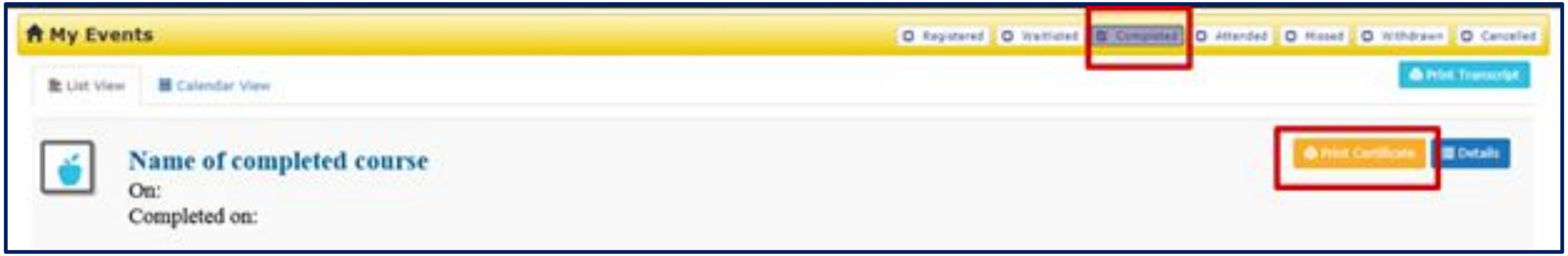
# WELCOME!

*Please review this information while we wait for all to join!*

## Attendance, Resources & PD Clock Hours

- You must stay on the whole time- 1 hour- to receive credit

- YOU print your certificate through ADE Connect- please wait 24-48 hours of webinar before printing certificates




- AFTER WEBINAR- Survey & follow-up email from ADE

Arizona Department of Education

# Transforming Science Learning: Engaging in Science & Engineering Practices Using Digital Tools

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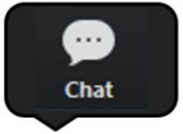
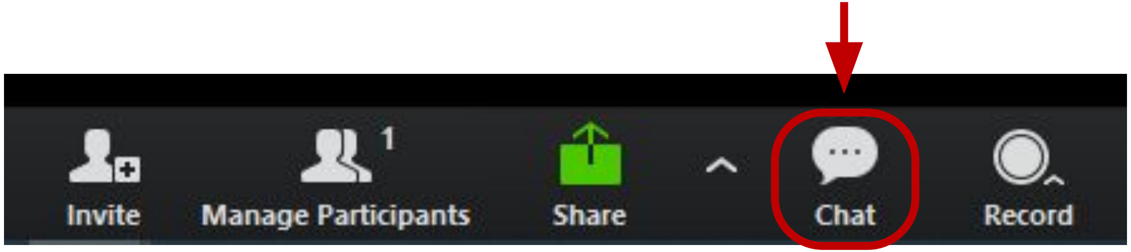
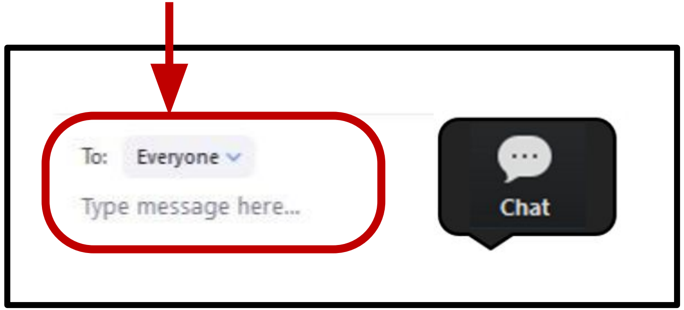
# Welcome!

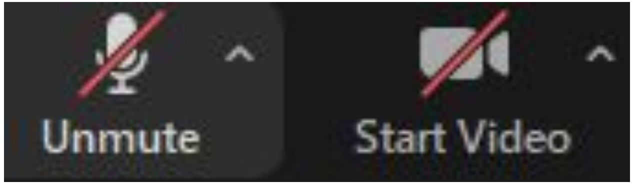




- Name
- Current Position
- County

# Webinar Housekeeping



# Webinar Resource Dashboard

## Transforming Science Learning- Engaging Students in the SEPs Using Digital Tools- Webinar Dashboard for 1.21.21

**Facilitators:** **Rebecca Garelli:** Rebecca.Garelli@azed.gov l **Sarah Sleasman:** Sarah.Sleasman@azed.gov

ADE Science Standards Page l ADE Science Resource Page l ADE Science & STEM Webinars

| | | | |
|---|---|---|---|
| 1 | **General Resources** | ⊕ Presentation PDF: PDF of Slides<br>⊕ ADE Webinar Pathways | |
| 2 | **3 Categories of Science & Engineering Practices** | ⊕ Assessing Practices Along a Continuum Article from NSTA<br>⊕ The Wonder of Science 3-D Cards | |
| 3 | **National Science Teaching Association (NSTA) Resources** | ⊕ ALL Daily Dos: https://www.nsta.org/resources/daily-do<br>⊕ Daily Do: Why Does the Ice Melt Faster? | |
| 4 | **Phenomena Video** | ⊕ Ice Melting Blocks Video | |
| 5 | **Alone Zone- Notice & Wonder** | ⊕ See-Think-Wonder Table (make a copy) | |
| 6 | **Noticings/Observations Jamboards by Birthday Month** | ⊕ December_January<br>⊕ February_March<br>⊕ April_May | ⊕ June_July<br>⊕ August_September<br>⊕ October_November |
| 7 | **What about the Science & Engineering Practices?** | ⊕ Vertical Progressions Document | |

Gray- means we will open and use

DO NOT open with Google Docs!

**DOWNLOAD AS PDF**

Chat

To: Everyone

done

# Webinar Pathways

#1 in Dashboard

## ADE WEBINAR PATHWAYS FOR 3-DIMENSIONAL SCIENCE INSTRUCTION

**Use this guide to determine which professional learning experiences will support your needs!**

New to 3-Dimensional Instruction? START HERE

### 1 Introduction to the AzSS & 3-Dimensional Instruction

- A Look at Arizona's New Science Standards
- Crosscutting Concepts: 1 of the 3 Dimensions of the AZ Science Standards
- Science and Engineering Practices: 1 of 3 Dimensions of the AZ Science Standards
- Core Ideas: 1 of 3 Dimensions of the AZ Science Standards
- Phenomena-Based 3-Dimensional Instruction

Confident in your understanding of Webinar content in Box 1?

### 2 Instructional Practices to Support 3-Dimensional Teaching & Learning

- Transforming Science Learning: Engaging Students in the Science & Engineering Practices Using Digital Tools
- 5-E Instructional Model & Science Notebooks
- Constructing Explnations & Arguing from Evidence using Claims, Evidence, & Reasoning (CER)
- SEP: Asking Questions: Students Drive Instruction with Driving Question Boards!

Confident in your understanding of Webinar content in Box 1 & 2?

### 3 Summative & Formative Assessment & Performance Tasks

- What Elementary Educators Need to Know About Performance Tasks
- What Secondary Educators Need to Know About Performance Tasks

Link to Register for Live Science & STEM Webinars | Link to All Recorded Webinars

# ADE Announcements

## PAEMST 7-12 Awards

[The Presidential Awards for Excellence in Mathematics and Science Teaching (PAEMST)](https://www.paemst.org) are the nation's highest honors for teachers of mathematics and science (including computer science). Nominations and applications open for mathematics and science teacher grades 7-12 opened in the Fall. To submit a nomination, you only need the teacher’s contact information. If you know more than one teacher deserving this award, you may submit more than one nomination. Teachers may also initiate the application process themselves at www.paemst.org.

# THANK YOU NSTA!!


National Science Teaching Association

**This presentation was adapted from two of NSTA's web seminars:**

- **Transforming Science Learning: Acting, Thinking and Talking as Scientists. Engaging Students in Science and Engineering Practices on 8/12/20**
- **Distance-Learning Strategies: Providing ALL Student Opportunities to Access Science Learning (Part 1) on 11/15/20**

ARIZONA Department of Education

# WHAT, HOW, WHY

## GOALS:

- Become more familiar with the science and engineering practices (SEPs)
- Engage in sensemaking using digital tools to help support our sensemaking and collaboration
- Learn the different ways we can sequence SEPs to support students in figuring out phenomena

# Community Norms/Shared Agreements

- We honor each other and all our voices
- We actively and respectfully listen and speak to one another
- We commit to the group by contributing to the learning of others through active participation in this web seminar.

*Adapted from NSTA's Webinar- Transforming Science Learning: Acting, Thinking and Talking as Scientists. Engaging Students in Science and Engineering Practices on 8/12/20*

# Access to Science Literacy for ALL Students

economically disadvantaged

English learners

race and ethnicity

gifted and talented

students with disabilities

students with different cultures

*Adapted from NSTA's Webinar- Transforming Science Learning: Acting, Thinking and Talking as Scientists. Engaging Students in Science and Engineering Practices on 8/12/20*

# Sensemaking

# Two Labels for Instruction

## Information Frame

- Teacher is focused on disseminating information.
- Students are focused on knowing information.
- Science is portrayed as a body of established facts.
- Assessments are focused on "right" answers.

**Knowing about..**

## Sensemaking Frame

- Teacher is focused on developing conceptual understanding.
- Students are focused on understanding something.
- Science is portrayed as a way to make sense of something.
- Assessments are focused on use of evidence to support conclusions/generalizations.

**Figuring out…**



*Adapted from NSTA's Webinar- Transforming Science Learning: Acting, Thinking and Talking as Scientists. Engaging Students in Science and Engineering Practices on 8/12/20*

# Design for Distance Learning

- Phenomena
- Science and Engineering Practices
- Student Ideas
- Classroom Norms

*Adapted from NSTA's Webinar- Transforming Science Learning: Acting, Thinking and Talking as Scientists. Engaging Students in Science and Engineering Practices on 8/12/20*

# Distance Learning Environments

**Synchronous virtual learning** (same space/same time)

**Asynchronous virtual learning aided by technology** which allows students to communicate electronically with other students and the teacher (slow chat)

**Asynchronous learning without technology** ("packets")

*Adapted from NSTA's Webinar- Distance-Learning Strategies: Providing ALL Student Opportunities to Access Science Learning (Part 1) on November 15, 2020*

# Choosing Today's Digital Tools

We've made intentional choices about which digital tools to use based on our goals for this session and the time we have together.

We are not recommending you use these specific digital tools, but are asking you to consider the relationship between the **purpose** for using the tool and the **tool features**.

*Adapted from NSTA's Webinar- Distance-Learning Strategies: Providing ALL Student Opportunities to Access Science Learning (Part 1) on November 15, 2020*

# Science & Engineering Practices

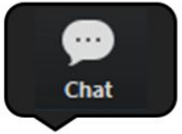
1. Asking questions (for science) and defining problems (for engineering)
2. Developing and using models
3. Planning and carrying out investigations
4. Analyzing and interpreting data
5. Using mathematics and computational thinking
6. Constructing explanations (for science) and designing solutions (for engineering)
7. Engaging in argument from evidence
8. Obtaining, evaluating, and communicating information

*Adapted from NSTA's Webinar- Transforming Science Learning: Acting, Thinking and Talking as Scientists. Engaging Students in Science and Engineering Practices on 8/12/20*

# Science & Engineering Practices (SEPs)

## Where do you fall on this spectrum?

| A | B | C | D | E |
|---|---|---|---|---|
| I know the SEPs exist | | I can engage my students in some of the SEPs | | I can confidently engage my students in the SEPs |




*Adapted from NSTA's Webinar- Transforming Science Learning: Acting, Thinking and Talking as Scientists. Engaging Students in Science and Engineering Practices on 8/12/20*

# Grouping the Practices


#2 in Dashboard

# 3 Categories of Science & Engineering Practices

## Investigating Practices

1. Asking Questions

3. Planning & Carrying Out Investigations

5. Using Mathematical & Computational Thinking

## Sensemaking Practices

2. Developing & Using Models

4. Analyzing & Interpreting Data

6. Constructing Explanations

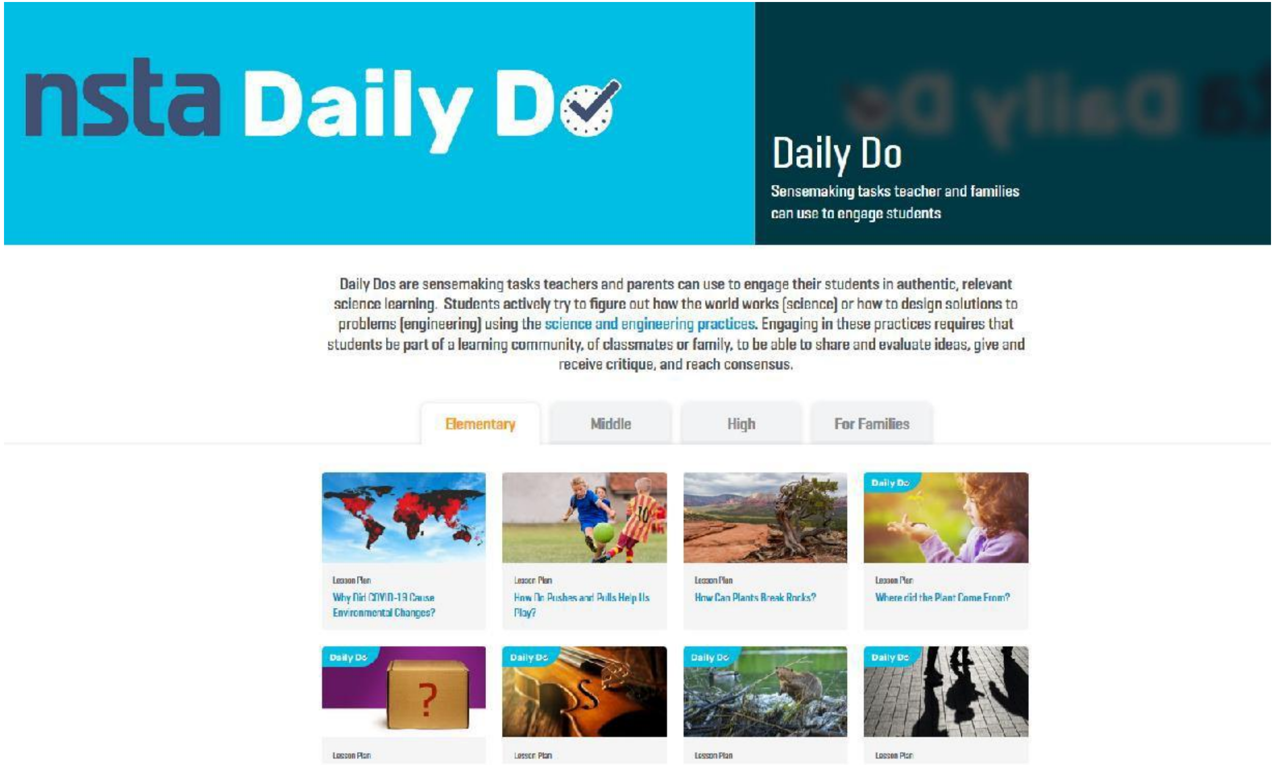
## Critiquing Practices

7. Engaging in Argument from Evidence

8. Obtaining, Evaluating, & Communicating Information

Article- #2 in Dashboard

# NSTA Daily Do




#3 in Dashboard

*Adapted from NSTA's Webinar- Transforming Science Learning: Acting, Thinking and Talking as Scientists. Engaging Students in Science and Engineering Practices on 8/12/20*

# Why NSTA Daily Do?

- ✔ Classroom to family connection
- ✔ Phenomena give students something to care about and create the ***need* to engage** in science learning
- ✔ Students engage in science learning from home **and still build ideas collaboratively**
- ✔ Guidance for teachers

*Adapted from NSTA's Webinar- Transforming Science Learning: Acting, Thinking and Talking as Scientists. Engaging Students in Science and Engineering Practices on 8/12/20*

# Middle School Science Daily Do

DAILY DO

## Why Does the Ice Melt Faster?

Share   + Add to library   ··· Supplemental Resources   Start a Discussion

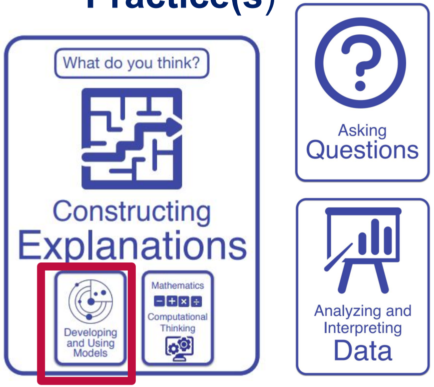

## Connected Arizona Science Standard

**8.P4U1.3**

Construct an explanation on how energy can be transferred from one energy store to another.

**Core Idea P4: The total amount of energy in a closed system is always the same but can be transferred from one energy store to another during an event.**
**U1: Sensemaking using practices**

## Science & Engineering Practice(s)




## Crosscutting Concept


*Adapted from NSTA's Webinar- Transforming Science Learning: Acting, Thinking and Talking as Scientists. Engaging Students in Science and Engineering Practices on 8/12/20*

# Student Hat/Teacher "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 teacher moves.

*Adapted from NSTA's Webinar- Transforming Science Learning: Acting, Thinking and Talking as Scientists. Engaging Students in Science and Engineering Practices on 8/12/20*

# Notice & Wonder


## Create a See-Think-Wonder table

| I notice/see | I think | I wonder |
|---|---|---|
| | | |

**#5 in Dashboard**


Arizona Department of Education

*Adapted from NSTA's Webinar- Transforming Science Learning: Acting, Thinking and Talking as Scientists. Engaging Students in Science and Engineering Practices on 8/12/20*

# Notice & Wonder


## Alone Zone

As you watch the video, record your observations, initial ideas, and any questions that arise.

| I notice/see (observations) | I think (initial ideas/prior thinking) | I wonder (questions) |
|---|---|---|
| | | |

Arizona Department of Education

*Adapted from NSTA's Webinar- Transforming Science Learning: Acting, Thinking and Talking as Scientists. Engaging Students in Science and Engineering Practices on 8/12/20*

# Notice & Wonder



| I notice/see (observations) | I think (initial ideas/prior thinking) | I wonder (questions) |
|---|---|---|
| | | |

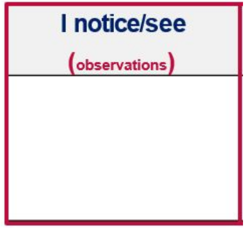
https://youtu.be/rrYAmEptMLQ



*Adapted from NSTA's Webinar- Transforming Science Learning: Acting, Thinking and Talking as Scientists. Engaging Students in Science and Engineering Practices on 8/12/20*

# Noticings Jamboard

## Small Group





**<u>MOVE 1</u>: Share observations with your group:**

- Review your observations
- Choose **two** observations to post
- Post your observations on Jamboard (one observation per sticky note) Please post on **BLUE**

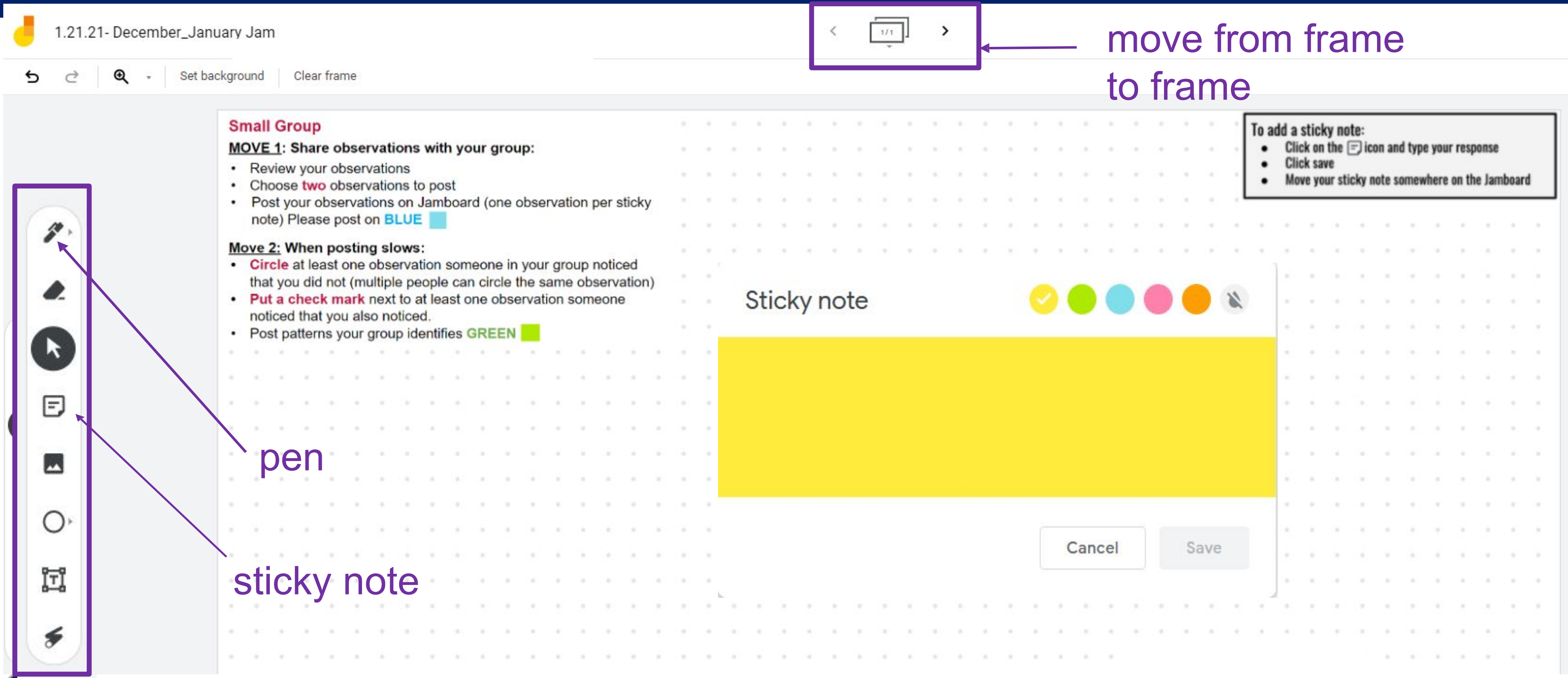
**<u>Move 2:</u> When posting slows:**

- **Circle** at least one observation someone in your group noticed that you did not (multiple people can circle the same observation)
- **Put a check mark** next to at least one observation someone noticed that you also noticed.
- Post patterns your group identifies **GREEN**

ARIZONA Department of Education

*Adapted from NSTA's Webinar- Transforming Science Learning: Acting, Thinking and Talking as Scientists. Engaging Students in Science and Engineering Practices on 8/12/20*

# Using Jamboard




*Adapted from NSTA's Webinar- Transforming Science Learning: Acting, Thinking and Talking as Scientists. Engaging Students in Science and Engineering Practices on 8/12/20*

# Jamboard (use your birthday month)

## #6 in Dashboard

| | | | |
|---|---|---|---|
| 6 | Noticings/Observations<br>Jamboards by Birthday Month | ⊕ December January<br>⊕ February March<br>⊕ April May | ⊕ June July<br>⊕ August September<br>⊕ October November |

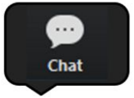
# Wonderings Waterfall

## Small Group



**Share questions with your group:**

- Review your own observations and the observations of your group.
- Review and/or add to the questions you recorded in **"I wonder"** column of your table.
- Choose one question to share.
- **Share your question in the chat window.**

# What about the Science & Engineering Practices?

## Find and open this resource

#7 in Dashboard

[Vertical Progressions Document]

K-12 Science and Engineering Practices* Progression Matrix of Elements
For use with *Arizona Science Standards*

| Science and Engineering Practices | K–2 Condensed Practices | 3–5 Condensed Practices | 6–8 Condensed Practices | 9–12 Condensed Practices |
|---|---|---|---|---|
| **Asking Questions and Defining Problems**<br><br>A practice of science is to ask and refine questions that lead to descriptions and explanations of how the natural and designed world works and which can be empirically tested.<br><br>Engineering questions clarify problems to determine criteria for successful solutions and identify constraints to solve problems about the designed world.<br><br>Both scientists and engineers also ask questions to clarify ideas. | Asking questions and defining problems in grades K–2 builds on prior experiences and progresses to simple descriptive questions that can be tested.<br><br>• Ask questions based on observations of the natural and/or designed world.<br>• Define a simple problem that can be solved through the development of a new or improved object or tool. | Asking questions and defining problems in grades 3–5 builds from grades K–2 experiences and progresses to specifying qualitative relationships.<br><br>• Identify scientific (testable) and non-scientific (non-testable) questions.<br>• Ask questions based on careful observations of phenomena and information.<br>• Ask questions to clarify ideas or request evidence.<br>• Ask questions that relate one variable to another variable.<br>• Ask questions to clarify the constraints of solutions to a problem.<br>• Use prior knowledge to describe problems that can be solved.<br>• Define a simple design problem that can be solved through the development of an object, tool or process and includes several criteria for success and constraints on materials, time, or cost.<br>• Formulate questions that can be investigated and predict reasonable outcomes based on patterns such as cause and effect relationships. | Asking questions and defining problems in grades 6–8 builds from grades K–5 experiences and progresses to formulating and refining empirically testable models that support explanations of phenomena or solutions to problems.<br>• Ask questions that arise from careful observation of phenomena, models, or unexpected results.<br>• Ask questions to clarify or identify evidence and the premise(s) of an argument.<br>• Ask questions to determine relationships between independent and dependent variables.<br>• Ask questions that challenge the interpretation of a data set.<br>• Ask questions to clarify and refine a model, an explanation, or an engineering problem.<br>• Define a design problem that can be solved through the development of an object, tool, process or system and includes multiple criteria and constraints, including scientific knowledge that may limit possible solutions.<br>• Formulate a question that can be investigated within the scope of the classroom, school laboratory, or field with available resources and, when appropriate, frame a hypothesis (a possible explanation that predicts a particular and stable outcome) based on a model or theory. | Asking questions and defining problems in grades 9–12 builds from grades K–8 experiences and progresses to formulating, refining, and evaluating empirically testable questions and design solutions using models and simulations.<br><br>• Ask questions that arise from careful observation of phenomena, models, theory, or unexpected results.<br>• Ask questions that require relevant empirical evidence to answer.<br>• Ask questions to determine relationships, including quantitative relationships, between independent and dependent variables.<br>• Ask and evaluate questions that challenge the premise of an argument, the interpretation of a data set, or the suitability of a design.<br>• Define a design problem that involves the development of a process or system with interacting components and criteria and constraints that may include social, technical and/or environmental considerations |

*Adapted from NSTA's Webinar- Transforming Science Learning: Acting, Thinking and Talking as Scientists. Engaging Students in Science and Engineering Practices on 8/12/20*

# SEP: Asking Questions & Defining Problems

Asking Questions

**Elements:**

**Specific pieces of knowledge and skill that make up the practice at each grade band.**

## K-12 Science and Engineering Practices* Progression Matrix of Elements

For use with *Arizona Science Standards*

| Science and Engineering Practices | K–2 Condensed Practices | 3–5 Condensed Practices | 6–8 Condensed Practices | 9–12 Condensed Practices |
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**Increasing sophistication**

*Adapted from NSTA's Webinar- Transforming Science Learning: Acting, Thinking and Talking as Scientists. Engaging Students in Science and Engineering Practices on 8/12/20*

# Asking Questions/Defining Problems

Which element of the Asking Questions science and engineering practice did we engage with?

Why do you say so?

Chat

| 3–5 Condensed Practices | 6–8 Condensed Practices | 9–12 Condensed Practices |
| --- | --- | --- |
| Asking questions and defining problems in grades 3–5 builds from grades K–2 experiences and progresses to specifying qualitative relationships.<br>A • dentify scientific (testable) and non-scientific (non-testable) questions.<br>• Ask questions based on careful observations of phenomena and information.<br>• Ask questions to clarify ideas or request evidence.<br>• Ask questions that relate one variable to another variable.<br>• Ask questions to clarify the constraints of solutions to a problem.<br>• Use prior knowledge to describe problems that can be solved.<br>• Define a simple design problem that can be solved through the development of an object, tool or process and includes several criteria for success and constraints on materials, time, or cost.<br>• Formulate questions that can be investigated and predict reasonable outcomes based on patterns such as cause and effect relationships. | Asking questions and defining problems in grades 6–8 builds from grades K–5 experiences and B ...sses to formulating and refining ...cally testable models that ...rt explanations of phenomena or solutions to problems.<br>• Ask questions that arise from careful observation of phenomena, models, or unexpected results.<br>• Ask questions to clarify or identify evidence and the premise(s) of an argument.<br>• Ask questions to determine relationships between independent and dependent variables.<br>• Ask questions that challenge the interpretation of a data set.<br>• Ask questions to clarify and refine a model, an explanation, or an engineering problem.<br>• Define a design problem that can be solved through the development of an object, tool, process or system and includes multiple criteria and constraints, including scientific knowledge that may limit possible solutions.<br>• Formulate a question that can be investigated within the scope of the classroom, school laboratory, or field with available resources and, when appropriate, frame a hypothesis (a possible expl... that predicts a particular ar... outcome) based on a mode... theory. | Asking questions and defining problems in grades 9–12 builds from grades K–8 experiences and progresses to formulating, refining, and evaluating empirically testable questions and design solutions using models and simulations.<br>• Ask questions that arise from careful observation of phenomena, models, theory, or unexpected results.<br>• Ask questions that require relevant empirical evidence to answer.<br>C ...k questions to determine ...lationships, including quantitative ...lationships, between independent and dependent variables.<br>• Ask and evaluate questions that challenge the premise of an argument, the interpretation of a data set, or the suitability of a design.<br>• Define a design problem that involves the development of a process or system with interacting components and criteria and constraints that may include social, technical and/or environmental considerations |

*Adapted from NSTA's Webinar- Transforming Science Learning: Acting, Thinking and Talking as Scientists. Engaging Students in Science and Engineering Practices on 8/12/20*

# Intentional Use of Asking Questions

## Teacher Hat

Use evidence from data to create a model to explain why the ice melts faster on one block than the other.

## Student Hat

We have a lot of questions that we ***need*** to answer to explain why the ice melts faster on one block than the other.



*Adapted from NSTA's Webinar- Transforming Science Learning: Acting, Thinking and Talking as Scientists. Engaging Students in Science and Engineering Practices on 8/12/20*

# Guidance to Elicit Student Ideas

## Presentation of Phenomenon (What am I exploring today?)

**Guidance:** Students will observe the phenomenon through the Amazing Ice Melting Blocks video (see above). An ice cube is placed on each of two blocks that appear to be similar and students observe what happens throughout the time-lapse video. The goal is for students to generate questions that can be investigated with materials found at home. Using evidence from data collected in those investigations, students develop a model to explain their observations of the ice on each of two blocks.

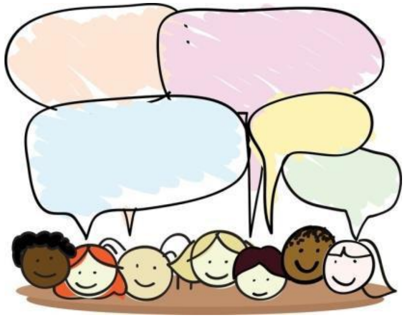
**Presenting the Phenomenon:** Ask students to watch the video and to complete a see-think-wonder chart, as shown below. Students should record observations ("I see..."), possible explanations of the phenomenon ("I think..."), and questions that they would like to investigate ("I wonder..."). It may be helpful to watch the video multiple times and to revisit the see-think-wonder chart. Students can print the See-Think-Wonder table or record their ideas on blank paper using the table below as a guide.

FIGURE 1

| I see... | I think... | I wonder... |
|---|---|---|
| | | |

You can use the following question to prompt students' thinking as they view and process the video.

- What did you see happening in the video?
- What is causing the ice to melt?
- Why do you think the ice melts faster on one block than the other?
- What do you think is the same or different about the blocks?
- What questions do you have?



*Adapted from NSTA's Webinar- Transforming Science Learning: Acting, Thinking and Talking as Scientists. Engaging Students in Science and Engineering Practices on 8/12/20*

# Navigating the Investigation

Many of us are wondering about the blocks.

- ✔ Are the blocks made of the same material?
- ✔ Does the material the blocks are made of make the difference?
- ✔ Are the blocks different temperatures?

**Should we investigate the questions about the blocks first?**

# Investigation with Household Objects

## Group A object

- metal pot, pan, cookie sheet, mixing bowl, etc.
- metal sink
- aluminum foil

## Group B object

- glass or ceramic baking dish, mixing bowl, etc.
- plastic or wood cutting board
- oven mitt
- parchment or wax paper

*This is not a complete materials list.*

# Melting Ice on Two Different Objects


**Investigation 1: Melting ice on two different kitchen objects**

| | Object A | Object B |
|---|---|---|
| Initial Observations | | |
| Room Temperature | | |
| How does the object feel to the touch? | | |
| Temperature of Object | | |
| Predicted Results | | |
| What do you think will happen when you place the ice cube on the block? | | |
| Actual Results | | |
| How fast did the ice cube melt? What else did you observe? | | |

*need thermometers*


*Adapted from NSTA's Webinar- Transforming Science Learning: Acting, Thinking and Talking as Scientists. Engaging Students in Science and Engineering Practices on 8/12/20*

#5 in Dashboard

# Investigation

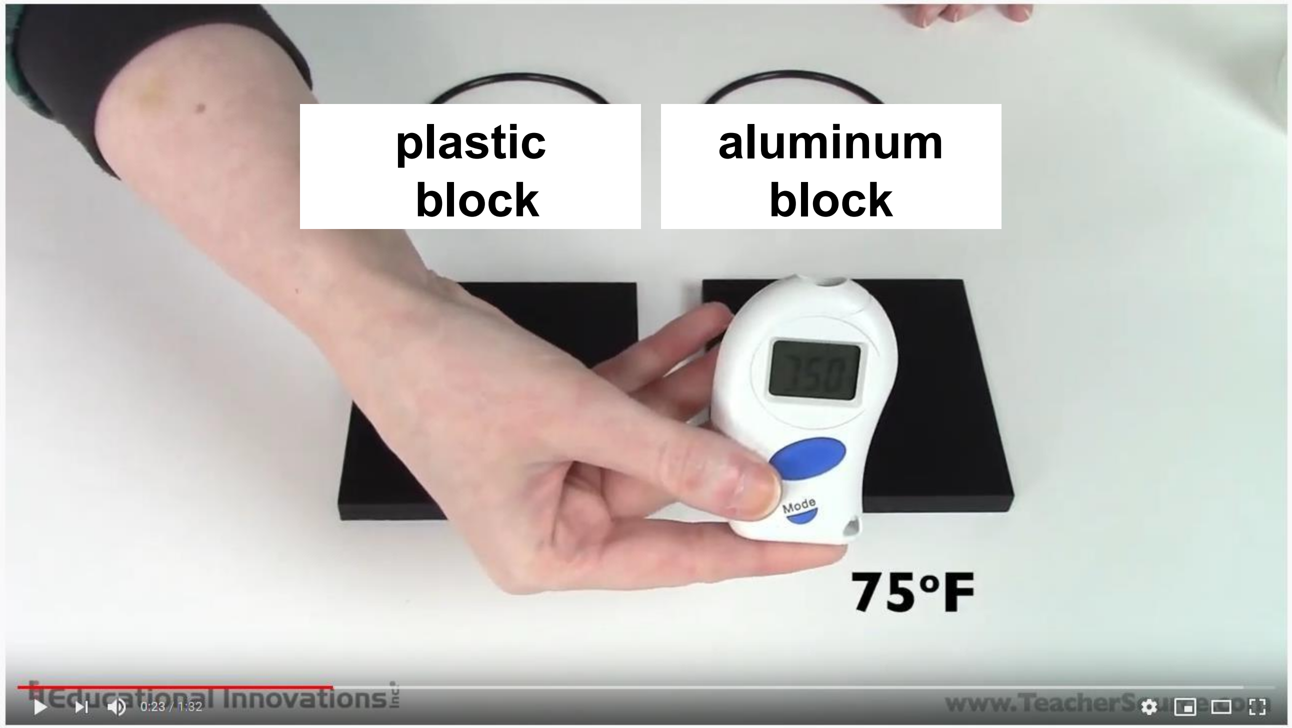
**Choose one object from each group.**

**Measure the temperature of each object.** *Infrared, aquarium-type liquid crystal, meat thermometers work well.*

- Group students by thermometer availability **OR**
- Support students in thinking logically about the temperature of each object (How should block temperatures compare to temperature of the room?)

**Place ice cubes of similar size and shape on the two “blocks”. Observe.**

# Alternative




*Adapted from NSTA's Webinar- Transforming Science Learning: Acting, Thinking and Talking as Scientists. Engaging Students in Science and Engineering Practices on 8/12/20*

# Alternative


Reach out and touch a metal object and plastic object. Notice how the object feels – cool, warm, not cool or warm

plastic

metal

# Alternative


**Investigation 1: Melting ice on two different kitchen objects**

| | Object A | Object B |
|---|---|---|
| Initial Observations | | |
| Room Temperature | | |
| How does the object feel to the touch? | | |
| Temperature of Object | | |
| Predicted Results | | |
| What do you think will happen when you place the ice cube on the block? | | |
| Actual Results | | |
| How fast did the ice cube melt? What else did you observe? | | |

https://www.youtube.com/watch?v=ZeHKsIz_qvE

*Adapted from NSTA's Webinar- Transforming Science Learning: Acting, Thinking and Talking as Scientists. Engaging Students in Science and Engineering Practices on 8/12/20*

# Making Sense of the Investigation

**Investigation 1: Melting ice on two different kitchen objects**

| | Object A | Object B |
|---|---|---|
| Initial Observations | | |
| Room Temperature | 75 | 75 |
| How does the object feel to the touch? | Cooler than B | Warmer than A |
| Temperature of Object | 75 | 75 |
| Predicted Results | | |
| What do you think will happen when you place the ice cube on the block? | varies | varies |
| Actual Results | | |
| How fast did the ice cube melt? What else did you observe? | ~7s<br>Ice melted faster, object is metal, etc. | It didn't melt<br>Object is non-metal, etc. |

- **What patterns did you observe? How did these patterns compare to your predictions?**
- **How do these patterns help you explain why the ice melts faster on some objects than on others?**
- **What do you think might be happening at the microscopic level that would help you explain the patterns you observed?**



Prompts for CCCs- #14 in dashboard

# Return to Jamboard- Add Noticings/Patterns

## Small Group

**MOVE 1: Share observations with your group:**

- Review your observations
- Choose **two** observations to post
- Post your observations on Jamboard (one observation per sticky note) Please post on **BLUE**

**Move 2: When posting slows:**

- **Circle** at least one observation someone in your group noticed that you did not (multiple people can circle the same observation)
- **Put a check mark** next to at least one observation someone noticed that you also noticed.
- Post patterns your group identifies **GREEN**

*Adapted from NSTA's Webinar- Transforming Science Learning: Acting, Thinking and Talking as Scientists. Engaging Students in Science and Engineering Practices on 8/12/20*

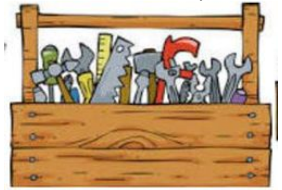
# Intentional Use of Analyzing and Interpreting Data

Which element of the **Analyzing and Interpreting Data** science and engineering practice did we engage with? (grade band & bullet #)

**Why do do you say so?**

Chat

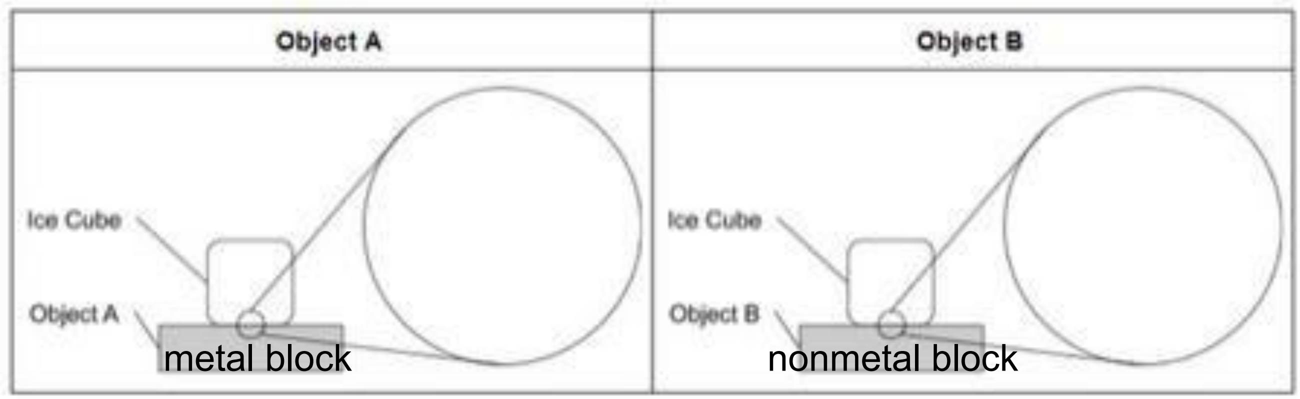
| K–2 Condensed Practices | 3–5 Condensed Practices | 6–8 Condensed Practices |
|---|---|---|
| Analyzing data in K–2 builds on prior experiences and progresses to collecting, recording, and sharing observations.<br>• Use and share pictures, drawings, and/or writings of observations.<br>• Use observations to describe patterns and/or relationships in the natural and designed worlds in order to answer scientific questions and solve problems.<br>• Make measurements of length to quantify data.<br>• Analyze data from tests of an object or tool to determine if a proposed object or tool functions as intended. | Analyzing data in 3–5 builds on K–2 and progresses to introducing quantitative approaches to collecting data and conducting multiple trials of qualitative observations.<br>• Display data in tables and graphs, using digital tools when feasible, to reveal patterns that indicate relationships.<br>• Use data to evaluate claims about cause and effect.<br>• Compare data collected by different groups in order to discuss similarities and differences in their findings.<br>• Use data to evaluate and refine design solutions.<br>• Interpret data to make sense of and explain phenomena, using logical reasoning, mathematics, and/or computation.<br>• Analyze data to refine a problem statement or the design of a proposed object, tool or process. | Analyzing data in 6–8 builds on K–5 and progresses to extending quantitative analysis to investigations, distinguishing between correlation and causation, and basic statistical techniques of data and error analysis.<br>• Apply concepts of statistics and probability (including mean, median, mode, and variability) to analyze and characterize data, using digital tools when feasible.<br>• Construct, analyze, and interpret graphical displays of data to identify linear and nonlinear relationships.<br>• Consider limitations of data analysis (e.g., measurement error), and seek to improve precision and accuracy of data with better technological tools and methods (e.g., multiple trials).<br>• Analyze and interpret data in order to determine similarities and differences in findings.<br>• Distinguish between causal and correlational relationships.<br>• Use graphical displays (e.g., maps) of large data sets to identify temporal and spatial relationships.<br>• Analyze data to define an optimal operational range for a proposed object, tool, process or system that best meets criteria for success. |



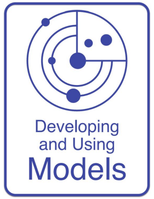
# Developing an Initial Model to Construct an Explanation

## Alone Zone

Create a model to explain why the ice cube melts faster on the metal block than on the nonmetal block.






# Collaborative Google Doc for Initial Model

## #10 in Dashboard

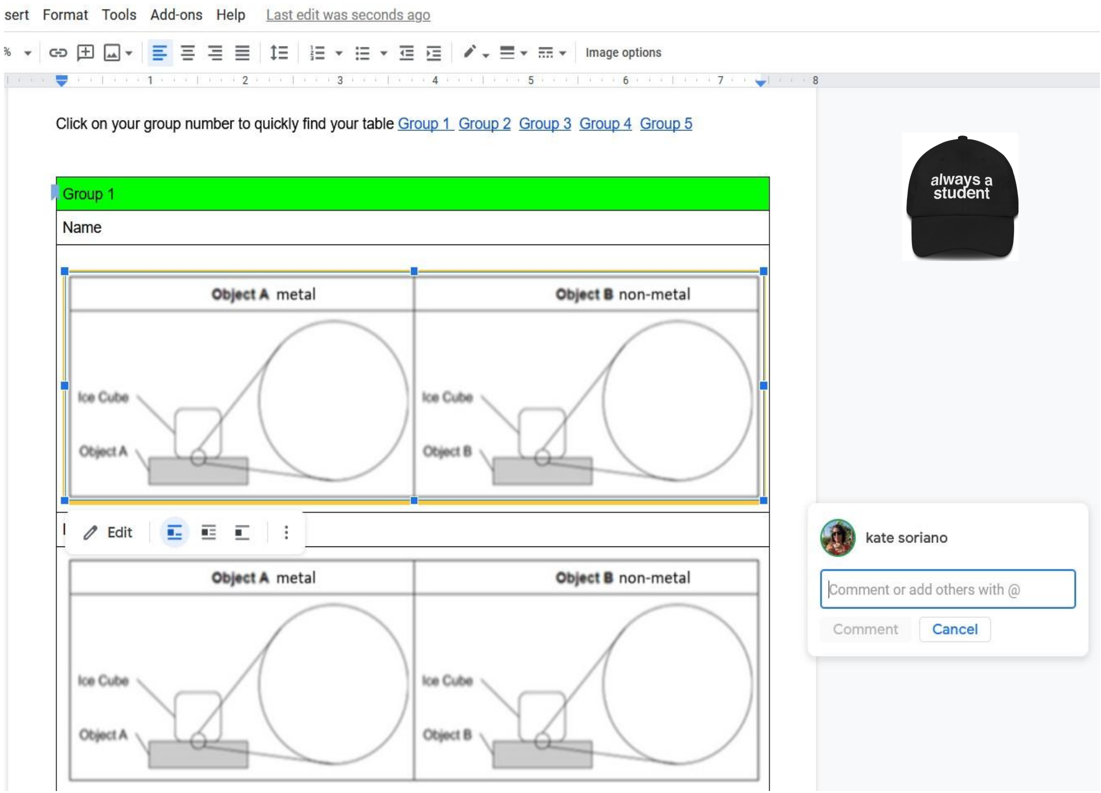
| | | | |
|---|---|---|---|
| 10 | **Initial Model Collaborative Group Google Docs by Birthday Month** | ⊕ December January<br>⊕ February March<br>⊕ April May | ⊕ June July<br>⊕ August September<br>⊕ October November |

*Adapted from NSTA's Webinar- Transforming Science Learning: Acting, Thinking and Talking as Scientists. Engaging Students in Science and Engineering Practices on 8/12/20*

# Initial Models

## Small Group

- Identify at **least one similarity and one difference** between your model and another group member's model.
- Ask **one clarifying question** about a different group member's model.



# Intentional Use of Developing & Using Models

Which element of the **Developing & Using Models** science and engineering practice did we engage with? (grade band & bullet #)

**Why do you say so?**

Chat

| K–2 Condensed Practices | 3–5 Condensed Practices | 6–8 Condensed Practices | 9–12 Condensed Practices |
|---|---|---|---|
| Modeling in K–2 builds on prior experiences and progresses to include identifying, using, and developing models that represent concrete events or design solutions.<br>• Distinguish between a model and the actual object, process, and/or events the model represents.<br>• Compare models to identify common features and differences.<br>• Develop and/or use models (i.e., diagrams, drawings, physical replicas, dioramas, dramatizations, or storyboards) that represent amounts, relationships, relative scales (bigger, smaller), and/or patterns in the natural and designed worlds.<br>• Develop a simple model that represents a proposed object or tool. | Modeling in 3–5 builds on K–2 models and progresses to building and revising simple models and using models to represent events and design solutions.<br>• Develop and revise models collaboratively to measure and explain frequent and regular events.<br>• Develop a model using an analogy, example, or abstract representation to describe a scientific principle or design solution.<br>• Use simple models to describe or support explanations for phenomena and test cause and effect relationships or interactions concerning the functioning of a natural or designed system.<br>• Identify limitations of models.<br>• Develop a diagram or simple physical prototype to convey a proposed object, tool or process.<br>• Use a simple model to test cause and effect relationships concerning the functioning of a proposed object, tool or process. | Modeling in 6–8 builds on K–5 and progresses to developing, using, and revising models to support explanations, describe, test, and predict more abstract phenomena and design systems.<br>• Use and/or develop models to predict, describe, support explanations, and/or collect data to test ideas about phenomena in natural or designed systems, including those representing inputs and outputs, and those at unobservable scales.<br>• Develop models to describe unobservable mechanisms.<br>• Modify models—based on their limitations—to increase detail or clarity, or to explore what will happen if a component is changed.<br>• Use and develop models of simple systems with uncertain and less predictable factors.<br>• Develop a model that allows for manipulation and testing of a proposed object, tool, process or system.<br>• Evaluate limitations of a model for a proposed object or tool. | Modeling in 9–12 builds on K–8 and progresses to using, synthesizing, and developing models to predict and explain relationships between systems and their components in the natural and designed world.<br>• Use multiple types of models to represent and support explanations of phenomena, and move flexibly between model types based on merits and limitations.<br>• Develop, revise, and use models to predict and support explanations of relationships between systems or between components of a system.<br>• Use models (including mathematical and computational) to generate data to support explanations and predict phenomena, analyze systems, and solve problems.<br>• Design a test of a model to ascertain its reliability.<br>• Develop a complex model that allows for manipulation and testing of a proposed process or system.<br>• Evaluate merits and limitations of two different models of the same proposed tool, process, or system in order to select or revise a model that best fits the evidence or design criteria. |

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# Navigating to the Next Investigation

We noticed the blocks' temperatures were the same at the start of the investigation. Many of us are wondering why the ice cubes melted at different rates.

**Does it make sense to investigate this question next?**

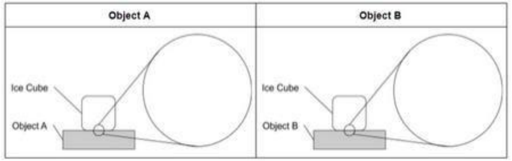
# Design for Distance Science Learning

- Phenomena


**Group A object**
- metal pot, pan, cookie sheet, mixing bowl, etc.
- metal sink
- aluminum foil

**Group B object**
- glass or ceramic baking dish, mixing bowl, etc.
- plastic or wood cutting board
- oven mitt
- parchment or wax paper

- **Science and Engineering Practices**




- Student Ideas


- Classroom Norms

# Design for Distance Science Learning

- Sensemaking requires **intentional choices** about how students experience the phenomenon, engage in the science and engineering practices and share ideas.

- **Sensemaking at a distance** requires intentional choices about the digital tools students will use to engage with the science and engineering practices.

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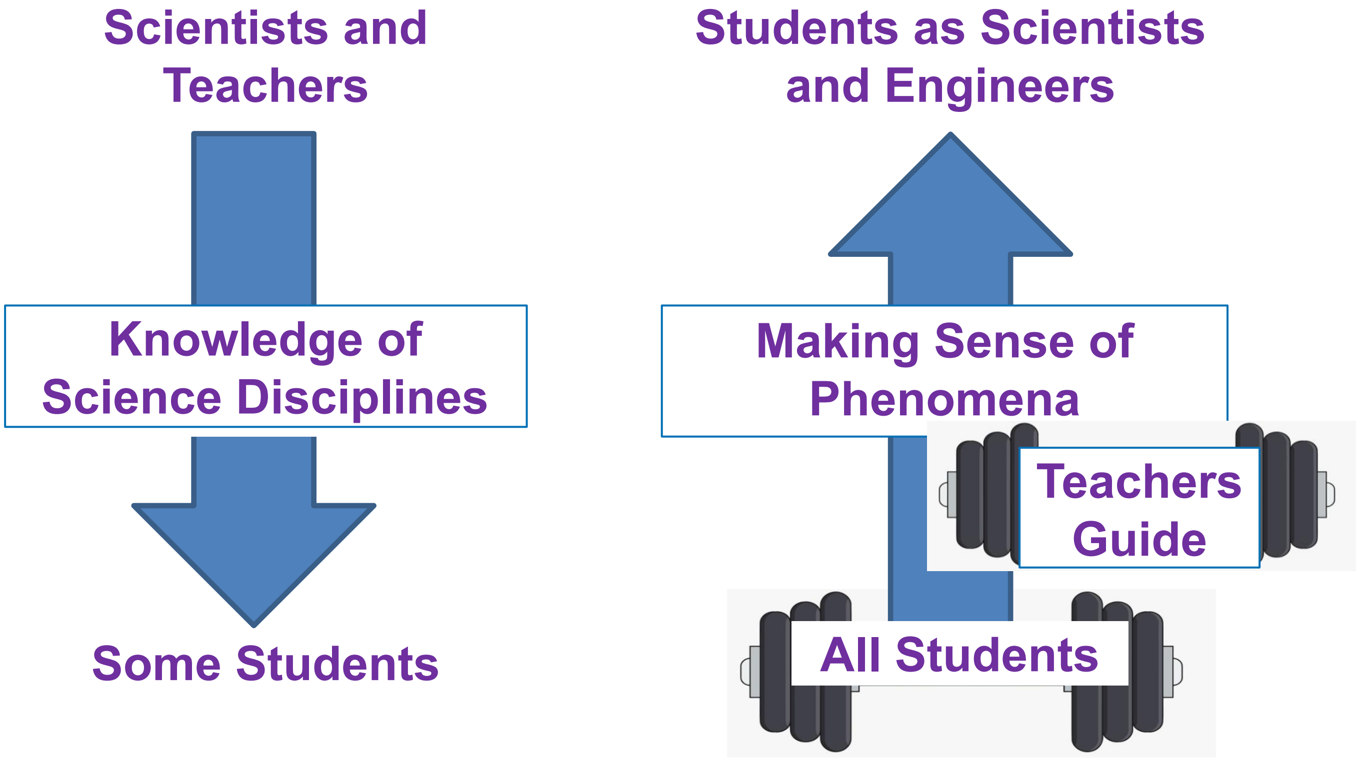
# Flip Upside Down!



# Thank you for sharing this space with us tonight!

## What questions do you have?

**Use a strategy called "stack"- helps build a virtual "line" or stack**


**Review of digital strategies we used:**

- **Chat box**
- **Waterfall in chat box**
- **Alone Zone**
- **Jamboard for collaboration & sharing of noticings/observations & patterns**
- **Google Docs for initial models and comments for group collaboration**
- **Stack to build a virtual "line"**

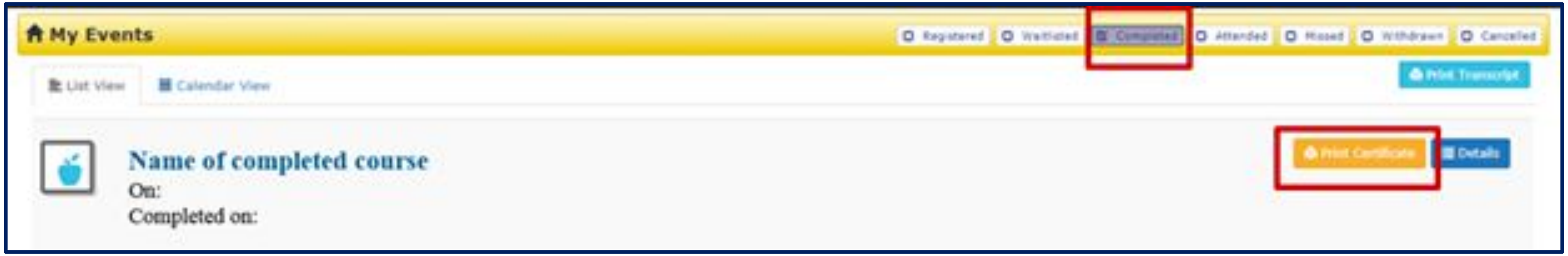
Rebecca Garelli I Rebecca.Garelli@azed.gov

# REMINDER!
# Please review this information!

## Attendance, Resources & PD Clock Hours

- **You must stay on the whole time- 1 hour- to receive credit**

- **<u>YOU</u> print your certificate through ADE Connect- please wait 24-48 hours of webinar before printing certificates**




- **AFTER WEBINAR- Survey & follow-up email from ADE**