

# Session 1:

## *Teaching and learning science*



# Thought Swap

- Describe a moment when you thought you were at your best teaching something – or you saw someone else doing so. What was especially effective about it/what were they doing that impressed you?
- Describe any experiences you've had learning with or teaching using data. What are some reasons it might be important for students and the public to gain expertise in using data?
- This course will introduce underlying climate science concepts that help us to understand complex Earth systems science topics, such as climate change.
  - What are all the words and ideas that come to mind when you hear the words climate change?
  - What are you wondering about regarding climate change?
- What would make this a great class? In this great class, what would participants be like? What would the instructor be like?

# Course Overview

- **Climate Science Ideas:** Science underlying global environmental change (culturally responsive content; local knowledge about climate change)
- **Data Skills:** Working with climate science data
- **Effective teaching and learning practices:** Including how people learn/how we should teach
- **Framework/NGSS:** Understanding and applying the scientific practices and shifts in learning and teaching as described in the *Framework* and *NGSS*.

# Goals for Session 1

- **Climate science ideas:** Build understanding of density, an underlying science concept for understanding density-driven currents.
- **Effective teaching & learning practices:** Learn about the goals, design and requirements of the course.
- **Framework/NGSS:** Experience conceptual shifts in teaching and learning as described in the NRC *Framework for K-12 Science Education* (Framework) and NGSS.

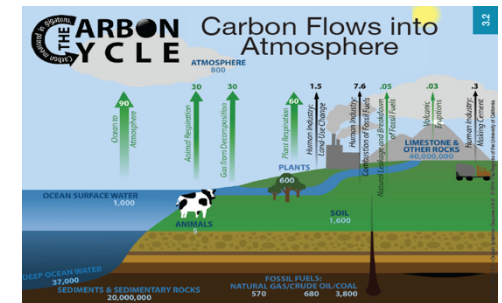
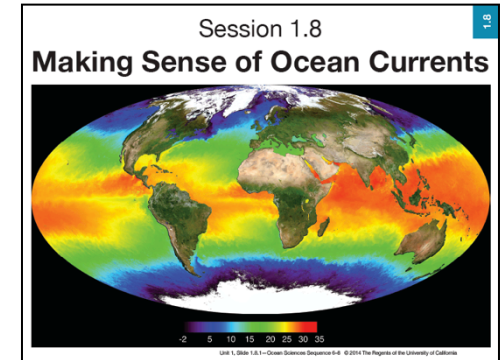
# Ocean Sciences Sequence Overview

## Grades 6–8

**Unit 1: How do the ocean and atmosphere interact?**

**Unit 2: How does carbon flow through the ocean, land, and atmosphere?**

**Unit 3: What are the causes & effects of climate change?**



# Climate Change Concept Map

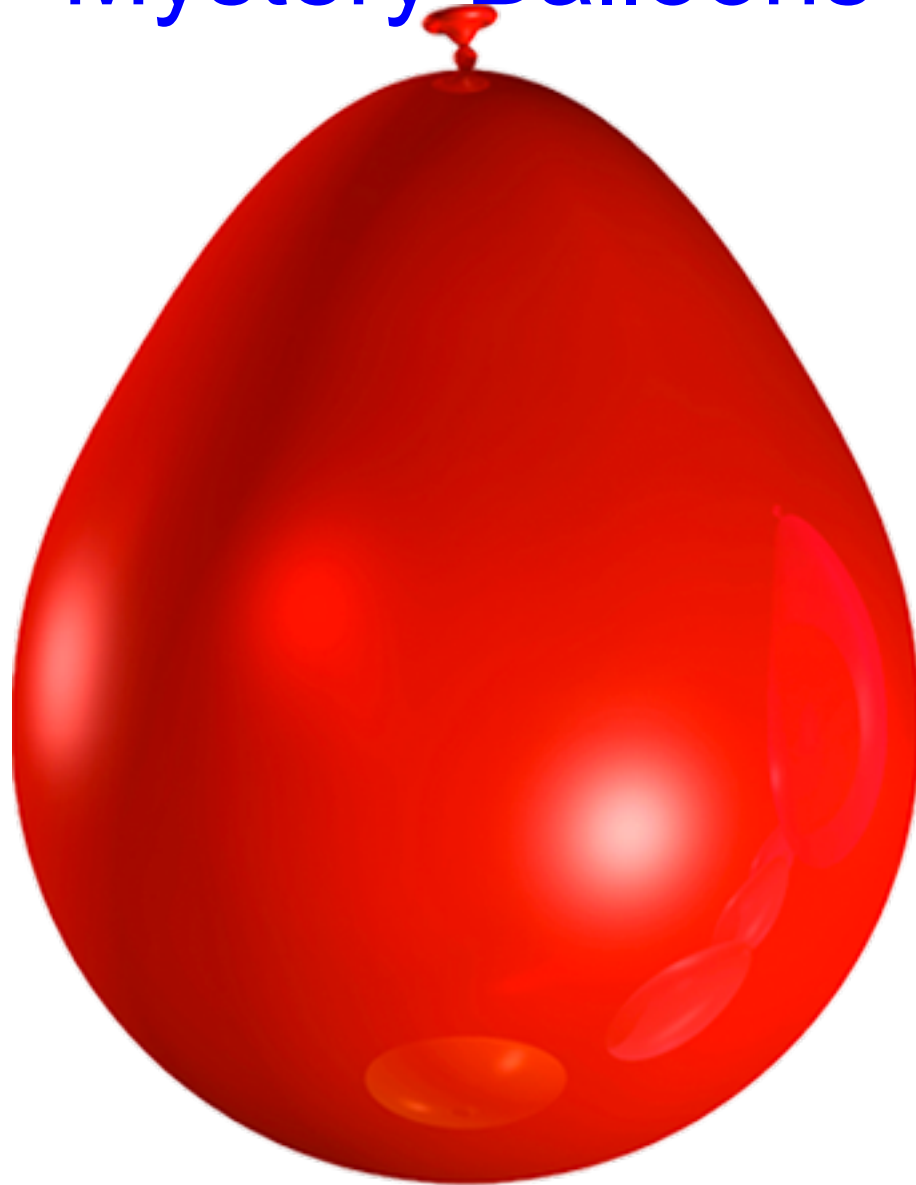


**Think**

**Pair**

**Share**

# Mystery Balloons



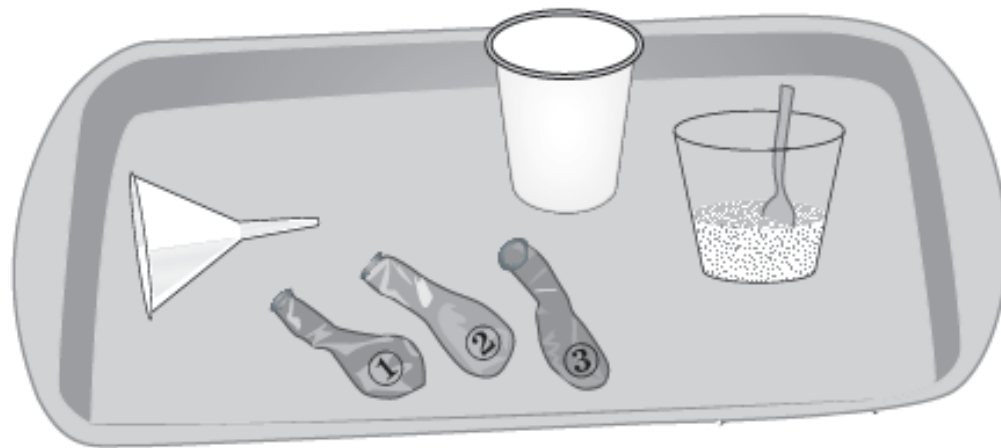


# Balloon Investigation Directions: 1

1. Start with balloon #1. Choose a substance to put in your balloon: (1) hot water, (2) cold water, or (3) room-temperature water. Another option is to add salt to any of the three types of water.
2. Record your substance and your group's prediction on the data sheet. How will the water-filled balloon respond when you place it in your test tank? Sink to the bottom, float on the surface, or go somewhere in between?
3. Use your group's paper cup to get your chosen water from the labeled containers, and bring the cup and water back to your group.

# Balloon Investigation Directions: 2

4. If adding salt, stir 1 spoon of salt into your cup of water, before adding the water to the balloon.
5. Work over the tray. Using the funnel, pour the water into the balloon until it just overflows, pinch the balloon near the opening and squeeze just a little water out of the balloon to make sure there is no air inside, and then tie off the balloon.



# Balloon Investigation Directions: 3

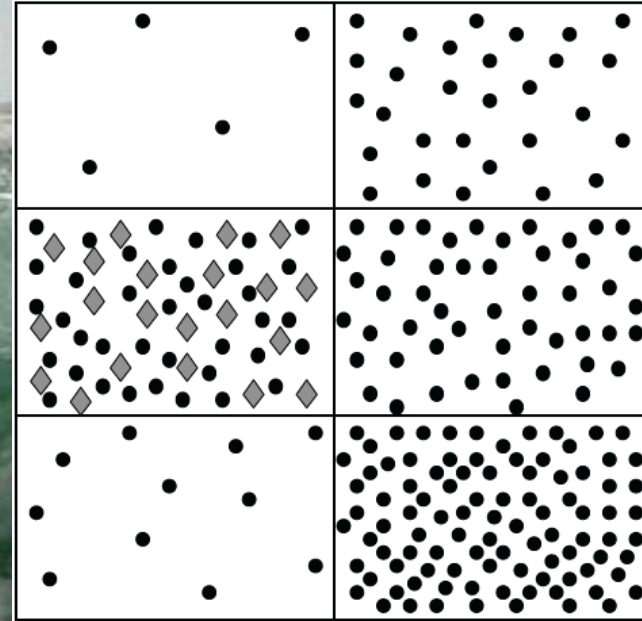
6. Place the balloon in the test tank. After 30 seconds, record where the balloon ends up, and draw it on the tank diagram on your data sheet. Write why you think the balloon responded in that way. Indicate with arrows if the position of the balloon changes as you are doing the investigation. Put the balloon number on your drawing.
7. Use a sticky note to add your group's results to the class chart, Balloon Investigation Results. First write what substance was in the balloon, then position the sticky note so it shows where your balloon was located about 30 seconds after you added it to your tank.
8. Repeat steps 1–7 with your next substance and balloon, or until it is time to clean up.

# Balloon Investigation Discoveries

- What did you discover?
  - What kinds of balloons sank, and what kinds of balloons floated?
- How could you explain what happened?

**Density - is a measure of how tightly packed molecules are in a substance or in a solution, such as salt water.**

*Key  
Concept*



**For any one type of substance, such as water, it will be denser if the molecules are closer together. It will be less dense if the molecules are farther apart.**

# Mystery Balloons Explained

- What kind of water is in one of the mystery balloons?  
What evidence supports your idea?

*Key  
Concept*



**Denser substances sink below substances that are less dense.**

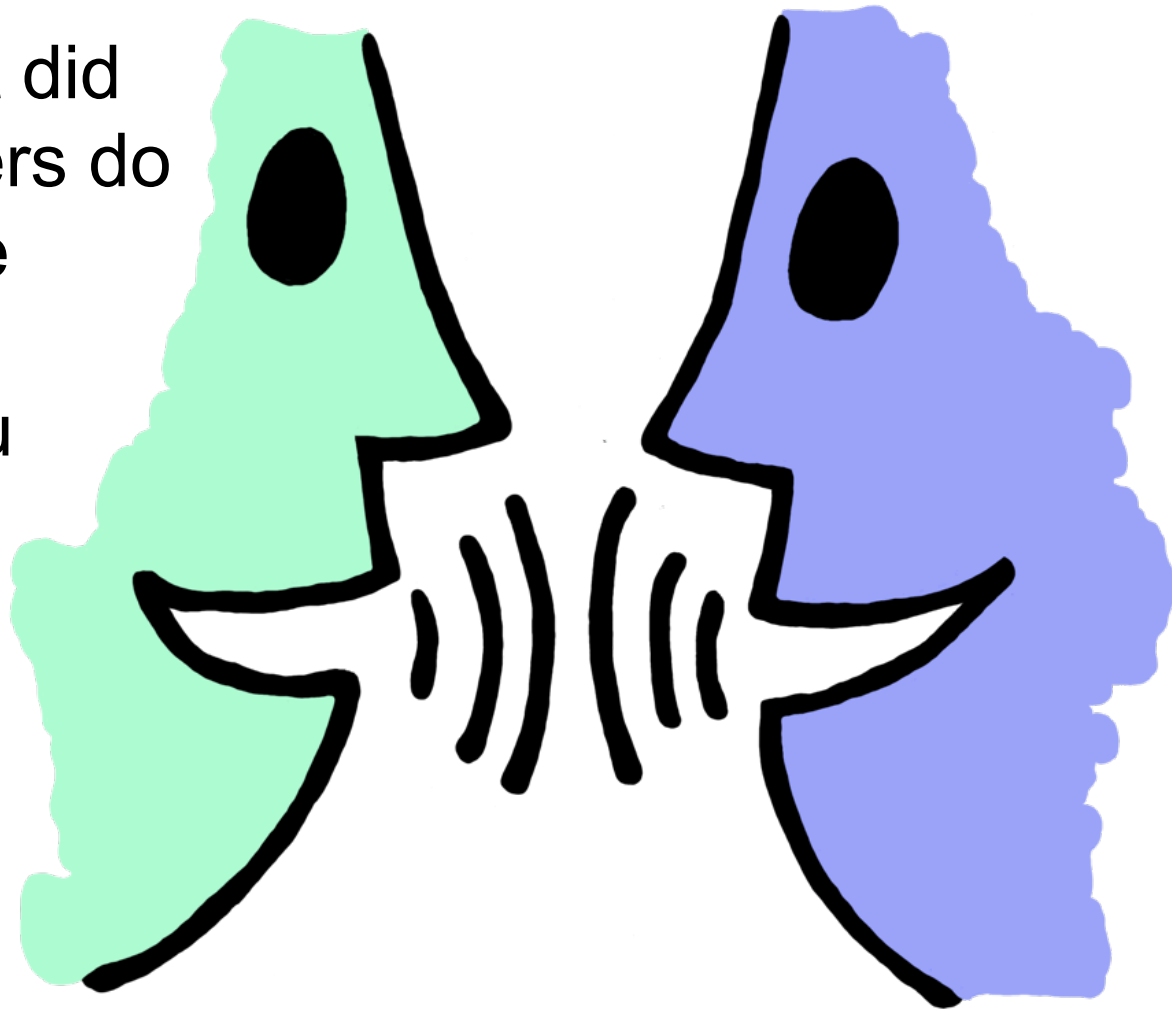
What are two ways you could make this water denser?





# Turn and Talk: *Mystery Balloons Debrief*

Specifically, what did you and your peers do to learn about the concept? What strategies did you engage in?



# Which strategies helped you?

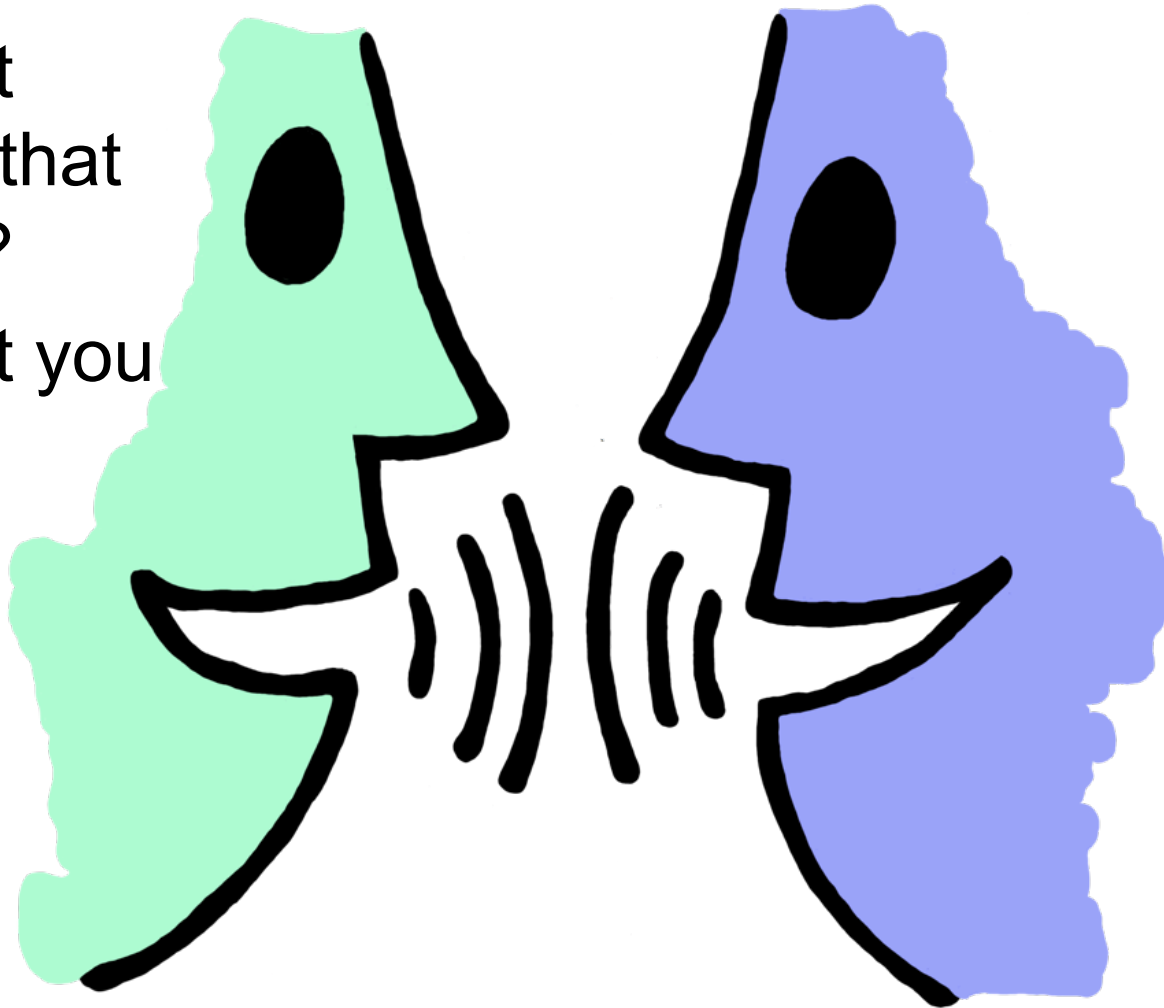
- Hands-on, manipulation of model
- Listening to and talking with peers
- Thinking on your own
- Listening and talking with instructor in whole-group discussion
- Overhearing other peers
- Discussing and testing out ideas that agree or disagree with your own understanding
- Asking new questions
- Explaining your ideas to peers and instructor
- Accessing and making connections to prior knowledge and experiences

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# Turn and Talk

- What is one aspect about this session that stands out for you?
- What is one aspect you wonder about?



# Homework

**Read.** Read A New Conceptual Framework chapter (NRC *Framework for K–12 Science Education* (pp. 7-22)).

**Watch.** Watch Phenomenon-based instruction video:

<https://www.nextgenscience.org/resources/ngss-equip-rubric-using-phenomena>

**Respond.** Respond to the prompts:

1. Describe two examples of how the conceptual shifts described in the reading may be meaningful to teaching science in schools? And/or to your own teaching practice?
2. Given the new vision for K-12 science teaching and learning, what questions do you have?
3. The video provided examples of phenomenon-driven instruction, what phenomenon might you use to engage all students in learning about an aspect of climate science and climate change?