USING INQUIRY-BASED LEARNING AS A MEANS FOR TEACHING SCIENCE

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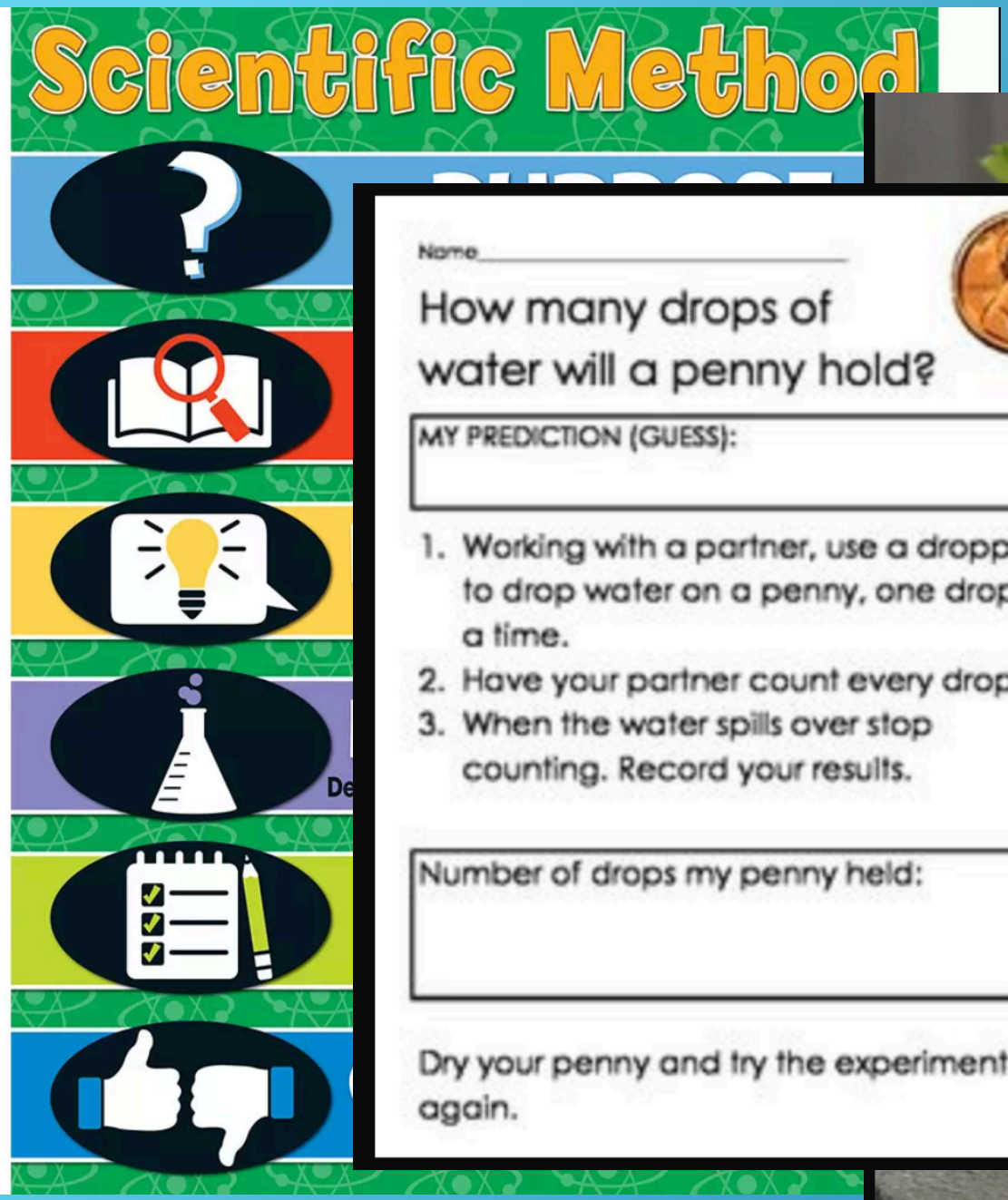
TODAY WE WILL….

- Discover the social and cognitive potential of using inquiry-based learning with early elementary aged children.
- Explore inquiry activities that highlight effective teaching and learning and the connection to the new Nebraska State Science Standards (based on the national *Next Generation Science Standards- NGSS)*
- Practice strategies of how to navigate scientific investigations that provide ALL children opportunities to participate in science learning.
  - Argumentation with young children
  - CRE- Claim, Reasoning, Evidence



Name_____

How many drops of water will a penny hold?

MY PREDICTION (GUESS):

1. Working with a partner, use a dropper to drop water on a penny, one drop at a time.
2. Have your partner count every drop.
3. When the water spills over stop counting. Record your results.

Number of drops my penny held:

Dry your penny and try the experiment again.

The Bubble Break

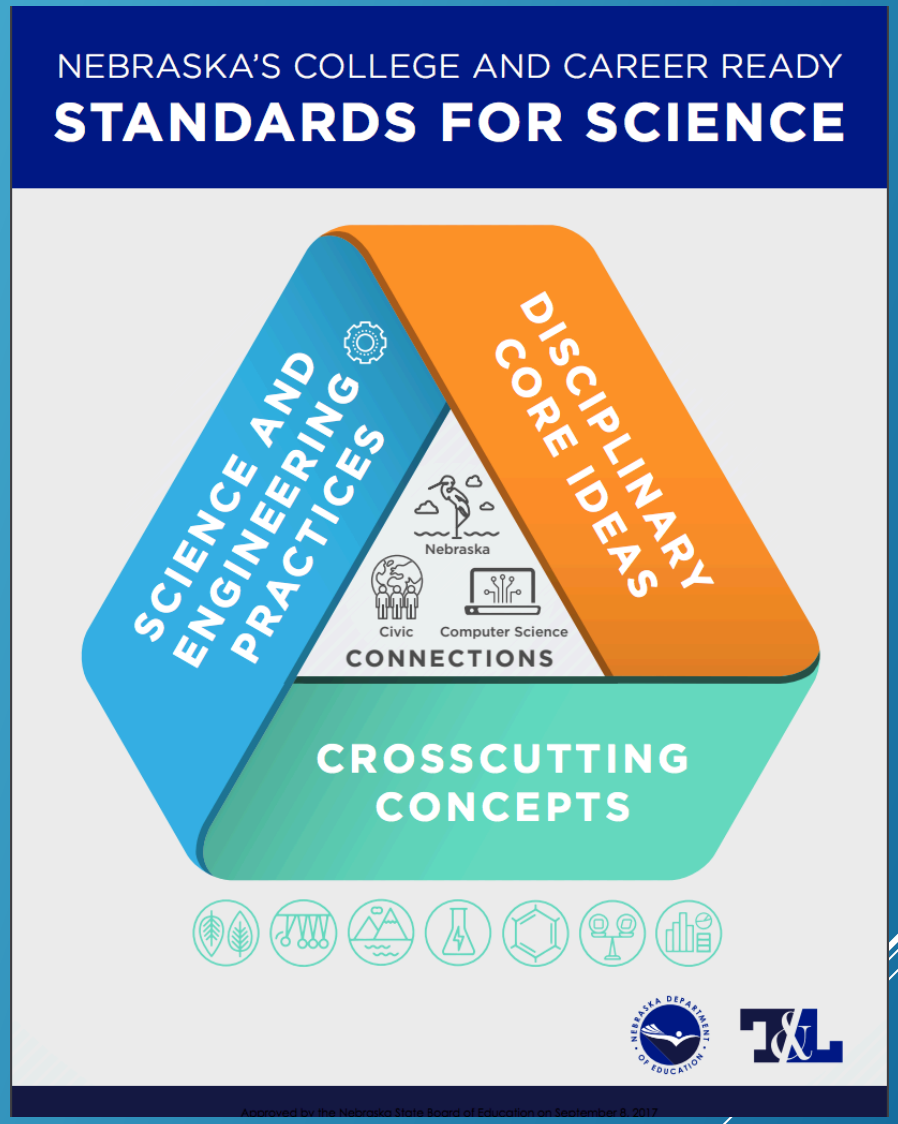
uch another object?

nately, you can touch the
tice what happens to the
ur pencil, your hand, your

what happens.
the bubble solution and
o the bubble in each case.

NEW NDE SCIENCE STANDARDS

SEPTEMBER, 2017



- https://www.education.ne.gov/AcademicStandards/Nebraska_Science_Standards_Final_9-8-17.pdf

LET'S GET POPPIN'

- **PROBLEM: Which bubble brand is the best?**

1. Which do you expect to be the best?
2. Carryout an experiment
3. Collect data/info
4. State your conclusion

LET'S GET POPPIN'

- **PROBLEM: Which bubble brand is the best?**

- What was your thinking?
- What ideas did you have about the bubbles that explain your thinking?
- What information or evidence might convince you to move further to determine a conclusion?

LET'S GET POPPIN'

- **PROBLEM: Which bubble brand is the best?**

- What different ideas were discussed in your group?
- Which ideas were different from yours?
- What justifications did you hear from others in your group?
- Did you change your thinking?
- Why or why not?
- What information or evidence might your group use to make a claim?

SHARE YOUR EXPERIMENT AND CONCLUSION WITH A PARTNER GROUP. PROVIDE WARM AND COOL FEEDBACK

- Warm Feedback
- I like that you included…..
- I appreciated the design of…..
- It was interesting that you…..

- Cool Feedback
- I would have liked to have seen/heard….
- I was a little confused about….
- Would you consider…..

Adpoted from Leana Peltier's presentation at NSTA conference 2017

"When we teach content through the practice of science and engineering, and then make sense by attaching the ideas to real world application via the crosscutting concepts, we take the first step in making science more accessible to all students."

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INQUIRY….

#NothingNew

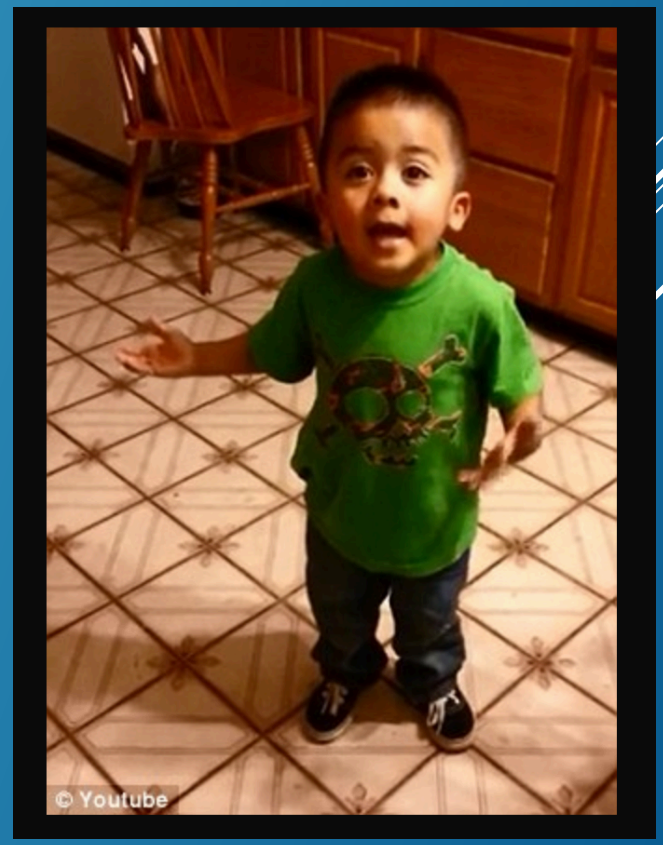
WHAT IS INQUIRY?

	Traditional Hands-on	Structured Inquiry	Guided Inquiry	Student Directed Inquiry	Student Research Inquiry
Topic	Teacher	Teacher	Teacher	Teacher	Teacher/Student
Question	Teacher	Teacher	Teacher	Teacher/Student	Student
Materials	Teacher	Teacher	Teacher	Student	Student
Procedures/ Design	Teacher	Teacher	Teacher/Student	Student	Student
Results/ Analysis	Teacher	Teacher/Student	Student	Student	Student
Conclusions	Teacher	Student	Student	Student	Student

STUDENTS ENGAGING IN THE PROCESS OF ARGUMENTATION

Individual or social, children provide an account of how or why a phenomenon occurs and explaining why the natural world works in particular ways. (Berland & Reiser, 2009; McNeill, 2011)

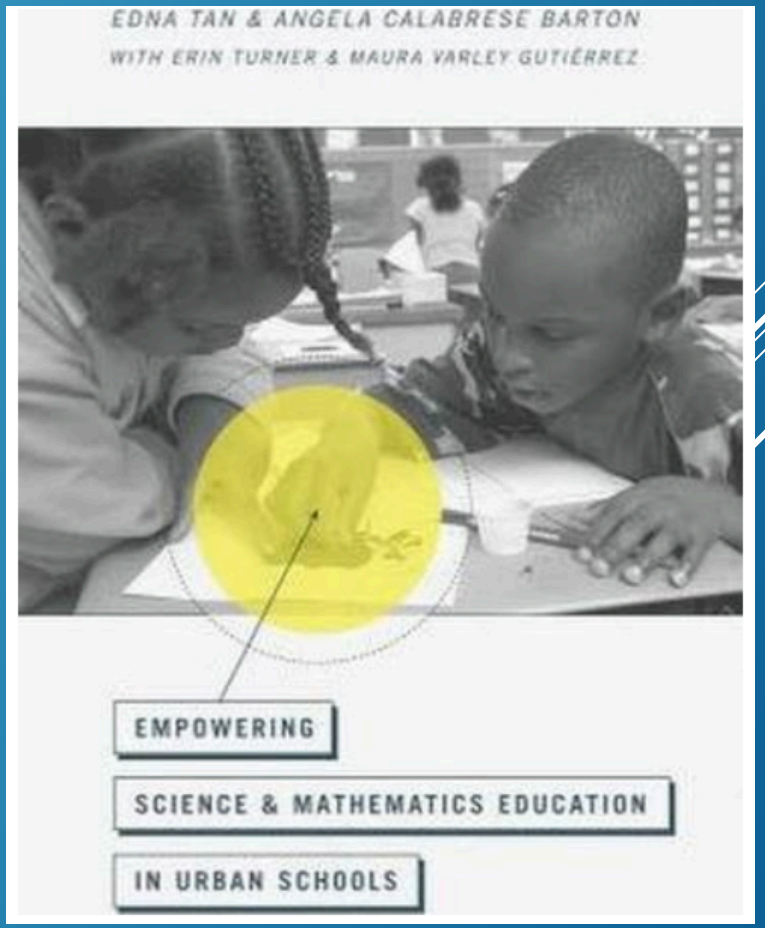
The C-E-R Process is similar in the NGSS (Lee, Quinn,& Valdes, 2013)



CLAIM

- A statement that answers a question or problem.
- Activate prior knowledge

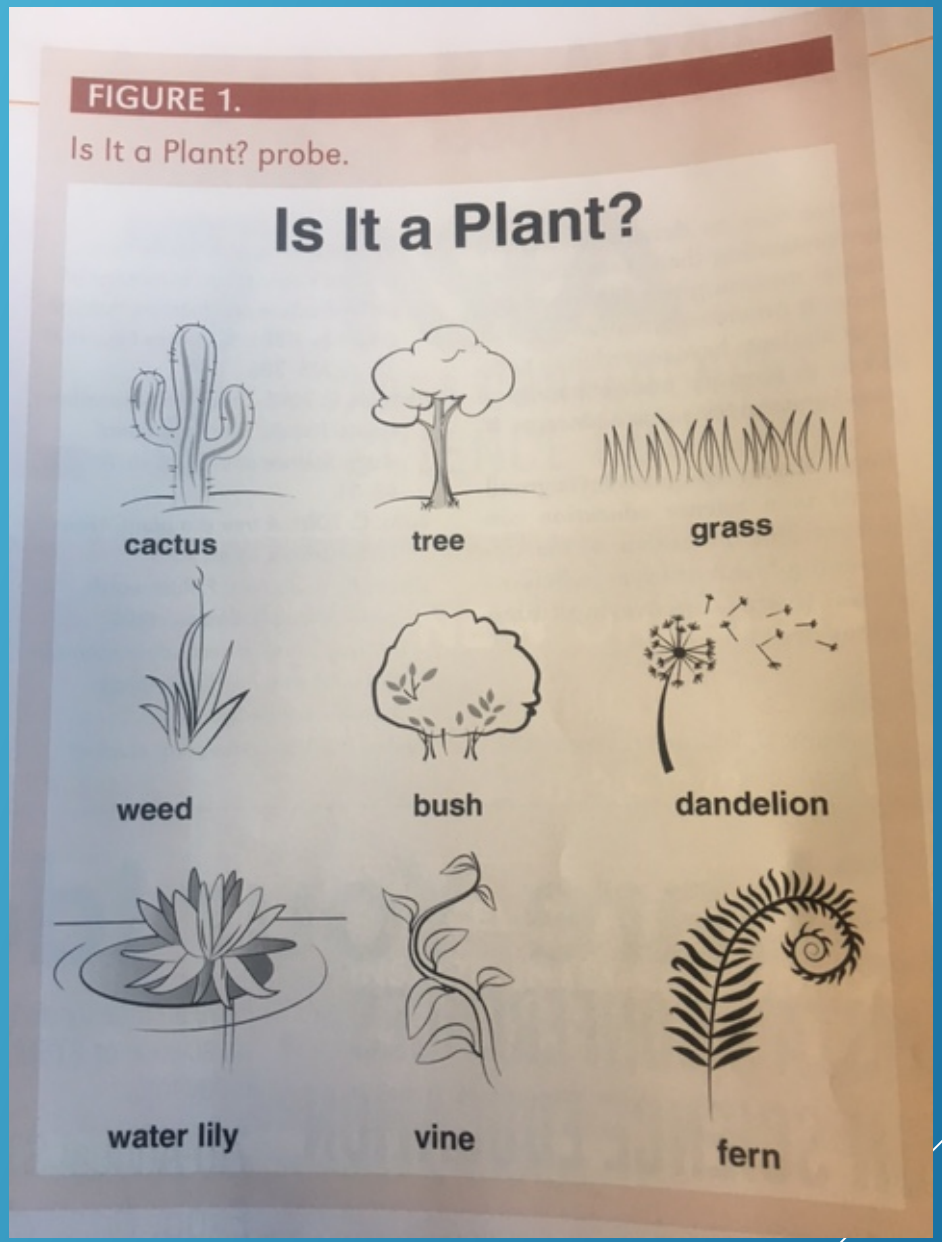
- Tan & Calabrese Barton (2012)
- Science Talks



Let's Talk Science PART 1

- What do you think this means? Why do you think that?
- Here's another way to think about that…
- Why do you think that would count as evidence?
- What else could we measure or describe to make a claim?
- I don't understand why you think that. Will you tell me your reasoning?
- How can we use that to make a case for our idea?
- How will we explain this?
- Good idea, but what about this?
- What other evidence could go with that?
- • Sounds good, tell me more.

Adpoted from Leana Peltier's presentation at NSTA conference 2017



From: Page Keeley 's (2017) "Uncovering Young Children's Concept of a Plant" in Science & Children, 2017

TALK ABOUT INFERENCES

Let's Talk Science PART 2

- Why do you think that? What is your reasoning?
- What is the evidence for that?
- Why do you think that counts as evidence?
- What claim can we make about it?
- Do you agree? Do you disagree? Why?
- I agree because...
- I don't agree because...

What kind of evidence do we need?

- How can we explain this one over here?
- We don't have to keep that claim. We could change our claim..
- This makes sense to me...

Adpoted from Leana Peltier's presentation at NSTA conference 2017

EVIDENCE

- Investigate to support or refute your claim
- Data to solve a problem or make a decision (Aikenhead, 2005)

- Messing About
- Science Drawings
- Models

SCIENCE DRAWING

- **WHY DRAW?**
- **Way to show thinking**
- **Communicate ideas**
- **Evidence without interpretation (Hale, 2015)**

Adpoted from Flowers, Cook, Dye, Notebaert, & Augustinsky (2017) presentation at NSTA conference

SCIENCE DRAWING

- NOT about producing an artistic result
- Produce a meaningful visual representation

SC.1.6.2.B **Develop a simple sketch, drawing, or physical model** to illustrate how the shape of an object helps it function as needed to solve a given problem.

SCIENCE DRAWING

1. Closely observe the object

2. Describe what you see

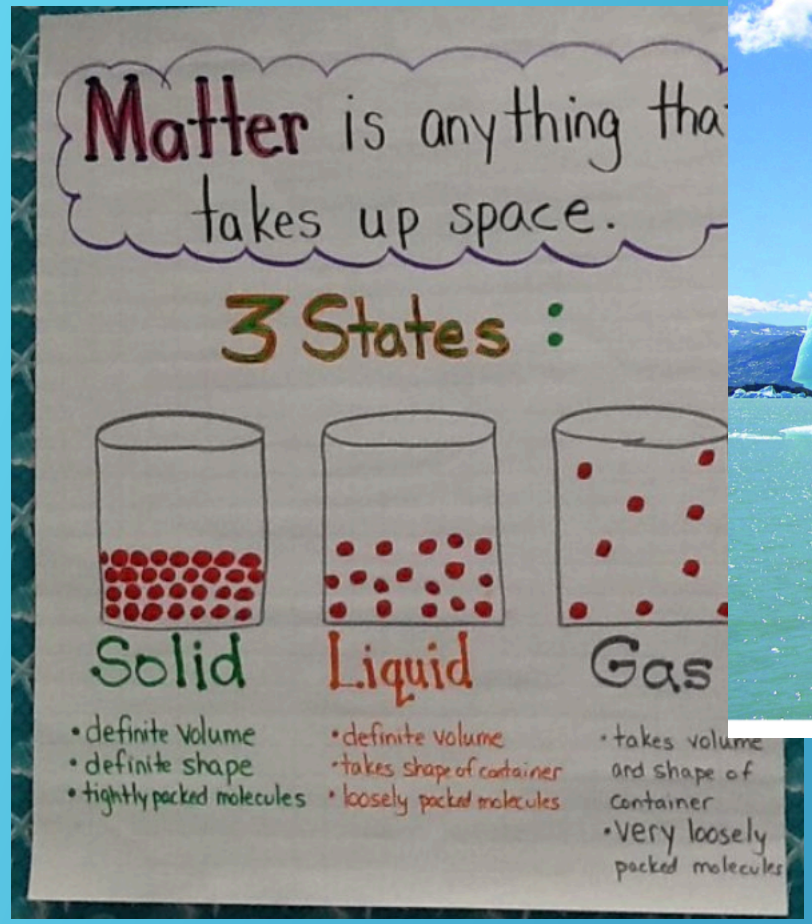
3. What details did you notice about the object?

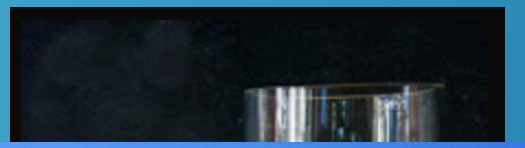
SCIENCE DRAWING

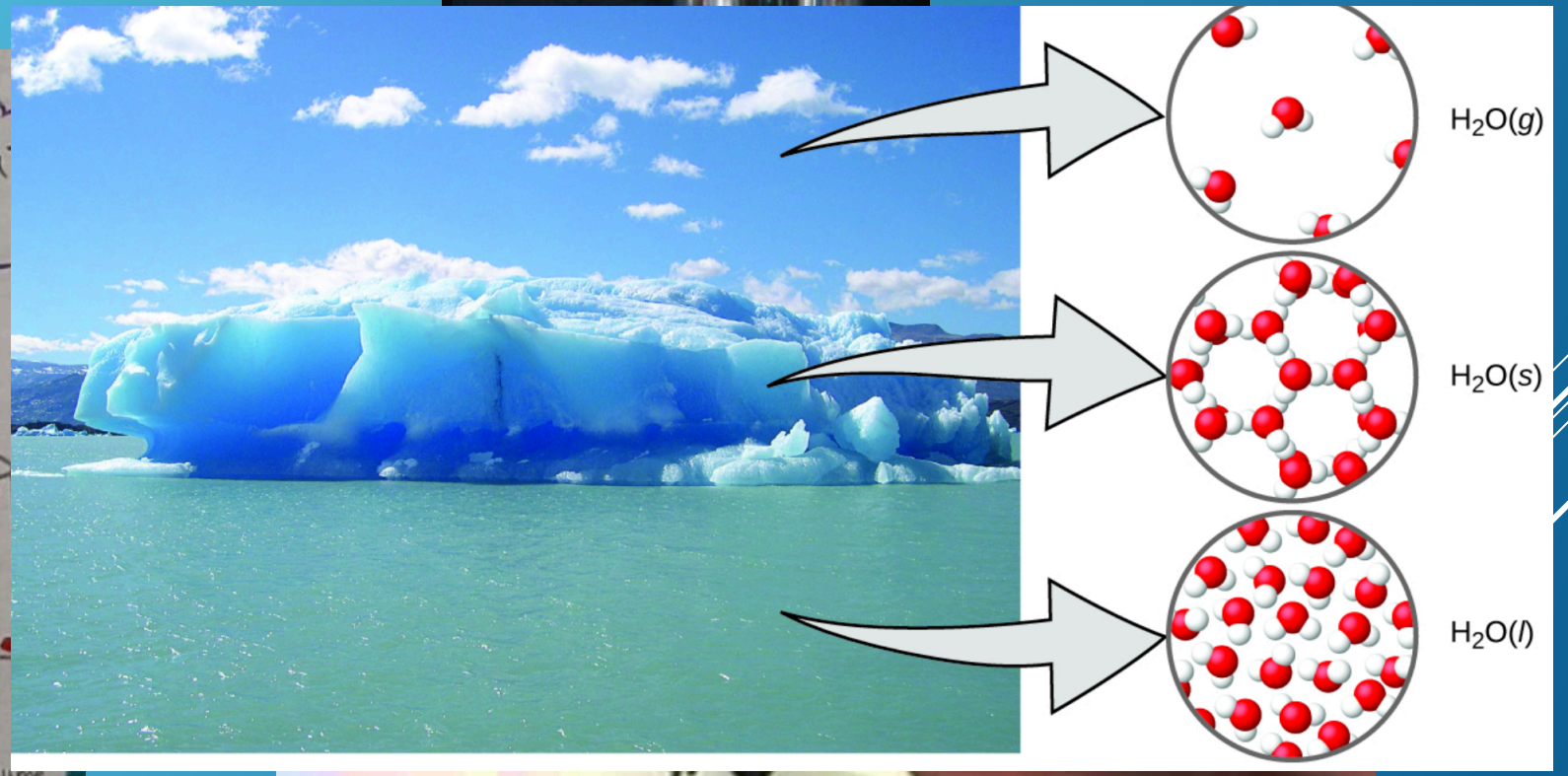
1. Make a drawing of the object

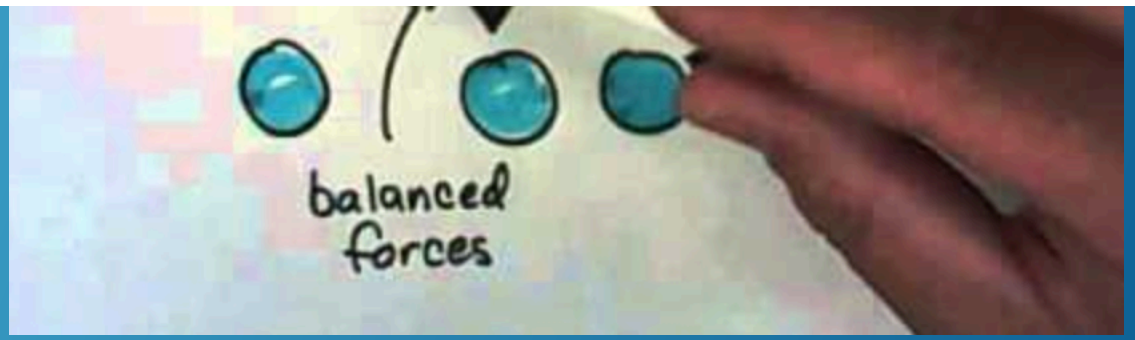
2. With a partner, discuss
   - What additional details did you notice after drawing?
   - How did your experience with the object differ when you wrote compared to when you drew?

SCIENCE MODELING









REASONING

- Applies the science knowledge and evidence
- Suggests a solution to the problem
- Explains why the evidence supports the claim.
- Make connections between the investigation and what you know

- Science Talks with evidence

Table 2
Genre coding scheme with examples from lesson 1

Code	Description	Student Examples—Lesson 1
Argument	Justifies a claim using either evidence or reasoning. The writing needs to have a claim and some justification for that claim	"Dirt and underground, tree, log/rocks. I choose #1 because worms live in the ground and dirt. And food for them they go up ground and search on flower and leaves. I choose #2 because. . ."
Just a claim	Provides a claim with no justification (i.e., evidence or reasoning). A claim is a statement that answers the question	"Both of them are habitats—dirt and under rocks"
Informational text	Reports information about the science content, but does not provide a claim for the specific question asked. This could include a scientific definition or a description of scientific observations	"The spider has eight legs. And it could make a web to catch his food which it is fly"
Story	Includes a story about thoughts, feelings, or actions. This could talk about a student liking to do something or a creative story about a plant or animal	"Those eggs really look weird and was my first time looking at eggs"

Journal of Research in Science Teaching

McNeill, K. (2011). Elementary students' views of explanation, argumentation, and evidence, and their abilities to construct arguments over the school year. *Journal of Research in Science Teaching, 48*(7), 793-823.

SC.K.1 Forces and Interactions: Pushes and Pulls

SC.K.1.1 Gather, analyze, and communicate evidence of forces and their interactions.

SC.K.1.1.A **Plan and conduct an investigation to compare** the effects of different strengths or different directions of pushes and pulls on the motion of an object. Assessment is limited to different relative strengths or different directions, but not both at the same time. Assessment does not include non-contact pushes or pulls such as those produced by magnets.

SC.K.1.1.B **Analyze data to determine if a design solution** works as intended to change the speed or direction of an object with a push or a pull. Assessment does not include friction as a mechanism for change in speed.

SC.1.11 Space Systems: Patterns and Cycles

SC.1.11.3 Gather, analyze, and communicate evidence of patterns and cycles of space systems.

SC.1.11.3.A **Use observations** of the sun, moon, and stars to describe patterns that can be predicted. Assessment of star patterns is limited to stars being seen at night and not during the day.

SC.1.11.3.B **Make observations** at different times of the year to relate the amount of daylight to the time of year. Assessment is limited to relative amounts of daylight, not quantifying the hours or time of daylight.

SPECIAL GUEST

- It is an animal.
- It does not have fur.
- It does not have teeth.
- It has 8 legs.
- It is a water animal.


APRIL
Our weather

GETTING STARTED- TAKE AWAYS

- How?? Ask yourself the following:
  - What can the students discover on their own?
  - Where can the students ask their own questions?
  - Where can I give the students the opportunity
  - to explore?
  - Where can I let the students be creative?
  - Where can I let the students collaborate?

CONNECT TO YOUR CONTEXT

- How could you use the Inquiry-based learning (argumentation process, CER, Science Talks, Science Drawings, "Messing About") with your students?
  - 3 things you learned
  - 2 ways to change your pedagogical approach to science
  - 1 question you still have

QUESTIONS?

- Anne Karabon, PhD

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