

	Factors Affecting Primary Production
<p><b>Invitation</b></p> <p>How will it get learners interested in learning about the topic and access their prior knowledge?</p>	<p>Students complete one or more of the following. (1) Make a concept map about what they already know and return to it later to revise as their knowledge increases. (2) Take a pre-quiz. (3) Small groups discuss what they already know, questions they have, and what they need to learn more about regarding the statement: Primary production is affected by available nutrients; instructor records class discussion to return to later. (4) A video of humpback whales feeding sparks a discussion around student ideas about how patterns in primary production might impact higher trophic levels.</p>
<p><b>Exploration</b></p> <p>How will the experiences provide observations to help learners ask/answer questions, and make sense of the topic?</p>	<p>Pairs or small groups use multiple <b>widgets from other data labs</b> to explore variations in primary productivity such as across latitudes, within climate zones, time series, inshore vs offshore. After exploring and discussing questions embedded in each widget, students determine which of their questions have been answered, what new questions were raised by each of the widgets, and what more they need/want to know.</p>
<p><b>Concept Invention</b></p> <p>How will learners be encouraged to struggle with their understanding and negotiate their ideas with others?</p>	<p>Small groups discuss factors affecting primary productivity they explored and what other factors may be involved. They predict how each factor varies across a year locally and then in a Polar region. Small groups/partners explore the <b>concept invention widget</b> focusing on the relationship between light, nutrients, temperature, and primary production in the Southern Ocean. They discuss embedded questions about the relationships between factors and the evidence to support their ideas. Instructor leads a discussion, asks guiding questions, encourages students to make evidence-based explanations, and provides additional information as needed.</p>
<p><b>Application</b></p> <p>How will learners authentically use what they've learned and apply it to a new situation or context?</p>	<p>Students use the <b>application widget</b> to explore how primary productivity varies in the Southern Ocean. They predict the pattern of light availability and nutrients based on the data and share their rationale. Instructor leads a discussion about how their predicted patterns compared to actual patterns. Students draw hypothesized seasonal patterns at different latitudes and predict how primary productivity would vary with these factors at each latitude.</p>
<p><b>Reflection</b></p> <p>How will learners think back on the process of learning to help reinforce their understandings &amp; make them better learners in the future?</p>	<p>Options: Students revise their concept maps to reflect what they learned, and/or take a post quiz and compare to the pre quiz to reflect on how their knowledge about primary productivity has improved. They respond to prompts about the skills and concepts they needed to learn, what new connections they made, and what was the most difficult part and what helped them to figure it out.</p>