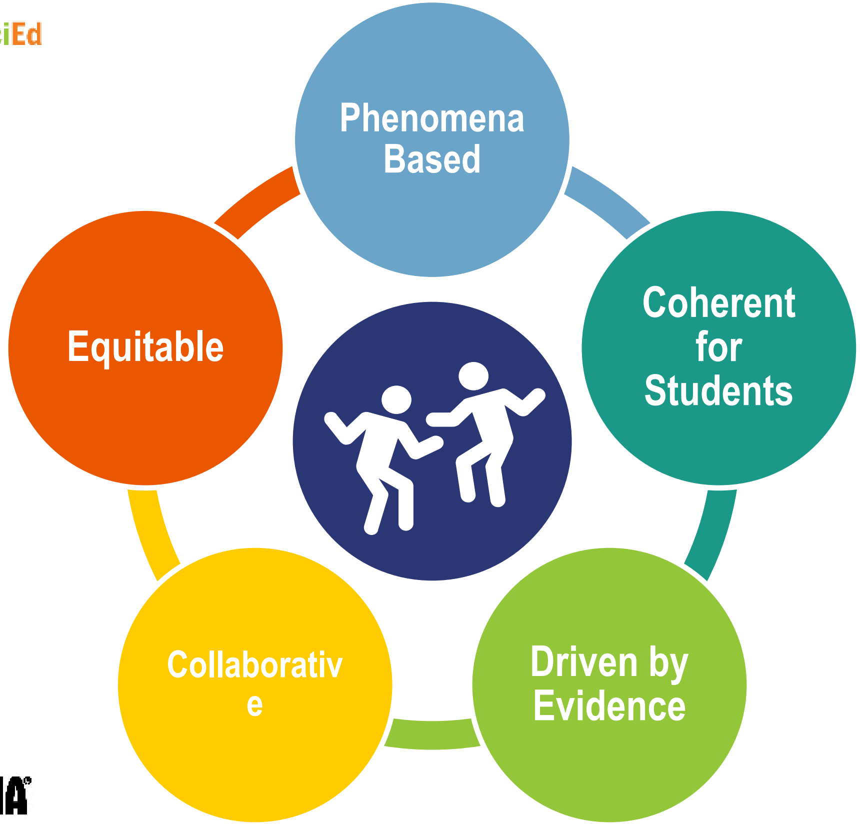
OpenSciEd | CAROLINA®

Transforming Science Education, Together

Designed and built with students front and center



- Exploration is driven by **students'** questions and ideas
- Builds on **students'** prior knowledge and experiences
- **Students** use evidence to revise their thinking
- **Students** figure out ideas as classroom community

Developed by leading education and research institutions

BSCS Science Learning Team

Dana Center Team

Northwestern University Team

University of Colorado Boulder Team

Boston College Team

Field tested by teachers and students across the country

OpenSciEd Teachers & Students

265 field test teachers
and
5800 participating students
in
115 school districts
in
10 states

teach the OpenSciEd units and provide feedback.

The 10 OpenSciEd Partner States

How OpenSciEd Materials Rank

All units reviewed by the Science Peer Review Panel at NextGenScience using the EQuIP Rubric

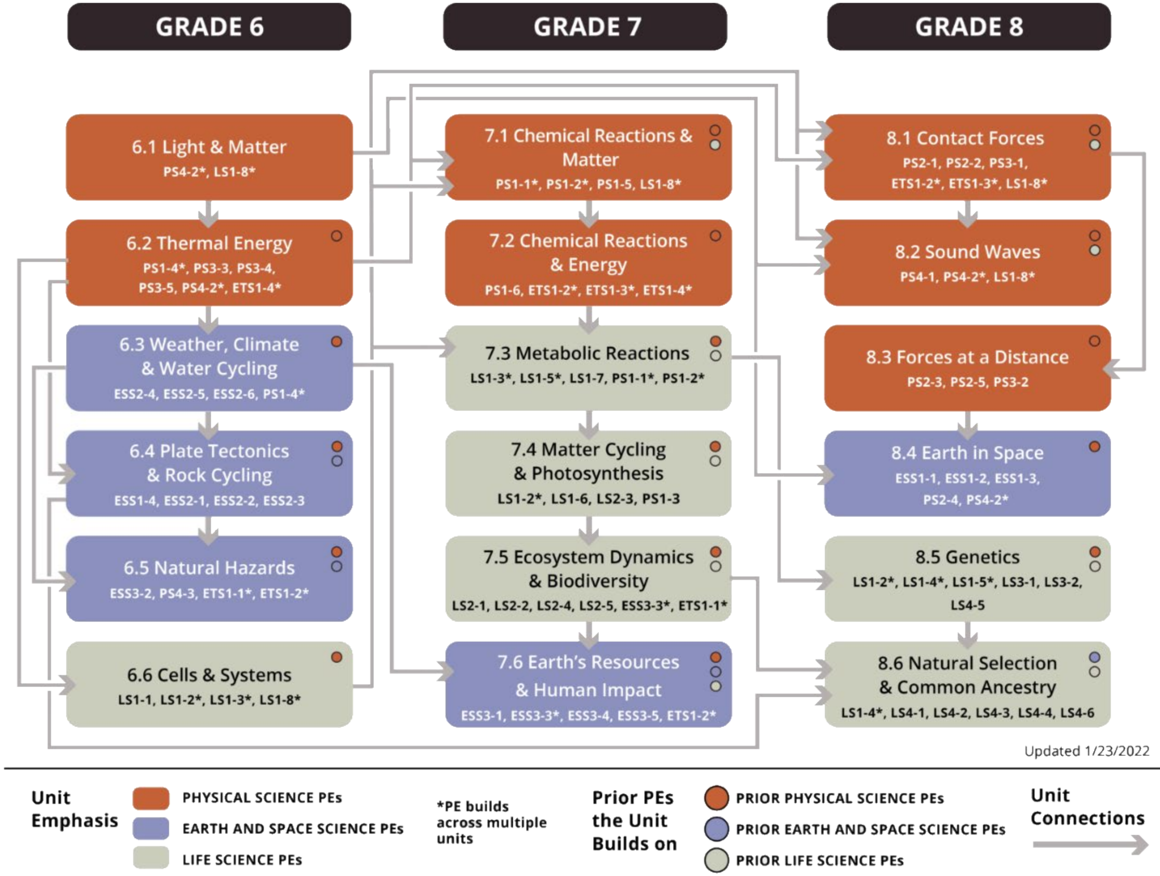
- **ALL of the units are rated Quality Examples of Science Lessons and Units**
- **16 units received the High Quality NGSS Design Badge ranking**
- **93% of materials submitted for review do not achieve a quality rating**

HIGH QUALITY NGSS DESIGN

NEXTGENSCIENCE.ORG

OpenSciEd

Middle School Scope & Sequence



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Transforming Science Education

Carolina and OpenSciEd have partnered to make high-quality instructional materials even better.

High-quality instructional content from OpenSciEd

Materials and production expertise from Carolina

Dedicated service and support from Carolina

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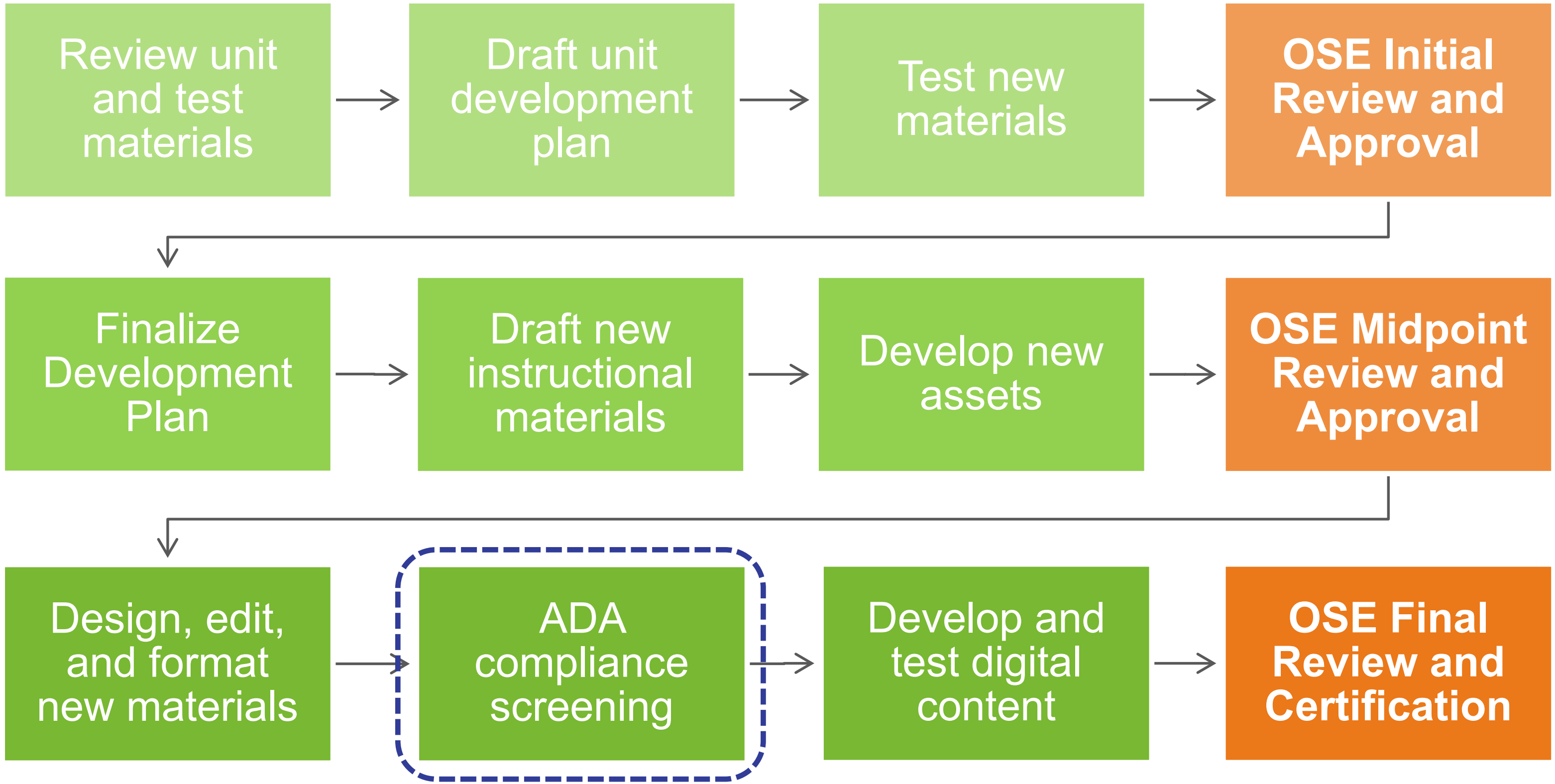
Carolina Development Focus

Ease of Use	Redesign the Teacher Guide Reengineer labs and materials Add digital resources and support
Less Prep and Instruction Time	Simplify procedures with new or improved materials Convert some labs to demo or video Add Teacher Prep Videos
Reduce Cost of Kits	Fewer materials Less expensive materials Digital options
Add Safety Measures	Additional Safety Guidance Include PPE in kits Replace and/or reduce some chemicals
Enhance Accessibility	Enhanced ADA features Maintain UDL standards Materials meet adoption standards

CAROLINA

Carolina Development Plan

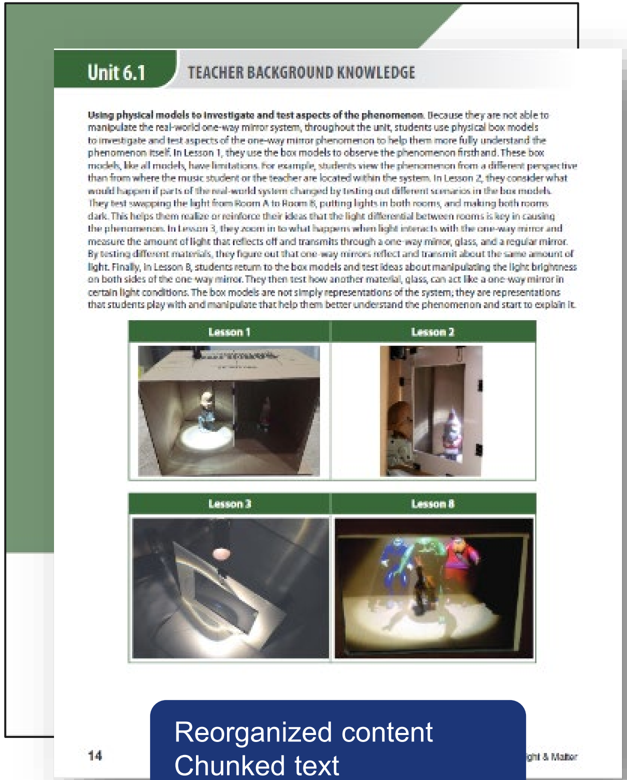


CAROLINA

Redesigned Teacher Guide

Portrait layout with ADA compliant colors and fonts.

Redesigned Teacher Guide


Unit 6.1 TEACHER BACKGROUND KNOWLEDGE

Using physical models to investigate and test aspects of the phenomenon. Because they are not able to manipulate the real-world one-way mirror system, throughout the unit, students use physical box models to investigate and test aspects of the one-way mirror phenomenon to help them more fully understand the phenomenon itself. In Lesson 1, they use the box models to observe the phenomenon firsthand. These box models, like all models, have limitations. For example, students view the phenomenon from a different perspective than from where the music student or the teacher are located within the system. In Lesson 2, they consider what would happen if parts of the real-world system changed by testing out different scenarios in the box models. They test swapping the light from Room A to Room B, putting lights in both rooms, and making both rooms dark. This helps them realize or reinforce their ideas that the light differential between rooms is key in causing the phenomenon. In Lesson 3, they zoom in to what happens when light interacts with the one-way mirror and measure the amount of light that reflects off and transmits through a one-way mirror, glass, and a regular mirror. By testing different materials, they figure out that one-way mirrors reflect and transmit about the same amount of light. Finally, in Lesson 8, students return to the box models and test ideas about manipulating the light brighness on both sides of the one-way mirror. They then test how another material, glass, can act like a one-way mirror in certain light conditions. The box models are not simply representations of the system; they are representations that students play with and manipulate that help them better understand the phenomenon and start to explain it.

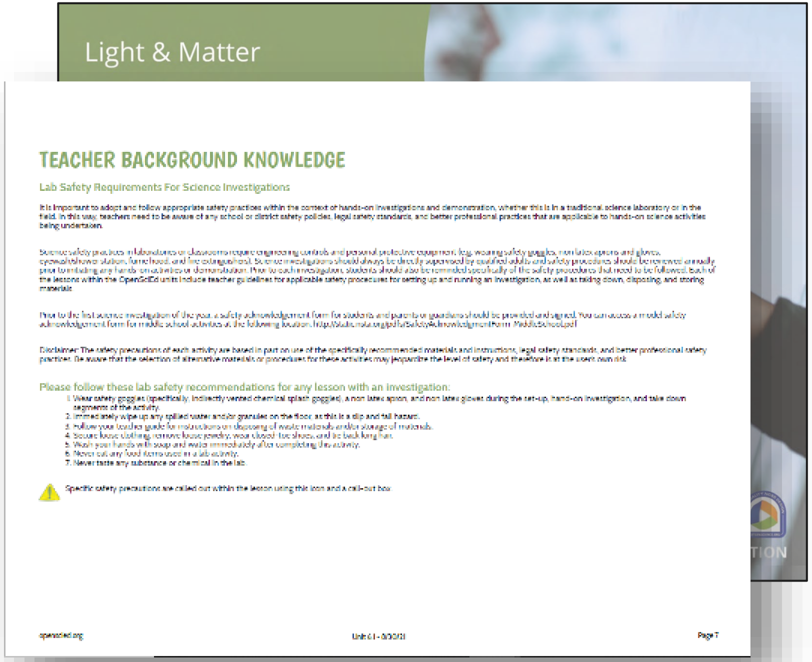
Lesson 1	Lesson 2
Lesson 3	Lesson 8

14

Reorganized content
Chunked text

Redesigned Teacher Guide

OpenSciEd CERTIFIED CAROLINA VERSION



Light & Matter

TEACHER BACKGROUND KNOWLEDGE

Lab Safety Requirements For Science Investigations

It is important to adopt and follow appropriate safety practices within the context of hands-on investigations and demonstration, whether this is in a traditional science laboratory or in the field. In this way, teachers need to be aware of any school or district safety policies, legal safety standards, and better professional practices that are applicable to hands-on science activities being undertaken.

Science safety practices in laboratories or classrooms require engineering controls and personal protective equipment (e.g., wearing safety goggles, non-latex aprons and gloves, eyewash/shower station, fume hood, and fire extinguishers). Science investigations should always be directly supervised by qualified adults and safety procedures should be reviewed annually prior to initiating any hands-on activities or demonstration. Prior to each investigation, students should also be reminded specifically of the safety procedures that need to be followed. Each of the lessons within the OpenSciEd units include teacher guidelines for applicable safety procedures for setting up and running an investigation, as well as taking down, disposing, and storing materials.

Prior to the first science investigation of the year, a safety acknowledgement form for students and parents or guardians should be provided and signed. You can access a model safety acknowledgement form for middle school activities at the following location: http://static.nsta.org/pdfs/SafetyAcknowledgmentForm-MiddleSchool.pdf

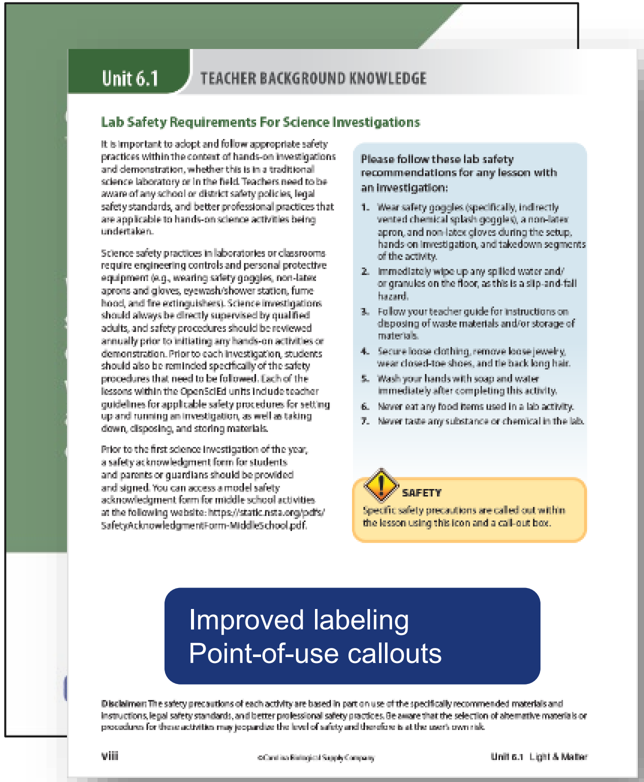
Disclaimer: The safety precautions of each activity are based in part on use of the specifically recommended materials and instructions, legal safety standards, and better professional safety practices. Be aware that the selection of alternative materials or procedures for these activities may jeopardize the level of safety and therefore is at the user's own risk.

Please follow these lab safety recommendations for any lesson with an investigation:

1. Wear safety goggles (specifically, indirectly vented chemical splash goggles), a non latex apron, and non latex gloves during the set-up, hand-on investigation, and take down segments of the activity.
2. Immediately wipe up any spilled water and/or granules on the floor, as this is a slip and fall hazard.
3. Follow your teacher guide for instructions on disposing of waste materials and/or storage of materials.
4. Secure loose clothing, remove loose jewelry, wear closed-toe shoes, and tie back long hair.
5. Wash your hands with soap and water immediately after completing the activity.
6. Never eat any food items used in a lab activity.
7. Never taste any substance or chemical in the lab.

Specific safety precautions are called out within the lesson using this icon and a call-out box.

openscied.org Unit 6.1 - 8/2021 Page 7



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SAFETY
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viii ©Carolina Biological Supply Company Unit 6.1 Light & Matter

Improved labeling
Point-of-use callouts

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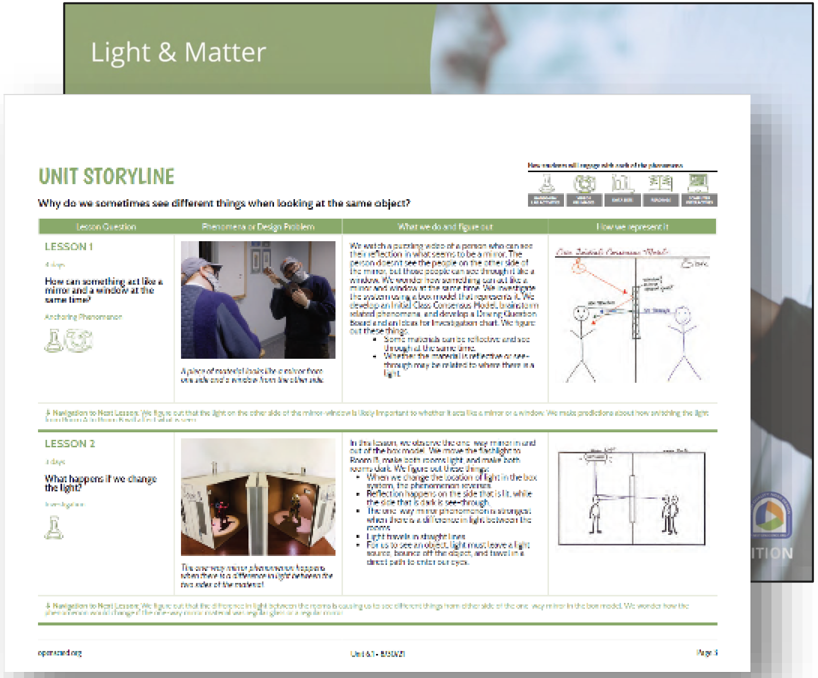
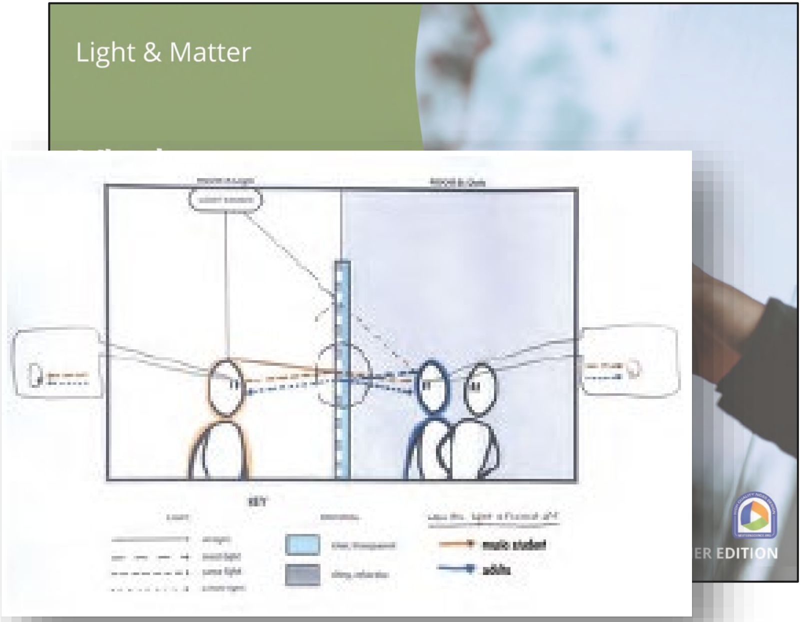
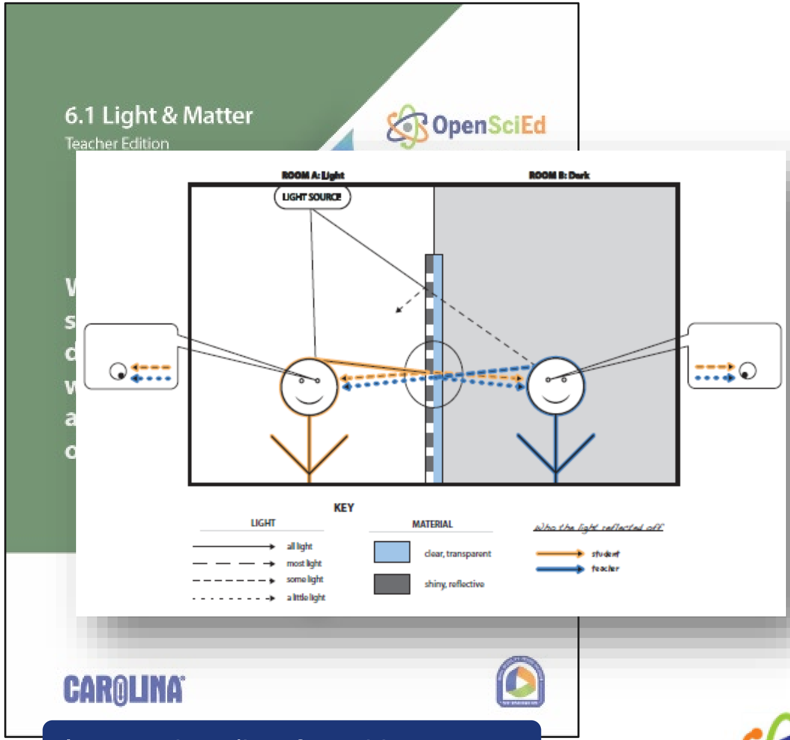
Redesigned Teacher Guide



Improved quality of icons, photos and graphics

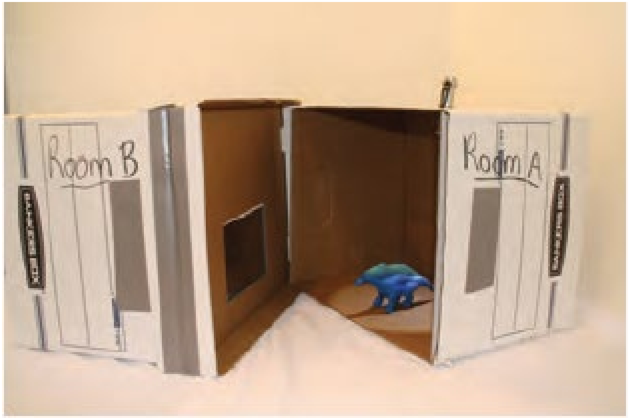
Redesigned Teacher Guide





Improved quality of graphics

6.1 Light & Matter



- Two banker boxes
- Teacher prep ~20 mins per group (2.5-3 hours total)

- One cardboard box
- Teacher prep ~10 mins per group; recommend that students do setup

✓ Fewer materials
✓ Cut prep time in half or more
✓ Better storage option

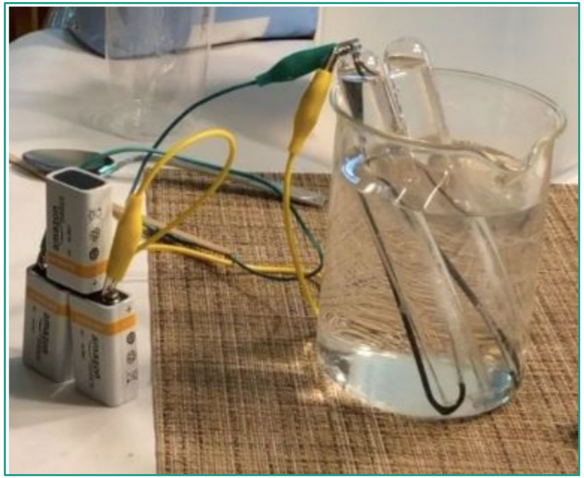
7.1 Chemical Reactions

- Teachers make100’s bath bombs (one per student x 4 recipes)
- Students test all 4 bath bombs

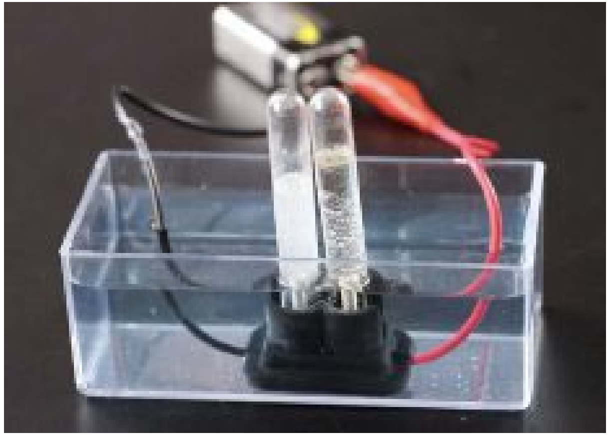
- Teachers make 160 bath bombs
- Students test first round of bath bombs, then observe subsequent bombs via video

✓ Fewer consumable materials
✓ Cut prep time in half (or more)
✓ Less instructional time

7.1 Chemical Reactions



- Electrolysis setup made of expensive individual materials
- Difficult and time-consuming to set up

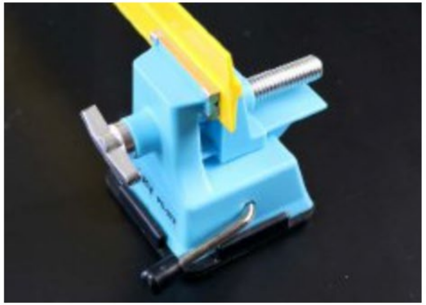


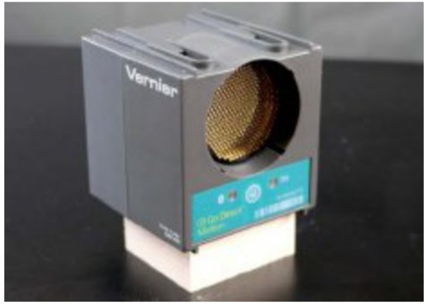
- Carolina® proprietary micro electrolysis apparatus

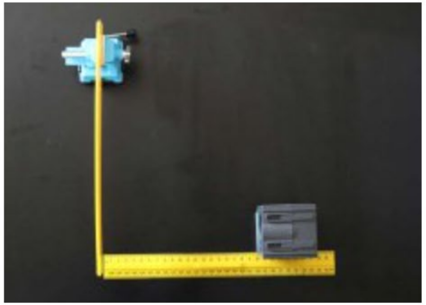
✓ Less expensive
✓ Set up in 5 mins

OpenSciEd CERTIFIED CAROLINA VERSION

8.2 Sound Waves







OpenSciEd Launch PD

Day 1: Phenomena and Questions

Introduction Session

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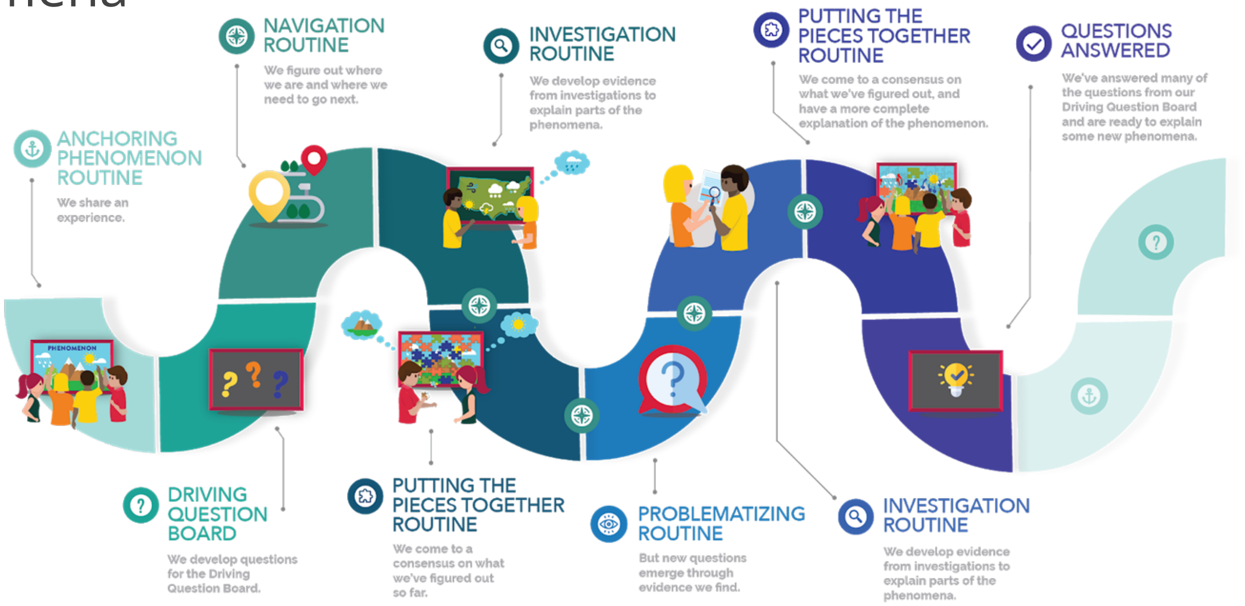
OpenSciEd Instructional Model

OpenSciEd units are based on a science storyline.

- Each step is driven by students' questions that arise from phenomena



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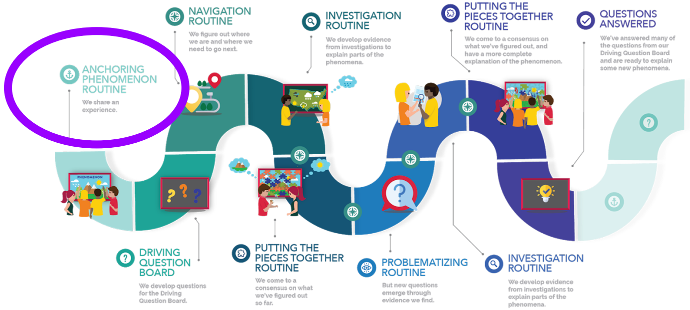
OpenSciEd Instructional Model

ANCHORING PHENOMENON ROUTINE



All units have an anchoring phenomenon or problem.
This results in student-driven questions, ideas and initial explanations that are then explored in future lessons.

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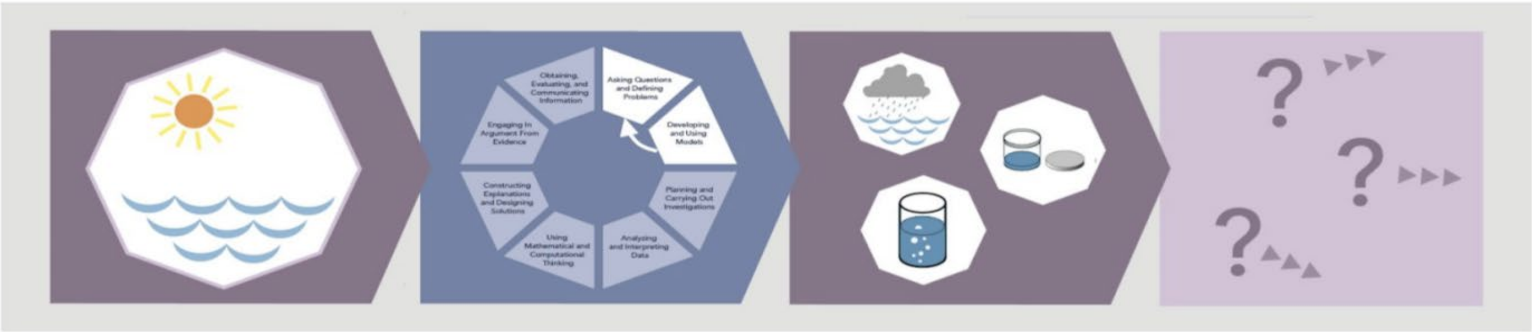
Anchoring Phenomenon Routine

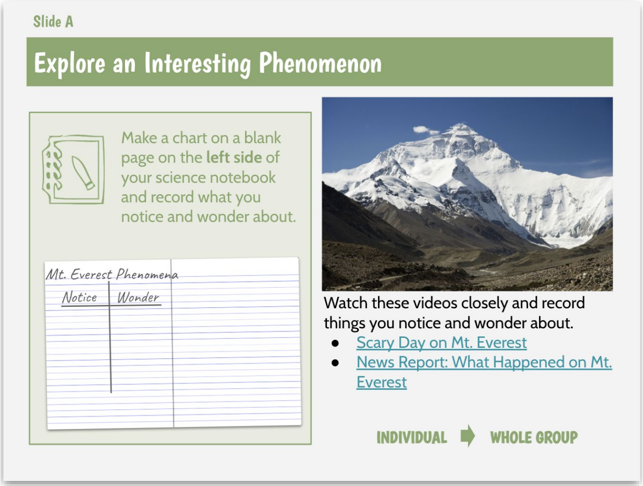
This is the first routine of the OpenSciEd curriculum to position students in making sense of a phenomenon, grounding all students in a common experience and raising student questions.

Element #1: Explore the phenomenon	*Element #2: Attempt to make sense*	*Element #3: Identify related phenomenon*	*Element #4 Questions and next steps*

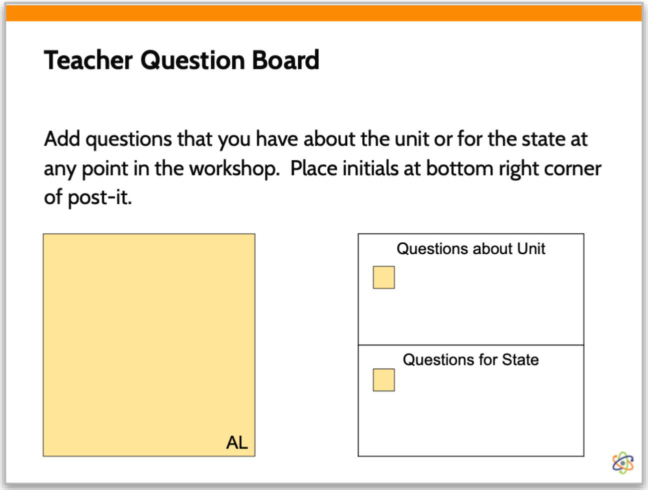


Switching hats

Student hat: Thinking like a kid. What do you anticipate a middle school student might think? What might they say? Channel your inner middle schooler.



Teacher hat: Reflecting on pedagogical approach, instructional routines, classroom culture, logistics/supports, NGSS, etc...



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Anchoring Phenomena Routine Tracker

Anchoring Phenomena Routine Tracker

OpenSciEd

	Element 1: Explore the Phenomenon *What do we notice?*	**Element 2:** Attempt to Make Sense of the Phenomenon *How can we explain this? Do our explanations agree?*	**Element 3:** Identify Related Phenomena *Where else does something similar happen?*	**Element 4:** Develop Questions and Next Steps *What should we do to figure out how to explain this?*
Notes about what you or the students did.				
How does this support ***figuring out***?				
How does this support a ***classroom culture where all students have access?***				

Student hat

Teacher hat

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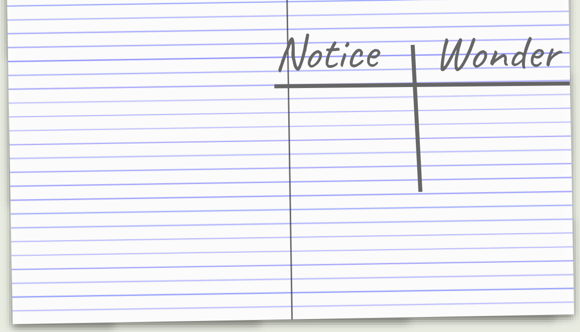
Welcome 6th Grade Students!


Museum Hours
Tuesday–Thursday
Saturday–Sunday 10–5
Friday 10–9
Closed Monday
CAUTION


SHOP
DINE
ONATE
CAUTION

Explore an Interesting Phenomenon

Make a 2column chart on a blank page on the **left side** of your science notebook and record what you notice and wonder about.



Watch the video closely and record things you notice and wonder about.

INDIVIDUAL

WHOLE CLASS

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Slide B

Share Noticings and Wonderings

What did you notice happening in the video?

What did you wonder about?

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Slide C

What do we think is happening?

Turn and Talk

- Why do the adults see the music student?
- Why does the music student see themself and not the adult?

Initial Explanations

What “parts” or “components” from the scene in the video do we think are important for explaining the phenomenon?

What’s not important?

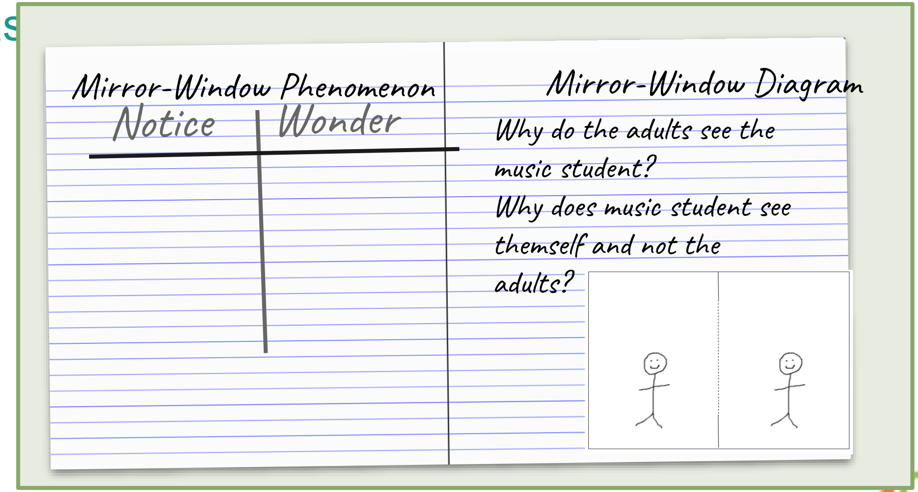
What are we not certain about?

Develop a Diagram

Write these two questions in your science notebook:

- Why do the adults see the music student?
- Why does the music student see themself and not the ad

Create a diagram to explain as much as
you know about the two questions.

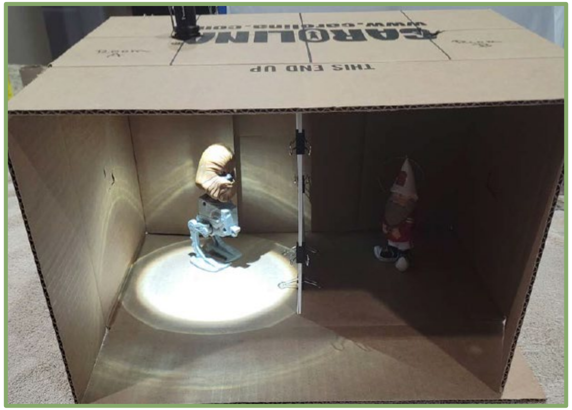


- ❑ Include all the important parts we agreed on and label them.
- ❑ Use pictures, symbols, and words to explain **how the parts interact** to cause the phenomenon.
- ❑ Record questions that you have if you become stuck.

Navigation

A **scale model** is a physical representation of something in the world. It can help us explain phenomena or solve problems.

Where have you seen or used scale models in your life?



Students would recall prior experiences and consider parts that should be represented in scale model.

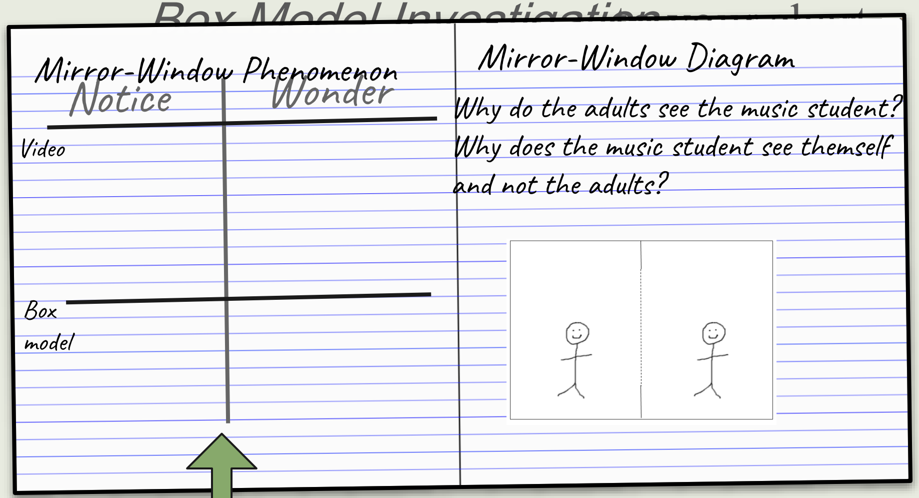
Mapping the Model to the

This part of the box model ...	is like this part of the real world ...	because ...	and is not like it because ...

Slide J

Investigate Using the Box Model

Locate your Notice and Wonder chart. Draw a line below your last noticing from the video. Add noticings from the *Box Model Investigation*



1. Turn on the flashlight for Room A.
2. Peek through the viewing hole for Room A. Record noticings to your Notice and Wonder chart.
3. Peek through the viewing hole for Room B. Record noticings.
4. Turn off the flashlight.
5. Add wonderings to your chart.
6. If time allows, remove Room A from the box model.

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Slide K

Noticings from the Box Model Investigation

- What was similar between what you saw in the video and what you saw in the box model?
- What was different?
- What new things did you notice in the box model?

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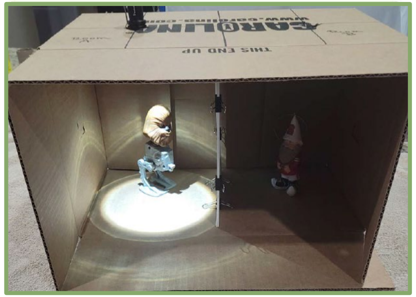
Slide L

Limitations of the Box Model



If we use this box model to test ideas about the one-way mirror phenomenon, what *differences* between the box model and the real world shown in the video could be important to keep in mind?

Slide R

In the Jamboard/ On-it Notes

1. Related Phenomenon (1 min)
   - What other experiences have you had, or what objects have you seen, that the video and model remind you of?
1. Driving Question Board (2 min)
   - Post 1 or more post-its with questions you have about the video or related phenomena.
   - Read the questions that others posted.
1. Ideas for Investigation (1 min)
   - What investigations could we do in our class to help us gather data to answer some of our questions on the Driving Question Board?

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Where to next?

We have a mission to accomplish as a class!

- ❑ Our questions represent what we hope to figure out.
- ❑ Our ideas for investigations and sources of data will help us.

If we switch the light from Room A to Room B, what do we predict will happen?

Welcome Back Educators!

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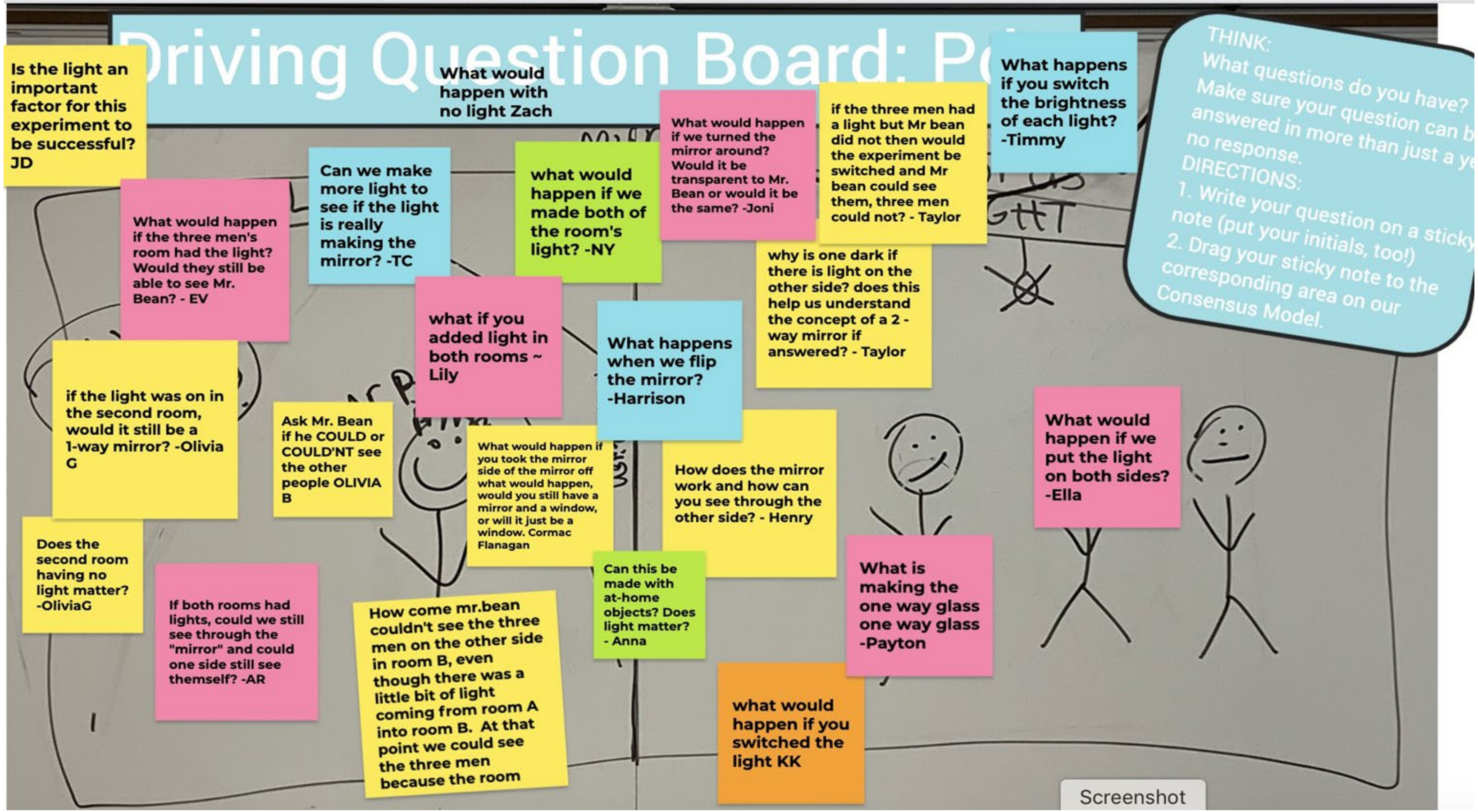

Driving Question Board: Po
Is the light an important factor for this experiment to be successful? JD
What would happen with no light Zach
What would happen if we turned the mirror around? Would it be transparent to Mr. Bean or would it be the same? -Joni
if the three men had a light but Mr bean did not then would the experiment be switched and Mr bean could see them, three men could not? - Taylor
What happens if you switch the brightness of each light? -Timmy
THINK:
What questions do you have?
Make sure your question can b
answered in more than just a ye
no response.
DIRECTIONS:
1. Write your question on a sticky note (put your initials, too!)
2. Drag your sticky note to the corresponding area on our Consensus Model.
What would happen if the three men's room had the light? Would they still be able to see Mr. Bean? - EV
Can we make more light to see if the light is really making the mirror? -TC
what would happen if we made both of the room's light? -NY
why is one dark if there is light on the other side? does this help us understand the concept of a 2 - way mirror if answered? - Taylor
what if you added light in both rooms ~ Lily
What happens when we flip the mirror? -Harrison
if the light was on in the second room, would it still be a 1-way mirror? -Olivia G
Ask Mr. Bean if he COULD or COULD'NT see the other people OLIVIA B
What would happen if you took the mirror side of the mirror off what would happen, would you still have a mirror and a window, or will it just be a window. Cormac Flanagan
How does the mirror work and how can you see through the other side? - Henry
What would happen if we put the light on both sides? -Ella
Does the second room having no light matter? -OliviaG
If both rooms had lights, could we still see through the "mirror" and could one side still see themself? -AR
How come mr.bean couldn't see the three men on the other side in room B, even though there was a little bit of light coming from room A into room B. At that point we could see the three men because the room
Can this be made with at-home objects? Does light matter? - Anna
What is making the one way glass one way glass -Payton
what would happen if you switched the light KK
Screenshot

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Purpose of Our Consensus Discussion

The goal of this discussion is to figure out areas of agreement and disagreement in our diagrams.

We also want to practice our norms.

Our discussion is guided by these questions:

- What do we all seem to agree on?
- What do we disagree on?
- What are some new ideas that we may want to consider?

Co-develop norms for consensus-building discussion

1. **Respectful:** Our classroom is a safe space to share
2. **Equitable:** Everyone's participation and ideas are valuable
3. **Committed to our community:** We learn together
4. **Moving our science thinking forward:** We work to figure things out

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Slide N

Classroom Norms

Respectful Our classroom is a safe space to share.	• We provide each other with support and encouragement. • We share our time to talk. We do this by giving others time to think and share. • We critique the *ideas* we are working with but not the *people* we are working with.
Equitable Everyone's participation and ideas are valuable.	• We monitor our own time spent talking. • We encourage others' voices who we have not heard from yet. • We recognize and value that people think, share, and represent their ideas in different ways.
Committed to our community We learn together.	• We come prepared to work toward a common goal. • We share our own thinking to help us all learn. • We listen carefully and ask questions to help us understand everyone's ideas. • We speak clearly and loud enough so everyone can hear.
Moving our science thinking forward We work together to figure things out.	• We use and build on others' ideas. • We use evidence to support our ideas, ask for evidence from others, and suggest ways to get additional evidence. • We are open to changing our minds. • We challenge ourselves to think in new ways.

Initial Class Consensus Model to Explain the

Questions we are trying to answer:

- Why do the adults see the music student?
- Why does the music student see themself and not the adults?

Brainstorm Related Phenomena

Turn and Talk

- What other experiences have you had, or what objects have you seen, that the video and the box model remind you of?

Home Learning: Self-Documentation

Phenomenon: An object, like the one-way mirror, looks different in different conditions.

Where do you see a similar thing in your life? your ho

your neighborhood or community?

Take a photo or hand-draw one example.

related

Students would complete and share on Day 3 of Lesso

We will build on Day 3 of PD.

Types of Questions to Ask

All questions are welcomed!

As you write your question(s), ask yourself these questions:

- If we answer this question, will it help us explain the phenomenon?
- Can we investigate this question to learn more about the phenomenon?
- Can it be answered with a yes or no? If so, can I write it in a different way?