Humans are a part of the Polar system. The Arctic has a rich cultural history and diversity of Indigenous Peoples.

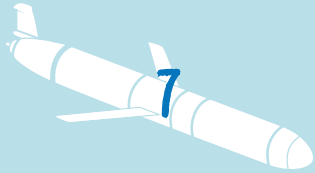
6A Humans have inhabited the Arctic for thousands of years. There is evidence of human Arctic presence from over 40,000 years ago. Humans continually adapted to inhabit the unique environment.

6B Polar systems affect humans in a variety of ways.

6C Climate change is affecting Arctic residents (about 4 million), including 40 different indigenous groups (about 10% of Arctic residents) through impacts to their environments, food webs, and infrastructure.

6D Arctic indigenous people are important partners to the science community in understanding and observing the Arctic.

6E The Arctic region of the United States holds sizable proved and potential conventional energy (oil and natural gas resources) and renewable energy (geothermal, tidal, wind, etc.). The impacts of extraction of the resources is questionable.



New technologies, sensors and tools—as well as new applications of existing technologies—are expanding scientists' abilities to study the land, ice, ocean, atmosphere and living creatures of the Polar Regions.

7A Historically Polar explorers took photographs and collected observational data (primarily atmospheric and meteorological observations) at various intervals during explorations to the Poles providing a discrete understanding of the Poles.

7B Today scientists use satellites, drifting buoys, tethered buoys, subsea observatories, unmanned submersibles, and automated weather stations to constantly and remotely study the Poles.

7C Piecing together historical data recorded by early explorers and traditional knowledge from residents, with ice cores and sediment cores gives scientists an understanding of natural history.

7D Antarctica's high elevation and dry atmosphere allow measurements of cosmic microwave background (fossil light from the early universe).

7E Scientists measure the ice and snow levels over many decades to observe the impact of climate change in the Arctic landscape.

7F Scientists are gathering genetic information across a range of Polar species, from DNA to the broad ecosystem.

Polar ICE partners include: Rutgers University, California State University Monterey Bay, Monterey Bay Aquarium Research Institute (MBARI), Eidos Education, Indiana University, and Open Minds Media. Special thanks to our contributors including scientists and educators from Lamont Doherty Earth Observatory, Byrd Center for Polar and Climate Research, The Ohio State University, PolarTREC, and the Long-term Ecological Research Programs - Palmer Station and McMurdo Dry Valleys.

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Polar Literacy Principles

POLAR–ICE

Interdisciplinary Coordinated Education

7 Principles of Polar Literacy

The Polar Regions are facing changes with global consequences. From climate to food web changes, impacts continue to emerge, while the importance of our Polar Regions are often overlooked. The Polar Literacy Principles outline essential concepts to improve public understanding of these critical and sensitive ecosystems.

For polar scientists, these principles define the important concepts to convey when communicating the broader impacts of their research. For educators, these principles provide guidance on significant concepts to teach about the Polar Regions.

Join us to improve public understanding of the Polar Regions and visit us at polar-ice.org.

The Arctic and Antarctic regions are unique because of their location on Earth.

- **1A** The Arctic and Antarctic are both cold environments but have different geographical features.
- **1B** Earth's tilted axis affects polar seasons – summer and winter. During summer (Arctic – June, July, Aug; Antarctic – Dec, Jan, Feb) the sun does not set, and during winter (Arctic – Dec, Jan, Feb; Antarctic – June, July, Aug) the sun does not rise.
- **1C** The physical characteristics of the environment (weather, climate, topography, geology) are significantly different.
- **1D** Polar climates create different living conditions.

Ice is the dominant feature of the Polar Regions.

- **2A** Ice is dynamic and comes in many shapes and sizes—big, small, floating in water or layered on land, thin or thick, solid or porous soft.
- **2B** Ice shapes the Polar landscape.
- **2C** Sea ice naturally shrinks and expands with the seasons. However, this natural dynamic cycle of ice growth and loss is affected by increasing air and water temperatures occurring at the Poles due to climate change.

Polar Regions play a central role in regulating Earth's weather and climate.

- **3A** Polar oceans play a key role in global circulation of ocean water and air masses that keep the Earth temperate.
- **3B** Ice and snow (white surfaces) reflect sunlight back into space. Ocean and land (dark surfaces) absorb more solar energy. As ice and snow disappear, heat is absorbed by exposed surfaces, which accelerates melting of additional snow and ice.

The Poles are experiencing the effects of climate change at an accelerating rate.

- **5A** Arctic sea ice is declining at a rapid rate.
- **5B** Antarctica is experiencing less sea ice loss than in the Arctic – for now.
- **5C** The Western Antarctic Peninsula (WAP) is the fastest winter-warming region in the world (about 10 times faster than global average).
- **5D** Warmer Polar Regions have a moister atmosphere, which leads to more precipitation.
- **5E** Effects of climate change at the Poles is directly connected to changes in sea level around the world.
- **5F** The Poles are locations of increasing Geopolitical issues.

The Polar Regions have productive food webs.

- **4A** Productivity (generation of life) is tied to seasonal changes in sea ice cover, water and air temperature.
- **4B** Sea ice cover, water and air temperature change with the seasons.
- **4C** The Antarctic food web is simple.
- **4D** The Arctic has a more complex food web.
- **4E** Marine and terrestrial predators are predictors (indicators) of change in food webs.