

Designing instruction based on how people learn

The Learning Cycle



Think Pair Share

- Think about a time you really learned something
 - How did you learn it?
 - What did it take for you to really learn it?
 - What was it about this prior learning experience that made it work for you?

Summary

- multi-faceted experiences - provided more than one opportunity to learn, different approaches were used
- creating a desire or will to learn about something
- teaching a topic to someone else
- having the chance to practice and extend the learning
- delaying providing an answer to help keep learner curious
- touching or doing something
- sharing thoughts and discussing ideas with others
- accessing and connecting to prior knowledge



Ice Cubes Challenge

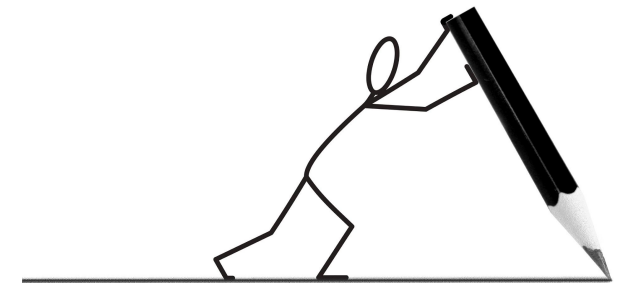
What will melt faster – ice cubes in fresh water or salt water?



Thought Experiment

Think about this on your own and record your ideas

1. Find two cups of water on the table. One is labeled “salt water,” the other is labeled “fresh water.” Both cups are room temperature.
2. Two ice cubes are placed in each cup. The cups are not stirred or disturbed.
3. **Quick Write:** In which cup do you predict the ice will melt the fastest?
 - What makes you think that? Record your prediction and explain your reasoning.
4. Once you record your ideas, discuss in your small group.



Do the Experiment

1. Gently place two ice cubes in each cup, and carefully observe what happens. Do not stir or disturb the water in the cups, or remove the ice cubes during your observations.
2. Describe what you notice as the ice cubes melt. Check the ice cubes about every 30 seconds to observe the progress.
3. Which melted fastest after about 2-3 minutes?
4. Why do you think that happened? Discuss your ideas about what you think is happening with your group. Support your explanations with evidence.
5. Record your ideas.

Additional Observations to help develop an Explanation

1. Add a couple of drops of food coloring to each cup without disturbing the water in the cup.
2. Compare what happens in each cup.
3. Does this help to explain the results? Explain what you and your group think is happening.

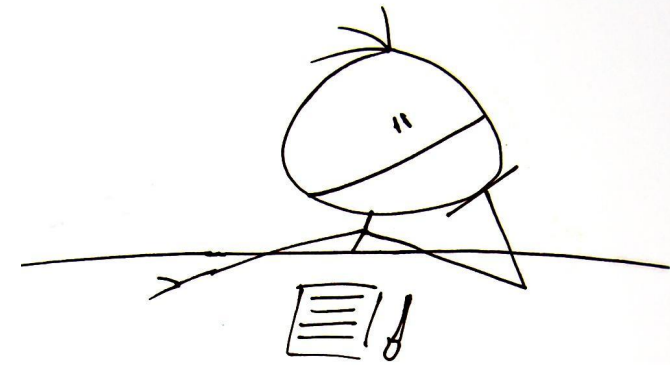


Request
More
Info

What additional information would be helpful to make an explanation?

Activity Debrief: Quick Write

- What did you notice about the melting rate of the ice cubes?
- Why do you think that was happening?
 - Draw a diagram to represent your explanation.
- What ideas did you discuss to explain the results?



A

B

C

D

Ice melts faster in fresh water than in salt water because...

- A. salt causes ice on roads to melt. A
- B. salt affects the freezing point of water &/or differences between the heat capacity of fresh & salt water. B
- C. salt water is more dense than fresh water. C
- D. ice is more buoyant in salt water than in fresh water. D
- E. dissolved NaCl causes molecules to be in greater motion and that causes more eroding away of ice. A B
- F. adding salt makes things colder (e.g used in making ice cream). C D

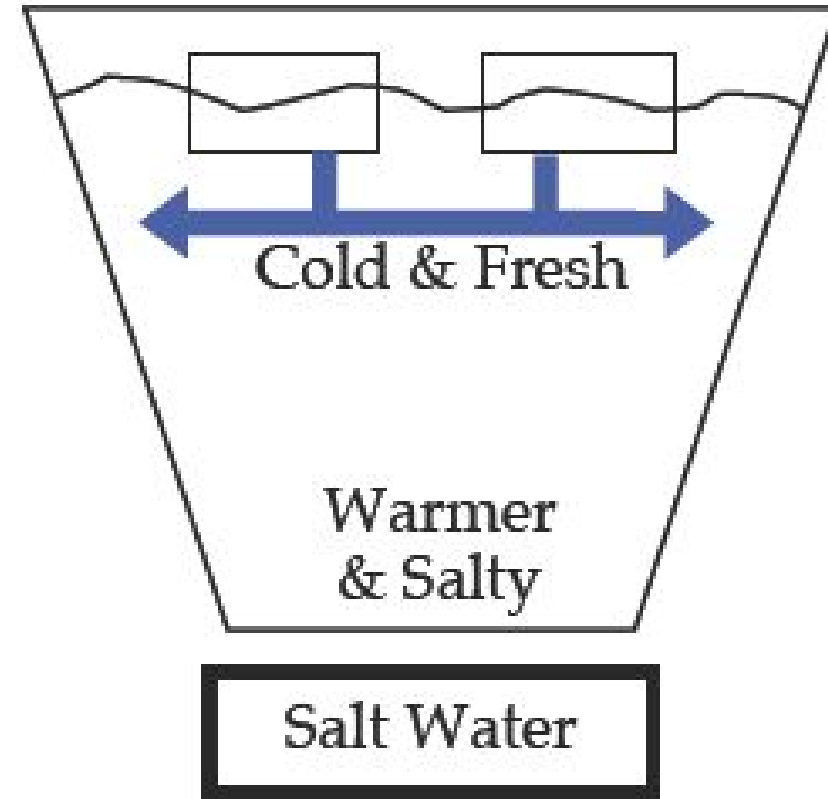
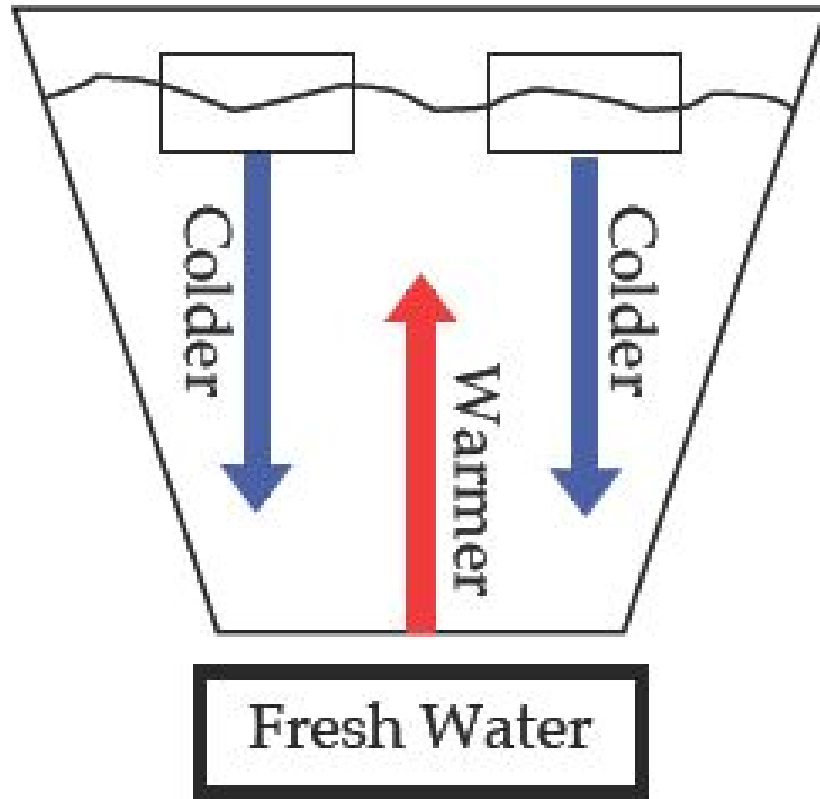


Ice Cubes Explanation

- Read the explanation using Active Reading.
 - Underline ideas that you think are interesting.
 - **Circle** ideas that you think are confusing or unclear.
 - Write questions in the margins.
- Turn & talk with a partner.
 - Share your understanding of the explanation.
 - Try to answer one another's questions.



Explanation for Ice Cubes Challenge

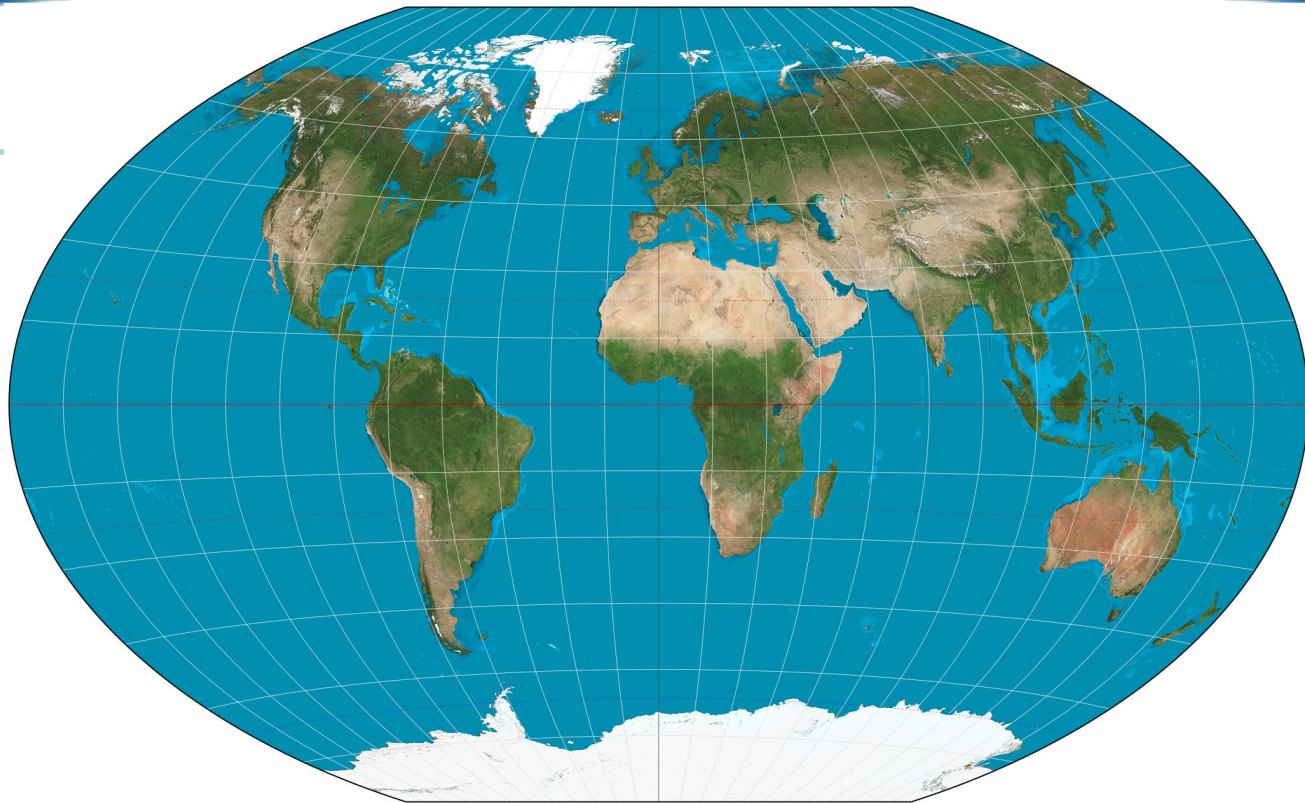




ReVISION

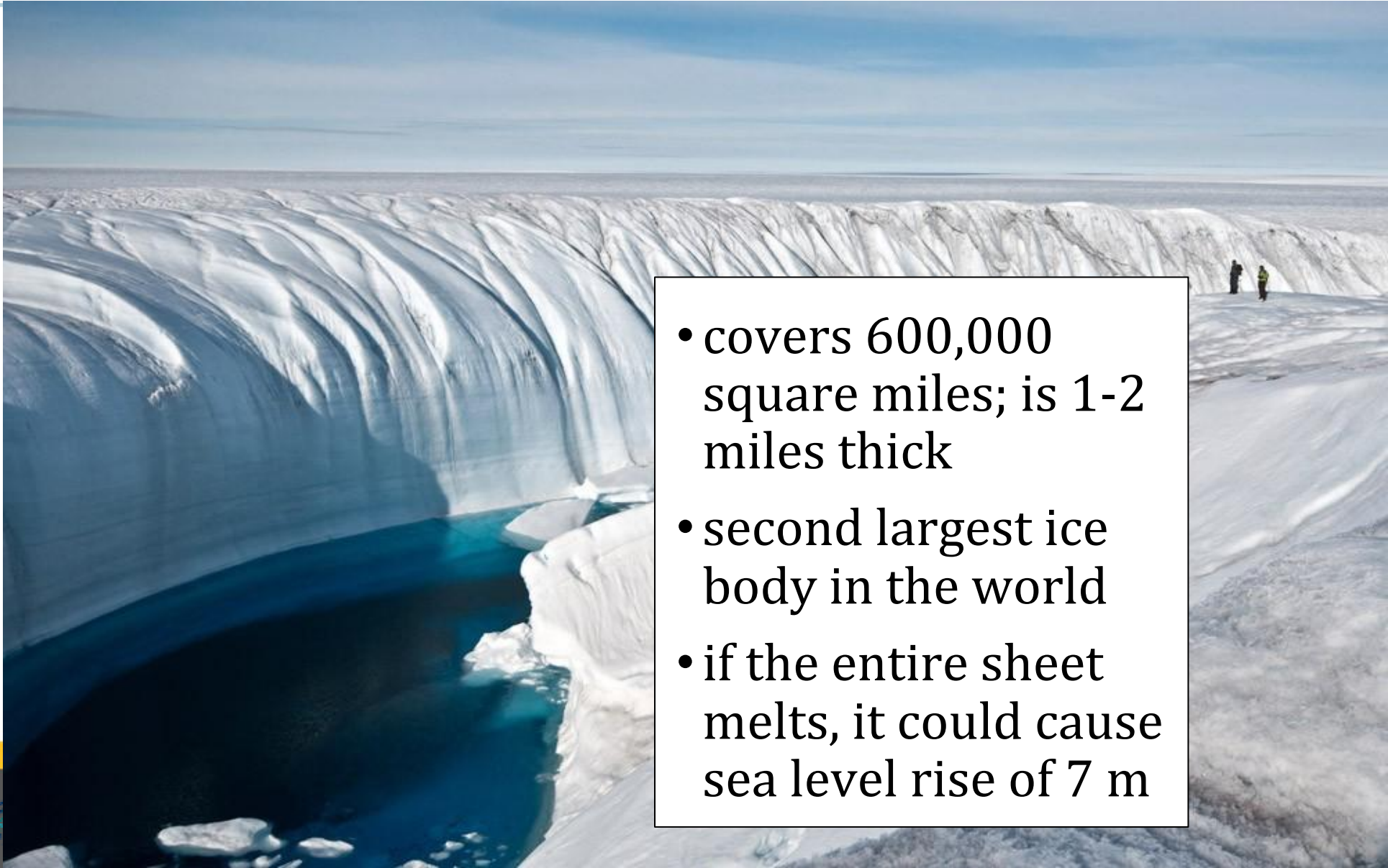
Revise your Quick Write

1. Draw a line under your original explanation.
2. Write new or additional explanations, include additional evidence you gathered.
3. What questions do you still have about the explanation?



What does this concept have to do with what happens in the ocean?

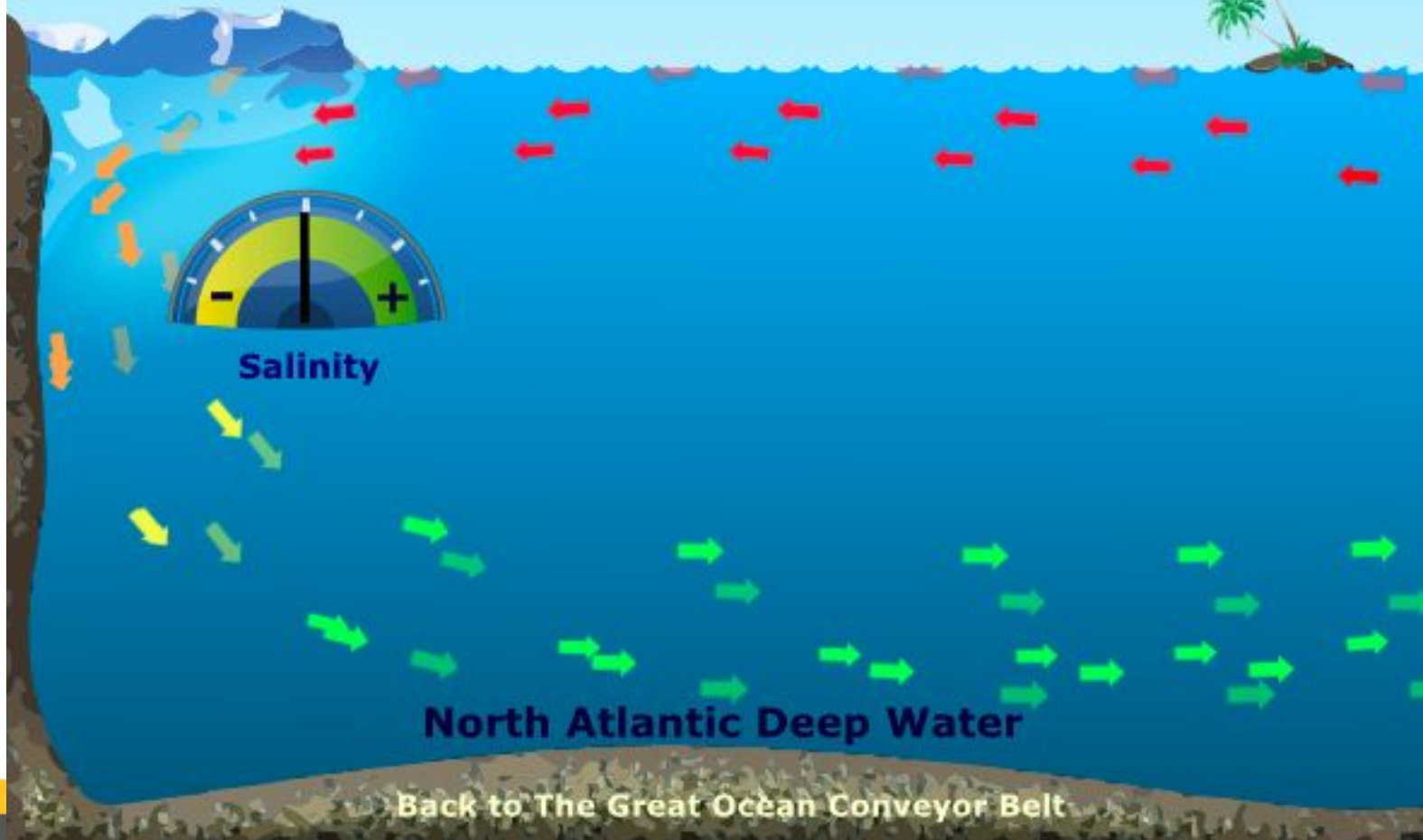
Greenland Ice Sheet



- covers 600,000 square miles; is 1-2 miles thick
- second largest ice body in the world
- if the entire sheet melts, it could cause sea level rise of 7 m

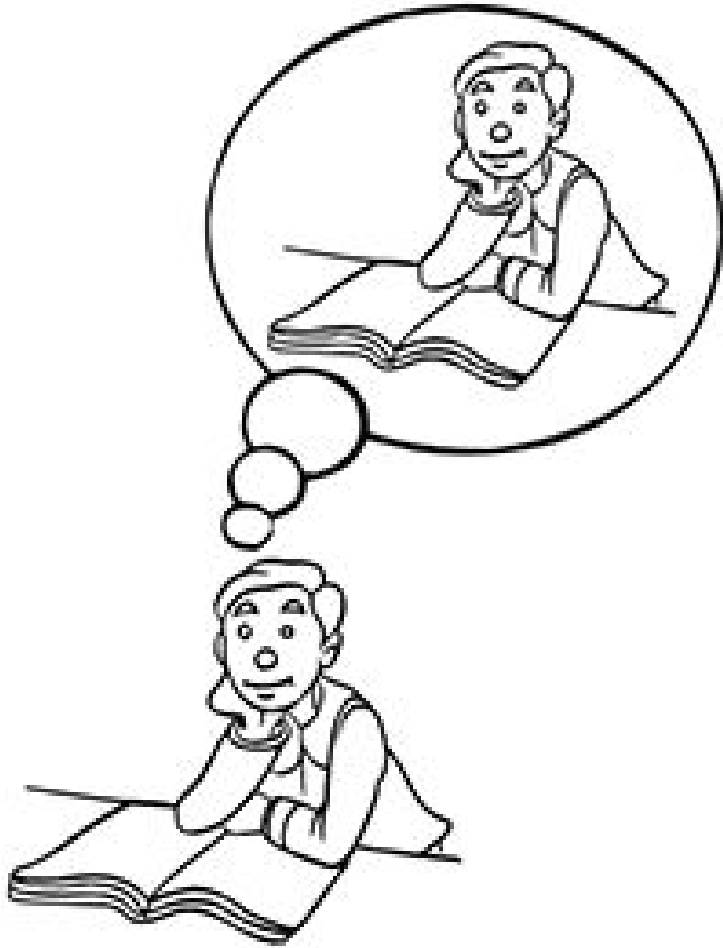
GREENLAND

EQUATOR



Back to The Great Ocean Conveyor Belt

Reflection



- In what ways did your ideas change? Compare and contrast your prior knowledge to your new understanding.
- What did you do in the Ice Cubes Challenge that affected your thinking & explanations?



Strategies for Learning & Teaching

- Doing the investigation
- Listening to & talking with peers
- Thinking on your own
- Reading about the explanation & engaging with the animation
- Listening & talking with the instructor in the whole group
- Discussing ideas that agree/disagree with your understanding
- Asking new questions
- Explaining your ideas to peers or instructor
- Accessing and making connections to prior knowledge & experiences
- Creating a desire or will to learn about something

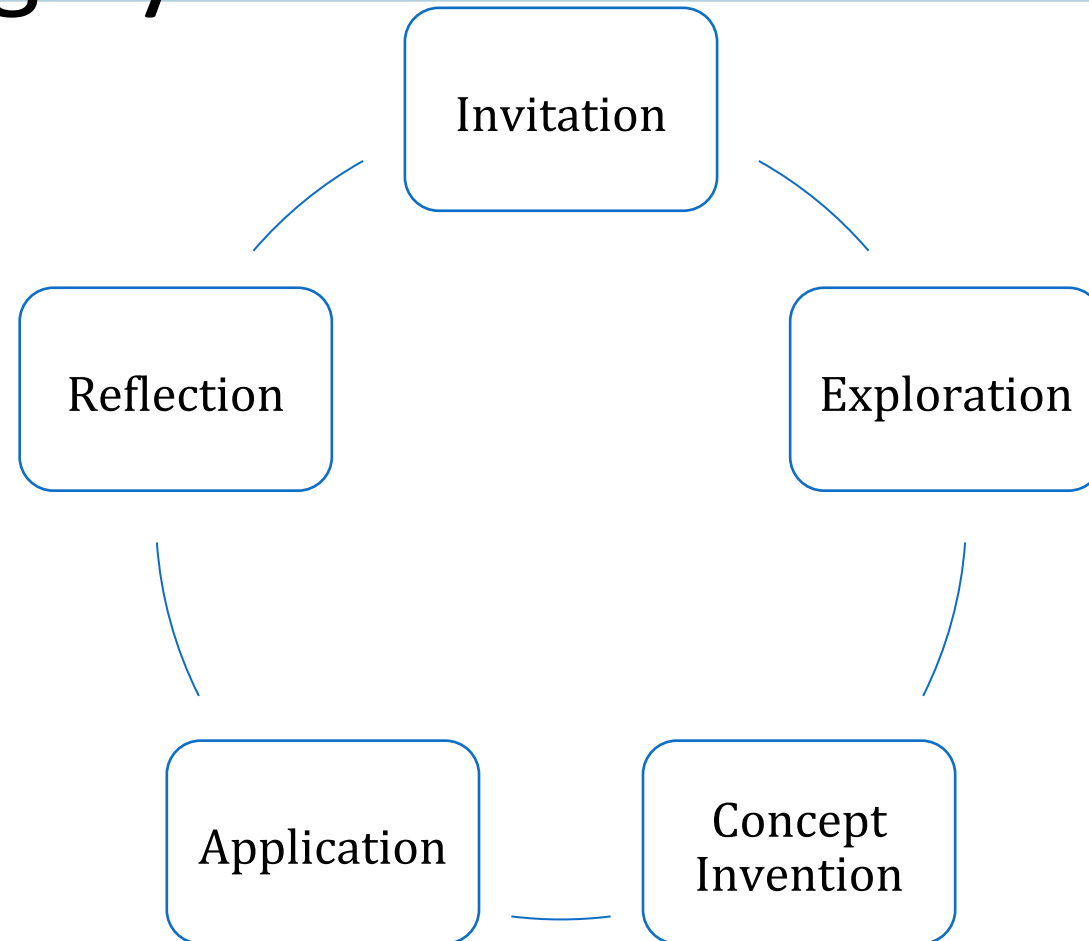
How can experiences be designed to support learning?



Learning Cycle

The learning cycle is based on research about how people learn, and has been used for decades to design science and other learning activities in ways that help students to learn.

The Learning Cycle



Using the learning cycle in the design of experiences

Questions to ask when designing an experience	Ice cubes challenge	This workshop session
Invitation - How does it get students interested in learning about the topic? How does it help them access their prior knowledge?		
Exploration - How will learners have experiences that provide concrete observations and discoveries to help them make sense of the topic?		
Concept Invention - How will learners be encouraged to struggle with their understanding and negotiate their ideas with others?		
Application - How will learners authentically apply what they've learned to a new situation or context?		
Reflection - how will learners think back on the learning process to help reinforce their understandings, and make them better learners in the future?		

Using the learning cycle in the design of experiences

Questions to ask when designing an experience	Ice cubes challenge	This workshop session
Invitation - How does it get students interested in learning about the topic? How does it help them access their prior knowledge?	Quick Write: What will melt faster – ice cubes in fresh or salt water? Write down prediction and rationale.	
Exploration - How will learners have experiences that provide concrete observations and discoveries to help them make sense of the topic?	Explore ice cubes melting with peers and discuss/compare ideas and rationale.	
Concept Invention - How will learners be encouraged to struggle with their understanding and negotiate their ideas with others?	Adding food coloring to cups. Voting and discussion. Learners construct explanations and gather evidence to support ideas. Teacher/reading explains concepts as necessary. Revise writing.	
Application - How will learners authentically apply what they've learned to a new situation or context?	Apply concept to real world scenario through engaging with animation.	
Reflection - how will learners think back on the learning process to help reinforce their understandings, and make them better learners in the future?	Learners compare ideas before & after investigation. What did they do in the activity that helped them to understand the concept?	

Using the learning cycle in the design of experiences

Questions to ask when designing an experience	Ice cubes challenge	This workshop session
Invitation - How does it get students interested in learning about the topic? How does it help them access their prior knowledge?	Quick Write: What will melt faster – ice cubes in fresh or salt water? Write down prediction and rationale.	Think Pair Share: think about a time when you really learned something. What helped you learn it?
Exploration - How will learners have experiences that provide concrete observations and discoveries to help them make sense of the topic?	Explore ice cubes melting with peers and discuss/compare ideas and rationale.	Doing the whole ice cubes challenge and discussion about what helped you to make sense of the concept.
Concept Invention - How will learners be encouraged to struggle with their understanding and negotiate their ideas with others?	Adding food coloring to cups. Voting and discussion. Learners construct explanations and gather evidence to support ideas. Teacher/reading explains concepts as necessary. Revise writing.	Introduction of learning cycle and discussion about how it supports learning.
Application - How will learners authentically apply what they've learned to a new situation or context?	Apply concept to real world scenario through engaging with animation.	Coming up: Using the learning cycle in the design of experiences with OOI data activities
Reflection - how will learners think back on the learning process to help reinforce their understandings, and make them better learners in the future?	Learners compare ideas before & after investigation. What did they do in the activity that helped them to understand the concept?	Coming up: What would you like to remember regarding designing experiences to reflect the learning cycle instructional design?

Addressing common lesson-design mistakes

- Look at existing lessons in terms of the learning cycle, e.g.
 - Does it start off with invitation or does it start with concept invention?
 - Were students given time to explore?
- Include time for students to engage in meaning-making and application.
- Allow students to think about and explore a topic before introducing concepts and vocabulary



Drawbacks of focusing on only one phase

- Many educators focus on the area of the Learning Cycle with which they are most comfortable
- Focusing solely on one phase of the cycle may mean neglecting or rushing other important phases of the cycle



Provide opportunities for students to struggle with meaning making.

- The heart of the learning cycle is providing opportunities for the learner to *struggle* to make sense of discoveries, explorations, and phenomena.
- Engage students with questions and ideas, and encourage them to explain what's going on.
- Prompt students to make connections and describe and/or discover the relationship between ideas.
- Meaning making can take place at every phase of the learning cycle. You want students continually asking: "What is going on here?" "Maybe it can be explained like this..."

The Learning Cycle supports how learning happens

- National Research Council's 2000 report *How People Learn: Brain, Mind, Experience, and School*
- **Key Finding #1 states:** *"Students come to the classroom with preconceptions about how the world works. If their initial understanding is not engaged, they may fail to grasp the new concepts and information, or they may learn them for purposes of a test but revert to their preconceptions outside the classroom."*
- **Key Finding #2 states:** *"To develop competence in an area of inquiry, students must (a) have a deep foundation of factual knowledge, (b) understand facts and ideas in the context of a conceptual framework, and (c) organize knowledge in ways that facilitate retrieval and application."*
- **Key Finding #3 states:** *"A metacognitive approach to instruction can help students learn to take control of their own learning by defining learning goals and monitoring their progress in achieving them."*

Reflect on the session

- Write about something you would like to remember about designing learning experiences according to the learning cycle.