Iceberg Diagram: A Systems Thinking Tool
About Iceberg Diagrams

In Earth System Science, underlying factors affecting observable phenomena can be difficult to identify and describe. This diagram uses the metaphor of an iceberg to demonstrate the idea of visible vs hidden as it relates to Earth science phenomena. This teaching strategy helps students to see beyond the obvious and to develop their awareness of the underlying causes, relationships, and/or conditions that can contribute to phenomenological events. It also provides a framework for digging deeper into phenomena-driven lessons in Earth Science.

Using Iceberg Diagrams

This tool helps students think about a phenomenon in four ways:
1. single or series of events to be described
2. patterns to be identified using mathematics
3. flows of energy and matter to analyzed
4. spheres of the Earth System to be connected

Understanding Iceberg Diagrams

EVENT: This stage involves learners making observations of the phenomenon as an event. Observations may come in the forms of local investigations in their school yard, experiments, data collected from field stations and satellites, etc. Learners also begin making predictions about why or how this phenomenon happens.

PATTERNS: Learners explore the data to identify patterns and relationships with respect to change over time, geographic location, etc. By looking for patterns, relationships (and the factors that influence them) may begin to emerge. Also, learners generate research questions.

STRUCTURE: Learners describe the fluctuations of energy and matter in the phenomenon, as well as relate scientific principles to them. These characteristics help the learner identify the boundaries of this phenomenon, its structure, and dynamics.

EARTH SYSTEM CONNECTIONS: Learners connect the phenomenon to the Earth System, as well as to human activities (found within the Biosphere).

Using Iceberg Diagrams with Jamboard

As phenomena and their characteristics are discovered, use the diagram with students to brainstorm and document their ideas. For virtual lessons, students use the Sticky Note feature to capture and share ideas.
Using the Iceberg Diagram
Jamboard or Handout

The Phenomenon Event
- What do you observe?
- Why do you think this is happening?
- What ideas do you have about how this happens?

Patterns of the Event
- How does this event change over time? Duration? Frequency?
- How does this event change over different geographic locations?
- What other variables do you believe to affect this event in the Earth System?
- What phenomenon is this event most closely connected to?

The Phenomenon Structure
- What materials are involved in this phenomenon?
  How does matter flow in/through the system to affect this phenomenon?
- What forms of energy are involved in this phenomenon? How does energy flow in/through the system to affect this phenomenon?
- What scientific principles are related to this phenomenon?

The Earth System Connection
- What system(s) does this phenomenon belong to (Atmosphere, Biosphere, Cryosphere, Geosphere, Hydrosphere)?
- How is this phenomenon connected to other spheres in the Earth System?
- What role do humans play in this phenomenon?

Document Resources
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