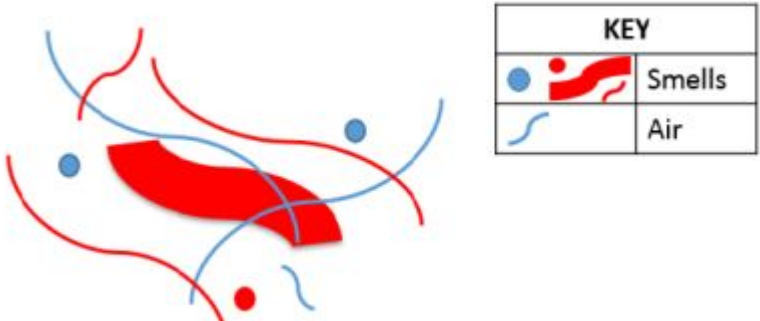






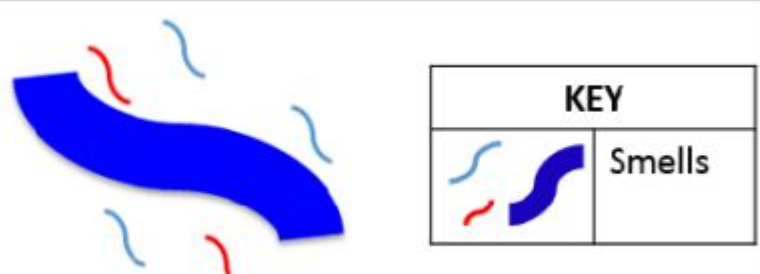







Before Mixing

After Mixing

KEY	
	Water
	Sugar particle mixed in with water particles

# Which model looks the most similar to your model?






1		 <table border="1" data-bbox="1226 301 1493 451"><thead><tr><th colspan="2">KEY</th></tr></thead><tbody><tr><td></td><td>Smells</td></tr><tr><td></td><td>Air</td></tr></tbody></table>	KEY			Smells		Air	
KEY									
	Smells								
	Air								
2		 <table border="1" data-bbox="1161 732 1493 911"><thead><tr><th colspan="2">KEY</th></tr></thead><tbody><tr><td></td><td>Smells</td></tr><tr><td></td><td>Air</td></tr></tbody></table>	KEY			Smells		Air	
KEY									
	Smells								
	Air								
3									

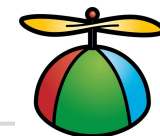
# Making Observations of Air



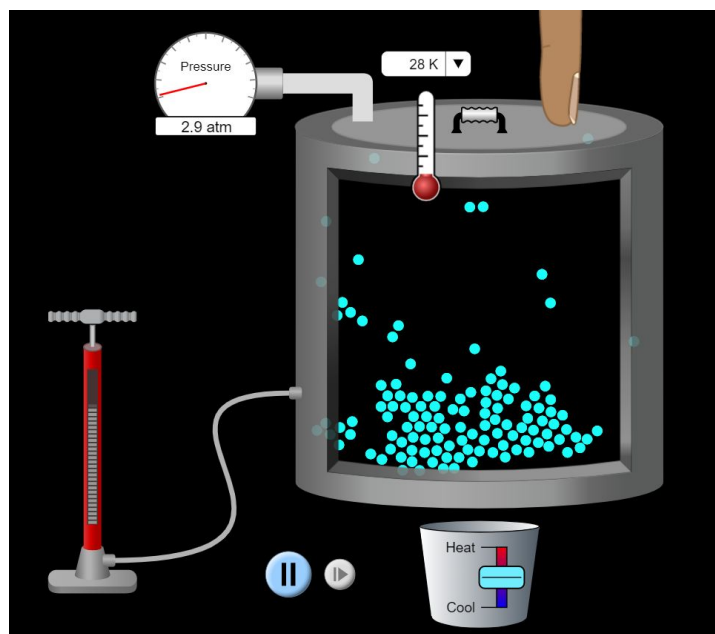
# Making Observations of Air

Investigation plan		✓
1	Gather materials: <ul style="list-style-type: none"><li>□ 1 Syringe (any size, approx. 10 mL)</li></ul>	
2	Raise the plunger to 10 mL. Record the volume in the investigation table. <ul style="list-style-type: none"><li>□ Use the lowest mark on the plunger as the stopping point of the measurement.</li></ul>	
3	Use your palm to tightly block the syringe opening. Press the plunger down as far as you can. Record the volume in the investigation table.	
4	Remove your palm from the syringe opening, while pushing down the plunger. Observe what happens.	

# Making Observations of Air



How does this computer simulation model help you to understand what happened in the syringe investigation?



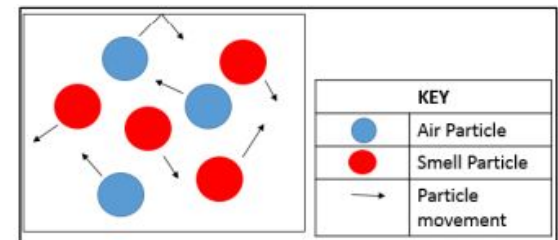
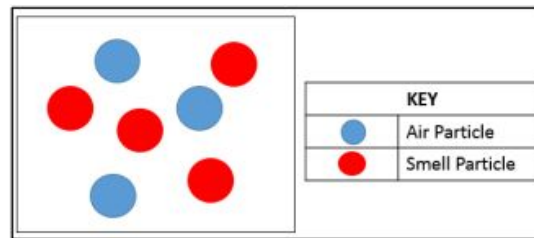
PhET: States of Matter -

[https://phet.colorado.edu/sims/html/states-of-matter/latest/states-of-matter\\_en.html](https://phet.colorado.edu/sims/html/states-of-matter/latest/states-of-matter_en.html)

# How do you notice the scent?



In your Science and Engineering Notebook (SEN):  
**Revise** your model to show your ideas about the smell and the air.





# Debrief Break: Teacher Hat

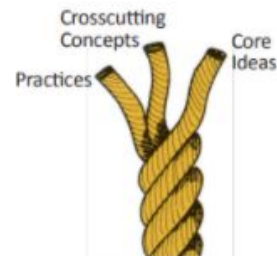
How does the lesson progression support students in moving from everyday to specialized language?

## NYU SAIL RESEARCH LAB

Doing Science, Using Language



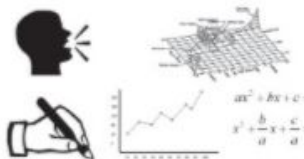
Phenomenon



Three-dimensional Learning



Learning Progressions



Modalities

Everyday

Specialized



Registers



Interactions



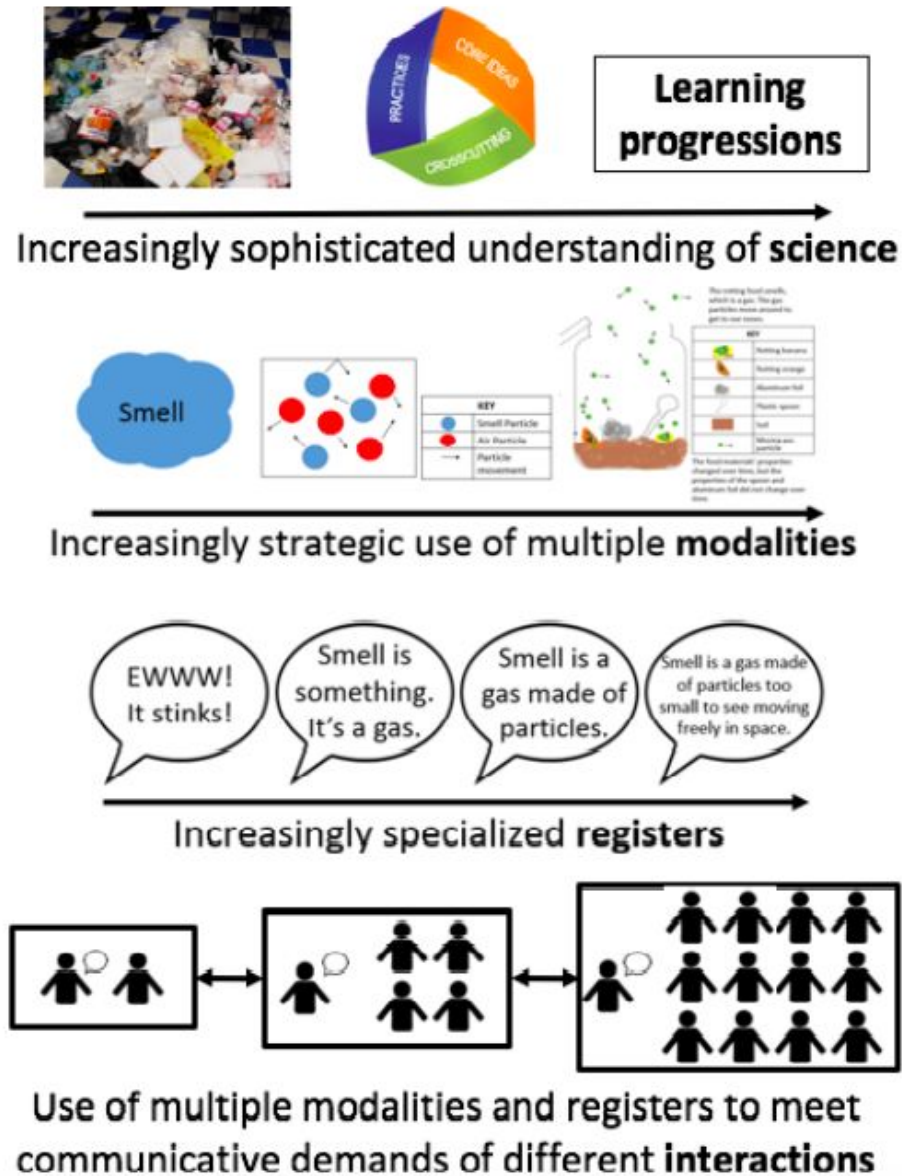


Figure 9. Science and language learning occur in tandem over the course of the Garbage unit.

Can be found on Collections page. Resource #6

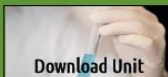
Read p. 1 - 6 (Overview and Day 1)

Jamboard: What has you excited? What questions or ideas are bubbling up to the top of your mind?

# Grade-Level Storylines



## 3 Playground Forces



### Overview

After completing this unit, students will never look at recess or physical education the same way again. The anchoring phenomenon for this unit is objects move in different ways during physical activities on the playground. This unit is the first half of the third grade Physical Science standards and addresses the first two Performance Expectations only. In this unit, students identify forces and that forces have strength and direction. While exploring the playground, students observe the action of contact forces by investigating how balanced and unbalanced forces cause motion as well as how speed and direction changes are caused by the



Grade 3

CONTENT AREA  
**SCIENCE** GRADE  
**5**



The Garbage Unit

LESSON PLANS

## Why Do Fireflies Light Up?

By Rita Januszyk and Alison Haas

[Share](#) [Add to library](#) [Start a Discussion](#)



Grade 4

# Reflection



## Alone Zone

How does your experience with the grade-level storyline compare to your experience learning science when you were in elementary school?

- What is similar?
- What is different?

**3 Playground Forces** Download Unit

**Overview**

After completing this unit, students will never look at recess or physical education the same way again. The anchoring phenomenon for this unit is objects move in different ways during physical activities on the playground. This unit is the first half of the third grade Physical Science standards and addresses the first two Performance Expectations only. In this unit, students identify forces and that forces have strength and direction. While exploring the playground, students observe the action of contact forces by investigating how balanced and unbalanced forces cause motion as well as how speed and direction changes are caused by the

Grade 3

**Why Do Fireflies Light Up?**

By Rita Janczyk and Alison Hays

Grade 4

CONTENT AREA GRADE  
**SCIENCE 5**

The Garbage Unit

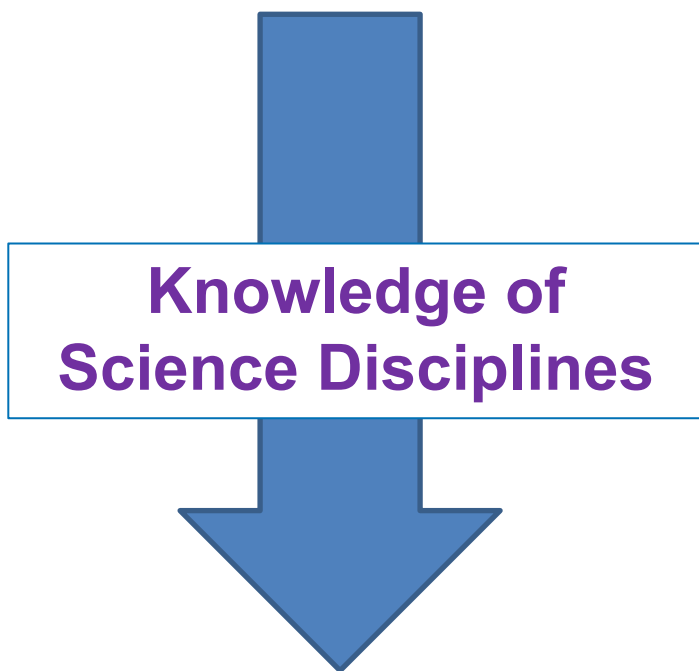
## Small Group

Share your thinking with your group members. Be ready to share an “aha!” or take away from your group’s discussion.

# Flip Upside Down!

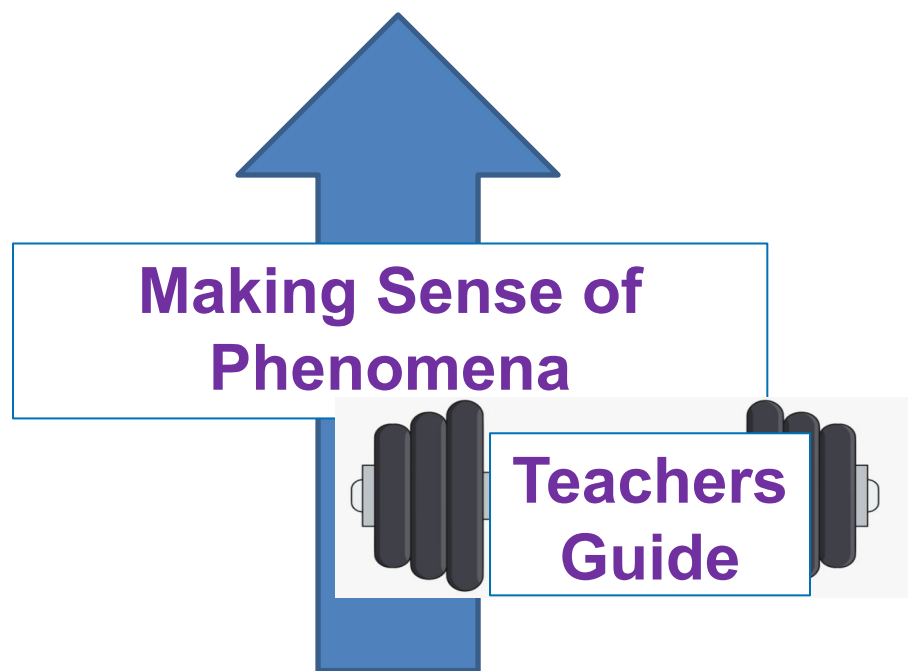


**Scientists and  
Teachers**



**Some Students**

**Students as Scientists  
and Engineers**



**All Students**



# Flip Upside Down!



**Scientists and  
Teachers**

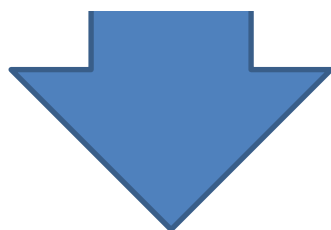


**Students as Scientists  
and Engineers**

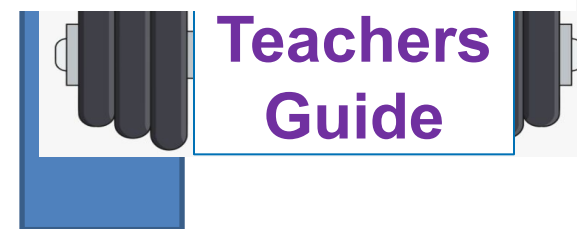


How does sensemaking leverage students' assets and help minimize barriers to learning?

*Please share in the chat window.*



**Some Students**



**All Students**

# NSTA Sensemaking Lessons and Units



**Daily Do**  
Sensemaking tasks teachers and families can use to engage students

Elementary Middle High For Families

 Lesson Plan How Will The Plant Grow?	 Daily Do Why Are the Temperatures Changing?	 Lesson Plan How Do Kites Fly?	 Daily Do Why Are Plane Designs So Different?
 Lesson Plan Why Are There Fish in the Desert?	 Lesson Plan How can we tell what season it is?	 Daily Do How Does Air Make Things Move?	 Lesson Plan How can a helicopter fly on Mars?
 Lesson Plan How is COVID-19 impacting families and communities?	 Lesson Plan Why do some objects stick to the refrigerator?	 Lesson Plan How Does Our Neighborhood Provide for its Wildlife?	 Lesson Plan How Can We Become Good Marble Players?

<https://www.nsta.org/resources/daily-do>

# NSTA Sensemaking Lessons and Units



## How Do Ants Help the Plants and Animals of the Woods?

NSTA Playlist



## How Were the Scablands Formed?

NSTA Playlist



## Why Do Fireflies Light Up?

NSTA Playlist



## What Happens to Our Garbage?

NSTA Playlist





# Sensemaking Lessons and Units



THE STANDARDS ▾ INSTRUCTION AND ASSESSMENT ▾ PLANNING AND COMMUNICATION ▾

## Quality Examples of Science Lessons and Units



## Interactions

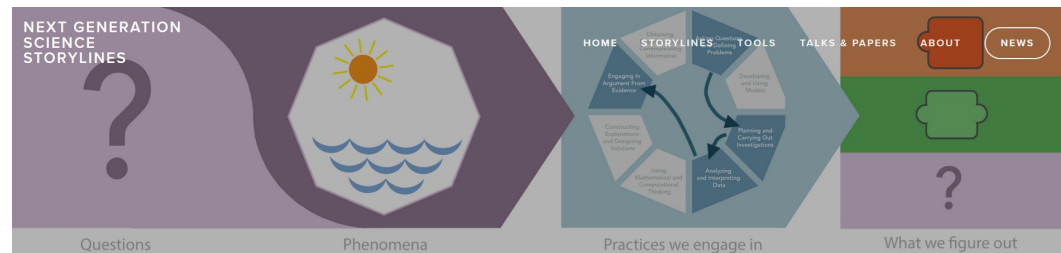
A collaboration between the CREATE for STEM Institute at Michigan State University and the Concord Consortium



## High School Physical Science Units



## Middle School Science Units



University of Colorado Boulder

## inquiryHub: Research-based Curricula Supporting Next Generation Science

Home About Curricula Assessments Research Events News

### Curricula

inquiryHub high school and middle school curricula are aligned to the Framework and guided by the Next Generation Science Standards in a deeply digital environment, students contribute resources, observations, data, and analyses to solve larger scientific problems.

inquiryHub curricula are designed to go beyond traditional science content. By focusing on phenomena relevant to students' lives and engage with science and engineering practices.

**Open Source Materials Available for Use**



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Too often, science instruction in the earliest grades consists of disparate activities rather than the comprehensive, coherent instruction needed to build a strong foundation for science literacy. That's why we're offering Levels K-2 of *PhD Science* as a free PDF open educational resource (OER). It's the richest and most robust OER K-2 science curriculum available today across the country.

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## Free 60 day membership

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- From Menu, choose My Account (<https://my.nsta.org/account/>)
- Just below the blue header bar, you will see your Member Number

If you do not have an NSTA account:

- Go here: <https://www.nsta.org/membership>
- Choose Free Membership
- Complete the form
- You should now be on the "Thank you for Joining NSTA!" page
- From Menu, choose My Account (<https://my.nsta.org/account/>)

# Feedback Survey

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Your feedback is valuable to us! We use it to provide follow-up support as well as inform choices about future professional learning opportunities.

Presenter 1: **Kristen Moorhead (Grade 3)**

Presenter 2: **Kate Soriano (Grade 4)**

Presenter 3: **Marisa Miller (Grade 5)**

District or School: **New Brunswick 3-5**

<https://www.surveymonkey.com/r/VPLNSTA20>



# Thank you for participating!

13  
6

