

Learning Cycle Phase	Explore Thermohaline Circulation & NADW Formation
<p>Invitation How will it get learners interested in learning about the topic and access their prior knowledge?</p>	<p>Show clip of high sea state in the North Atlantic. Students describe their observations and Turn & Talk about: What interactions may be occurring at the air-sea interface? Thinking back - in what ways does the atmosphere influence the ocean? What concepts might be in play here?</p>
<p>Exploration (#1 & #2) How will learners have experiences that provide observations and discoveries to help them ask and answer questions, and make sense of the topic?</p>	<p>#1: Pairs examine the temp vs season widget, describe observations, and try to explain what might cause the patterns. They make predictions, including a rationale and sketch, about how other physical factors (sea temp and density) will change in response to wind forcing.</p> <p>#2: Partners use the widget to examine a stacked set of temp and a stacked set of density plots. They look for patterns and compare the patterns to their predictions from Exploration #1. They respond to prompts, describe how temp and density change with depth, and discuss how this might contribute to thermohaline circulation. Whole group discussion about what they are wondering about and what more info is needed.</p>
<p>Concept Invention How will learners be encouraged to struggle with their understanding and negotiate their ideas with others?</p>	<p>Students participate in class discussion, explaining and supporting their ideas with evidence gathered from the 2 Exploration widgets and prior knowledge about the concepts. Students use the Concept Invention widget to investigate the relationship between wind speed, near-surface water temp, and density. Teacher leads discussion, adds explanations and helps make connections as necessary about how what happens at the surface affects water at depth. Students write about their understandings.</p>
<p>Application How will learners authentically use what they've learned & apply it to a new context?</p>	<p>Students identify another area of the world where deep water forms and compare the processes there with the Irminger Sea. They then compare and contrast the Irminger Sea with the Antarctic and Gulf of Mexico to apply their new understanding of deep water formation. They discuss the role of climate change in deep water formation.</p>
<p>Reflection How will learners think back on the process of learning to help reinforce their understanding & make them better learners in the future?</p>	<p>Although we often study separately the different parts of the ocean system, this activity focused on the interaction of the atmosphere (wind), water properties (temperature and density), and the thermohaline ocean circulation. As you tied together all these pieces, you learned something new about the ocean. What did you learn?</p>