Session 1: Teaching and learning science

Overview

This introductory session of the course begins with participants sharing and discussing their ideas and prior knowledge about some of the themes around which the course was designed. These themes include:

1. Local Ecological Knowledge & Place-based learning,
2. Developing skills to effectively teach with data in the science classroom,
3. Conceptual shifts in teaching and learning as described in science reform documents (e.g. NRC *Framework for K-12 Science Education* and *Next Generation Science Standards: For States, By States*),
4. Effective teaching practices based on how people learn, and
5. Climate science/change concepts.

Participants are introduced to a concept map illustrating how course concepts about climate science and climate change are connected. They then engage in inquiry-based activities from the *Ocean Sciences Sequence* curriculum (OSS) to learn science content about density, as the instructor models effective teaching practices. The goals, syllabus and requirements of the course, as well as rationale are reviewed.

Session Goals

Theme	Goals
Climate Science	Build understanding of density, an underlying science concept for understanding density-driven currents.
Teaching & Learning	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 *Next Generation*

	Science Standards (NGSS).

Materials Needed

For the class - for multiple sessions of course

- PowerPoint presentation
- Digital/data projector
- Whiteboard or flip chart paper and pens
- masking tape

For each participant

- Course syllabus
- 1 copy (or provide link for free download - https://www.nap.edu/read/13165/chapter/4) of the following reading for homework: NRC *Framework for K–12 Science Education,* (pp. 7-22)

For *Mystery of the Floating Balloons* (OSS Session 1.5) Activity

For whole class:

– 1 clear plastic container (5-gallon)
– 3 balloons, each a different color
– water
– cereal-sized bowl
– 3 dishpans
– electric kettle or hot tap water
– 1 bag of ice
– cooler or ice chest
– 1 heaping teaspoon of salt
– 2 sheets of chart paper
– 3 colored markers to match demo balloon colors
– 1 permanent marker
– masking tape

For each group of 3-6 students:

– 1 cafeteria-style tray

– 1 teaspoon
– 1 funnel
– ¼ cup of salt (4 tablespoons)
– 1 clear plastic cup (9 oz)
– 1 paper cup (8 oz)
– 3 balloons (all same color)
– 1 tank (1-1.5 gallon)
– 3 sticky notes
– 1 Balloon Investigation Data sheet
– 1 Balloon Investigation Direction sheet

For each pair of participants:

– set of molecule cards
– 2 paperclips (to hold molecule card sets)

For each participant:

– (optional) A Cup of Water handout

Preparation of Materials

For use with multiple sessions

Optional: Create chart with discussion norms. On a piece of chart paper, write out the norms for the course. These might include: a. Listen actively and share ideas; b. Share and ask for evidence and invite others to say more about what they are thinking; c. Keep an open, curious mind; d. Disagree productively; e. Work towards a deeper understanding (e.g., ask follow-up questions if you don't understand); f. Build on, synthesize and show appreciation for contributions from others (e.g., "I'd like to add on to what she said," "that's an interesting idea, it makes me wonder about..."); g. Monitor your own participation (e.g., be aware of talking too much or too little)

1. **Duplicate handouts.** Make one copy of each of the following handouts for each participant:
    a. Course syllabus
    b. *Chapter 1: A New Conceptual Framework,* pp. 7-22. *Framework for K–12 Science Education*. (https://www.nap.edu/read/13165/chapter/4)

For the Mystery of the Floating Balloons (OSS Session 1.5) activity

1. **Duplicate the handouts for each participant group.** Make a copy of the Balloon Investigation Directions, and a copy of the Balloon Investigation Data Sheet for each group. Make a copy of A Cup of Water handout for each participant, if providing this optional activity.

2. **Prepare balloons.** Set aside three different-colored balloons for the teacher demonstration.
    a. Prepare a small cup (8oz) of salty water. Add 3-4 teaspoons of salt to a small cup of water and stir until the salt is dissolved.
    b. Pour the salty water into one of the balloons using a funnel until it is about 1."–1." across.
    c. Fill the other two demonstration balloons with freshwater, making sure there is no air inside. Pour water into the balloons using a funnel and a cup until they are also about 1."–1." across.

3. **Prepare demonstration tank and participant tanks.** Fill the large clear plastic container (5-gallon) with freshwater and allow it to come to room temperature. (Note: If your room is cold, you may want to make the water slightly warmer than room temperature.) Label the tank, 'room temperature freshwater' and place at the front of the room. Fill a smaller tank (1-1.5 gallon) for each participant group and allow it to come to room temperature.

4. **Prepare trays for each participant group.** For each group, place the following materials on a tray: 1 spoon, 1 funnel, 3 balloons (label "1," "2," and "3" with a permanent marker), 1 teaspoon of salt in a plastic cup, 1 paper cup, 1 clear plastic cup, 3 Post-its.

5. **Prepare the Molecule Cards**. Copy the Molecule Cards for each participant pair. Cut apart the six cards and clip each set together with a paper clip.

6. **Make charts.** Using a marker and chart paper, make the following charts: Floating Balloons Mystery Demonstration Chart. (Write only the title and draw the tank without the balloons.) Balloon Investigation Results Chart. (Write only the title and draw the tank.) Post the chart where students can access it easily to record their results.

7. **(Optional) Duplicate 'A Cup of Water' handout for each participant.**

Just before the activity

1. **Prepare the water stations.** Add either ice and cold water, room-temperature water, and hot water to three dishpans, and label them. Place the dishpans where participants will be able to access them.
2. **Prepare the class demonstration.** Collect the three demonstration balloons. Place one of the freshwater balloons in a cup of ice cold water, place another in a cup of hot water, and place the third, containing salty water, in a cup of room temperature water. Place the three unlabeled cups close to the large demonstration tank, so that they can be removed from the cups and placed in the tank without participants discovering anything about what is in the balloons.

Session at a Glance

Task	Description	Time (minutes)
A. Introduction	Course welcome	5
B. Thought Swap	Participants respond to prompts to introduce and access prior knowledge about the contents and concepts addressed in the course. Participants share words that come to mind when they hear the words climate change; later these words are added to the course concept/road map.	35
C. Presentation: *Course Overview, Goals, & Concept Map*	Introduce course goals and themes. Describe course design focused on learning by doing & importance of discussion. Also describe rationale for why these goals were chosen.	30
D. Activity: *Mystery of the Floating Balloons* (OSS Activity 1.5)	Groups of participants try to discover the contents of some floating balloons, and relate what they find to ideas about density and molecules.	65
E. Turn & Talk: *Activity Debrief*	Participants reflect on what they did to build knowledge and make sense of the phenomenon they engaged with to learn about density.	10
F. Overview of course Syllabus	Participants reflect on the session. The course syllabus is introduced and questions addressed.	10
G. Homework	Read: *Framework for K–12 Science Education* (pp. 7-22): A New Conceptual Framework. Watch: Phenomenon-based instruction video https://www.nextgenscience.org/resources/ngss-equip-rubric-using-phenomena and respond to the reflection prompts.	5

	TOTAL: 2 hrs 40 mins	**160**

Session Details

A. Introduction

Welcome students to the course and introduce instructor.

B. Thought Swap

Note to Instructor: *If there are fewer than six participants, consider doing a Think-Pair-Share instead (see below).*

1. **Introduce "Thought Swap."** Tell participants that throughout the course they will be asked to share their predictions, ideas, and discoveries with others. Describe that a Thought Swap is a whole group activity for participants to become accustomed to sharing their ideas first with a partner and then with the whole group. In this case, the question prompts serve to provide participants with a quick overview of the course as well as an opportunity to discuss their ideas with others. ***Directions:***
    - Participants form two lines facing one another, making sure each person in one line has a partner in the other line.
    - The facilitator asks the whole group a question, and pairs in each line discuss their responses.
    - The facilitator calls time, and asks for a couple of volunteers to share what was discussed. Participants can share their own thoughts, what their partner shared, or what they talked about together.
    - After sharing out ideas about a prompt, the first person closest to the facilitator in one line moves to the end of their line, and everyone from that line moves towards the facilitator so that new sets of partners are formed for the next question.
    - Repeat until all questions are asked.

[***Note to Instructor****: The questions presented in the Thought Swap are designed to access participants' prior knowledge and ideas, and demonstrate to the students that they belong. Record their responses to the last two prompts on the whiteboard or chart paper. The climate change words they share will be used during the concept map activity.]*

2. **Prompts for Thought Swap.**
    1. 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?
    2. 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?
    3. This course will introduce underlying climate science concepts that help us to understand complex Earth systems science topics, such as climate change.
        a. What are all the words and ideas that come to mind when you hear the words climate change? (record their ideas on the board)
        b. What are you wondering about regarding climate change? (record their ideas on the board)
    4. What would make this a great class? In this great class, what would participants be like? What would the instructor be like? (record their ideas on the board)

    For this last question, share that you will aspire to be the kind of instructor they described. Also tell them that since it looks like the whole class wants the same sorts of things to make this a great class, there is no reason that we can't achieve that together.

C. Presentation: *Course Overview, Goals, & Concept Map*

1. **Introduce the course.** The previous Thought Swap activity gave a preview of what will be covered in this course. This course was designed to provide learning experiences and opportunities to delve synergistically into four major topics including:
    a. Climate science ideas - the science underlying global environmental change, including culturally responsive content, such as indigenous and local knowledge about climate change;
    b. Data skills - working with professionally-collected data, engaging in inquiry-based investigations using web-based and locally-relevant data resources (local ecological and place-based knowledge) as well as learner-generated data, and participating in experiences to explore how to teach using data and how people learn from data;
    c. Effective teaching and learning practices - including how people learn and consequently,

how we should teach; and

d. Understanding and applying the scientific practices and shifts in learning and teaching described in the *Framework for K–12 Science Education* (Framework) (National Research Council (NRC), 2012) and the *Next Generation Science Standards: For States, By States* (NGSS) (Achieve, 2013).

*[***Note to Instructor***: These seminal reform documents have been adopted by a number of states. Even in states that have not fully adopted them, many hold the Framework in very high regard and have incorporated the ideas into their planning and instruction, especially regarding the 3-dimensional teaching and learning described in the Framework. These 3-dimensions include: disciplinary core ideas (science content and concepts), science and engineering practices (what scientists do), and the crosscutting concepts (big ideas of science).]*

2. **Describe session design.** Project slide showing the four topics. Tell participants that each of the sessions in the course will model using effective teaching and learning practices to delve into climate science ideas, the nature and practices of science, and/or data skills. Each of the sessions have opportunities to engage with, read about, and reflect on the application of the topics.

3. **Introduce goals for Session 1.** Project the Session 1 Goals slide. Tell participants that in this introductory session three of the four themes are addressed through the following goals:

    - **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.

4. **Introduce OSS curriculum**. Most of the climate science and climate change activities that will be used to model effective practices come from the *Ocean Sciences Sequence (OSS) curriculum for grades 6–8* (http://mare.lawrencehallofscience.org/curriculum/ocean-science-sequence#OSS 6-8). This curriculum provides opportunities to learn about climate science, while also

emphasizing the practices of science and providing multiple opportunities for making sense of the content. The instructional design and effective strategies manifested in this curriculum will be "un-packed" and made explicit as the course progresses.

[Note to Instructor: *The OSS curriculum is the same curriculum that your students will use if they are doing a classroom placement with middle school students. Additional climate activities used in the course came from two college courses designed at the University of California, Berkeley – Communicating Ocean Sciences and Communicating Climate Science. The design and progression of how to use data in the classroom came from scientists and educators at Rutgers University; and the local ecological knowledge and culturally-responsive lessons were designed by scientists and educators at Western Washington University, University of Washington, and Padilla Bay National Estuarine Research Reserve.]*

5. **Explain rationale and introduce discussion norms.** Let participants know that this course has been designed to model effective pedagogy, including the importance of discussion and sharing of ideas. As such, it is very dependent on everyone's active participation and being open to both sharing and respectfully considering other's ideas. Display the draft list of classroom norms for them to consider, and invite participants to revise and/or suggest additional norms.
    - Listen actively and share ideas.
    - Share and ask for evidence and invite others to say more about what they are thinking
    - Keep an open, curious mind
    - Disagree productively
    - Work towards a deeper understanding (e.g., ask follow-up questions if you don't understand)
    - Build on, synthesize and show appreciation for contributions from others (e.g., "I'd like to add on to what she said," "that's an interesting idea, it makes me wonder about...")
    - Monitor your own participation (e.g., be aware of talking too much or too little)

6. **Introduce Climate Science/Change concept map for the course.** Project the slide and provide each participant with a Climate Science/Change Concept map handout. Indicate the list of climate change words they generated as part of the Thought Swap.

7. **Think-Pair-Share about Climate Science/Change concept map.**

D. Activity: *Mystery of the Floating Balloons (OSS Activity 1.5)*

Introduce the Mystery of the Floating Balloons

1. **Turn and Talk about currents.** Project slide of World Ocean Surface Currents. Ask, "What do you know about what causes freshwater and ocean water to move around Earth?" (Prompt is found on pg 3 of the Investigation Notebook). Have participants briefly talk to a partner about their ideas and any questions they have.

2. **Invite participants to think about the phenomenon.** Tell participants that you filled three balloons with different kinds of water, and you will now place each filled balloon into a large, clear container of "room temperature water" (just slightly warm freshwater). Point out the label. Tell participants that you will record the results by drawing where each of the three balloons ends up in the tank on the Floating Balloons Mystery Demonstration chart.

3. **Place balloons in water container.** One at a time, place the balloons into the container as participants observe carefully. (Don't let participants see where you are taking the balloons from, or let them touch the balloons, as it will give away the mystery.)

4. **Record results on the Floating Balloons Mystery Demonstration chart.** About 30 seconds after each balloon is placed, record the results on the Floating Balloons Mystery Demonstration chart by sketching the balloon in its position in the tank and either labeling it by the color of the balloon, or using a colored marker. Have participants help you accurately record the relative positions of the balloons in the tank, e.g. two balloons may be floating at or near the surface, but one may be floating a little higher than the other and so should be shown on the chart as floating a little higher.

5. **Look at position of balloons again.** Have participants continue to watch the tank for a few minutes to observe any changes. [*Within a couple of minutes, the cold-water balloon will start to rise slowly in the tank.*]

6. **Turn and Talk.** Have participants Turn and Talk to their partners about what they think is different about the water in each balloon, based on whether the balloons floated or sank and their positions in the tank relative to each other over time.

Directions for Participant Investigations

1. **Announce that participants will investigate.** Tell participants that you aren't going to give them the answer as to what kind of water was in each of the balloons; instead, they are going to gather evidence by doing some balloon investigations. They will try to make their balloons behave like your balloons did. Explain that:
    - Each group of four participants will start by deciding on one kind of water to try in a balloon and predict whether it will sink or float in a tank of slightly warm freshwater. They will have the choice of (1) cold freshwater, (2) hot freshwater, or (3) room-temperature freshwater.
    - They may add salt to any (or all) of these temperatures of freshwater if they predict it will make the balloons behave like the balloons did in the demonstration.
    - After filling a balloon and testing it in a tank, group members will watch it for about 30 seconds and record whether it sank or floated or something in between.
    - The group may then try a different water in another balloon. The point is not to try just anything, but to test things that they think might have been in the balloons shown in the demonstration. If they can get a balloon to behave like one of those balloons, that could be evidence about what was in the balloon in the tank.

2. **Point out water stations.** Show participants where the labeled cold, hot, and room-temperature water stations are located. Tell them that if they decide to use salty water, they can add one spoon of salt to about 1/3 cup of water, and then pour that water into their balloons. Emphasize that they should mix the salt and water together first, and then add it to the balloon, rather than putting salt directly into the balloon.

3. **Show group materials.** Each group will have a direction sheet, a test tank with slightly warm freshwater, a spoon, a funnel, three balloons, and a cup of salt. Caution participants not to mix anything into the water in their tanks.

4. **Project slide; pass out data and directions sheets.** Display the first Balloon Investigation Directions slide and pass one Balloon Investigation Data Sheet and one Balloon Investigation Directions sheet to each group. As you refer to the slide, use an example to explain how groups will complete the first two columns of the data table prior to doing their investigations.
    - If a group decides to put cold water in a balloon, they will write "cold water" in the Substance column.
    - Next to that, they would write "float," "sink," or "between" in the Prediction column, along with their reasoning supported by evidence for making such a prediction.

5. **Project slide; demonstrate balloon-filling procedure.** Show groups how to use the paper cup on their trays to obtain water from one of the water stations. They will bring the water back to their own tables to fill the balloons. Model how to fill a balloon using a cup and funnel with the tray underneath to catch any spills.
    - Explain that they need to make sure there is no air in any of the balloons because air will make the balloons float no matter what kind of water is in the balloon.
    - To get the air out, they can fill a balloon to the very top with water, then squeeze a little bit of water out as they pinch the neck of the balloon completely, and then tie off the opening of the balloon.
    - Emphasize how important it is to get all the air out.
    - Remind participants that they will try only one type of water in a balloon, and only one balloon at a time.

6. **Project slide; describe recording results in two places.** After the group tries a balloon in the test tank and watches it for about 30 seconds, they will collect their data of what actually happened and enter it into the Results column of the data table and describe why they think that

happened. They will also record the position of the balloon by adding it to the illustration of the test tank on their data sheet.

- Remind participants not to change their predictions after they see what happens.
- Also, remind participants to record if a balloon changes from its initial position by adding arrows to their drawings.

7. **Introduce class Balloon Investigation Results Chart.** Show participants the Balloon Investigation Result Chart you posted, and tell them that you want one person from each group to record their group's results on the Balloon Investigation Result Chart as they complete each balloon investigation.
    - Describe how they will write the type of water they used on a sticky note, and then place the sticky note on the Balloon Investigation Result Chart to show if the balloon sank, floated or went somewhere between.
    - Encourage them to place the sticky note on the Balloon Investigation Result Chart to show the relative position of the balloon after watching it for about 30 seconds in the test tank. If the balloon changed position during the investigation, they can note that on the Balloon Investigation Result Chart.

Participants Investigate

1. **Groups start investigations.** Ask participants if they have any questions. Caution them not to rush, and tell them it's fine if they complete only two balloons because everyone will share results later. Tell them that they will have about 10 minutes and have them begin.

2. **Circulate as groups work.** Go around the room encouraging the groups to discuss their predictions and record their reasoning in the data table on their data sheets. Also remind them to record their results on the class Balloon Investigation Result Chart. Give participants a five-minute, and then later a one-minute warning to start cleaning up materials. Remind participants to record their results on the Balloon Investigation Result Chart if they haven't done so yet.

3. **Stop the activity.** Stop the activity after 10 minutes or when every group has completed and recorded at least two balloon tests. Have someone from each group move the tank and the tray of materials to an area away from participants. Have each group keep their data sheet.

4. **Look again at the large container and balloons.** Ask participants to look again at the demonstration container and balloons to see if anything has changed. Have volunteers describe any changes and record the results on the Floating Balloons Mystery Demonstration chart by adding arrows to show if there was movement. [*Cold balloon that originally sank and then rose and floated vertically, is most likely now floating horizontally at the surface because the water in the balloon warmed up to room temperature. Hot balloon may be floating a bit lower in the water since the water in the balloon cooled off to the temperature of the tank. Salty balloon is still on the bottom.*]

Balloon Investigation Discoveries

1. **Turn class results into statements.** Quickly read off the results on the class Balloon Investigation Result Chart. Ask participants to share aloud any statements that might summarize patterns they notice, e.g, what kinds of balloons sank, and what kinds of balloons floated. Record their general statements on chart paper (this chart will be revisited in Session 2, in B. Activity: *Ocean Currents (OSS Sessions 1.7 and 1.8)*.

[**Note to Instructor**: *At this point, participants have not found evidence to support a statement that more dense substances sink below less dense substances, but they will have evidence to be able to say: salty water sinks below fresher water; hot freshwater floats in room temperature fresh water; colder water sinks below warmer water; and maybe even that salinity seems to trump temperature because warm saltwater balloons sank.*

Also, summarizing patterns from class data, rather than just their individual data, is an excellent example of how scientists seek as much data as possible before drawing conclusions. This also encourages the participants to use all of the range of data, rather than individual data points when summarizing the pattern. Looking at a range of data is an important foundational skill for the Data Interpretation data skills covered later in the course.]

2. **Discuss sources of evidence.** Tell groups that based on the evidence they have gathered as a class they will try to figure out what was in the three mystery balloons in your demonstration, and that they will try to make an explanation for each.

3. **Introduce the word *density*.** Tell participants that introducing and using a scientific term at this point will support the explanations. Click slide to give definition of density, and explain that density is the word for how dense a substance is. Density is a measure of how tightly packed molecules are in a substance or in a solution, such as salt water.

4. **Project key concept slide.** Project the slide with the 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."

5. **Introduce Molecule Cards.** Pass out molecule cards to each pair of participants. Ask them to use the cards to explain the key concept to their partner. Give pairs a minute to do this.

6. **Pairs explain what is in the balloons.** Ask the participants to work with their partner to explain what they think is in the balloons, and what evidence they have to support that idea. They should use the Molecule Cards and the words density and molecules, and refer to the Key Concepts and Mystery Balloon Investigation Results as evidence.

7. **Pairs share their explanations.** Have each pair of participants share their explanations with another pair. Encourage the participants to share any alternate ideas they have and to support their ideas with evidence.

8. **Class discusses mystery balloons.** Call on a volunteer to share his/her idea about what kind of water is in one of the mystery balloons and what evidence supports their idea.
    - Invite other participants to respond by asking questions, agreeing and adding more evidence, or disagreeing and explaining why.
    - Repeat for the other two balloons.
    - Participants may have noticed that one of the balloons (cold water) sank at first, but later started to rise (as the water in the balloon warmed up to room temperature). Encourage participants to use this additional evidence of what happened over time to decide which of the alternate ideas about what was in the mystery balloon is likely to be correct.

9. **Confirm the contents of the Mystery Balloons**. Finally, confirm that the two mystery balloons that sank were different. One was cold water, which later rose as it warmed, and the other was salty room-temperature water. The balloon that floated was hot water.

10. **Project key concept slide.** Project the new key concept and read it aloud: "Denser substances sink below substances that are less dense." Ask, "Which is denser, hot water or cold water? And how do you know?" Call on a volunteer to answer and challenge him/her to explain why. [*We know cold water is denser because colder water sinks below warmer water, and denser substances sink below less dense substances. Cold water is denser because the molecules are closer together.*]

11. **Optional: Discuss two ways to make water more dense.** Project an image of a cup of water (on page 26 of the investigation notebook). Ask, "What are two ways you could make this water denser?" Remind them to use the terms molecules and density in their explanations. Have one or two volunteers share out their responses.

E. Turn & Talk: *Activity debrief*

1. **Pose the debrief questions.** Explain that the activity they just participated in modeled how a community of learners can work together to generate explanations for a phenomenon and build understanding of a concept. Now it's time to be metacognitive–to think about thinking. Display the following questions:
    - Specifically, what did you and your peers do to learn about the concept? What strategies did you engage in?

2. **Turn & talk to someone.** Tell participants to turn to someone next to them and talk about the two questions.

3. **Begin whole-group discussion.** After 2-3 minutes of partner talk, call time and invite participants to share with the whole group what they talked about in pairs. Record discussion ideas on the board for everyone to see.

4. **Display and share the list of strategies.** Acknowledge the ideas/strategies that participants have offered and call attention to any on the list below that weren't mentioned.
    - 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

F. Overview of Course Syllabus

1. **Session reflection.** Project Session 1 Goals slide and describe how in this introductory session they have now engaged with some of the topics that are woven together and comprise the course. Draw their attention to each of the session 1 goals:

    - **Climate science ideas** - Build understanding of density, an underlying science concept for understanding density-driven currents.
    - **Teaching & learning** - 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.

2. **Turn and Talk about prompts.** Ask participants to do a turn and talk about the following 2 prompts:
    - What is one aspect about this session that stands out for you?
    - What is one aspect you wonder about?

3. **Share out.** Give participants a minute or two to discuss the prompts, then regain the attention of the whole group, and ask for volunteers to share their ideas. Invite participants to respond to one another by asking questions, agreeing or disagreeing and explaining why.

4. **Distribute course syllabus handout**. Distribute the course syllabus and review details of the requirements. Describe important points and ask participants for their questions.

G. Homework

1. **Show slide of Homework Assignments.** Describe homework tasks as follows:
    - **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?