



Polar PASS: Polar Place and Spaces - External Resource

Source*: Polar Pass Development Team

*All materials for this resource are hosted on the Science Education Resource Center
(serc.carlton.com)

Activity Summary

PolarPASS modules are ideal for use in upper-division geoscience and environmental science classes. Full instructions are provided for using the 360-degree interactive environments and GIS tools. GIS activities are designed for use with [QGIS](#), a free software package available for all computer operating systems. The curriculum is flexible to class format and has been taught in classes from the block system to semester-long classes. Instructors have taught within seminars, labs, and mixed classes, though we recommend a class format that includes interactive/lab time for teaching with PolarPASS.

Learning Goals and Outcomes

Students will...

- Explore glacier mass balance, albedo, and surface melt
- Explore past ice margin retreat and processes of ice margin retreat and elevation change

Context for Use

Topic	Glaciology
Course Type	Curriculum
Audience	Undergraduate
Instructional Time	This resource contains two modules that each can be spread across 2-3 weeks.
Context	PolarPASS is designed to bring polar environments into the classroom, allowing students to explore extreme environments and connect with new and seemingly distant places. Using 360-degree interactive environments and Geographic Information System (GIS) data, along with more traditional learning resources, PolarPASS provides a science-based curriculum that immerses students in unique polar locations and brings them up close and personal with Earth science data and field locations on both land and ice near Kangerlussuaq, Greenland.

Description

Module 1:

This module consists of five units, walking students through an overview of the glacier basin system, exploring glacier mass balance, albedo, and surface melt, and looking inside and



underneath the glacier. The units cover the transition from the glacier margin to land and system responses to climate change.

- [Unit 1: Overview of the Glacier Basin System](#)
- [Unit 2: Glacier Mass Balance, Albedo, and Surface Melt](#)
- [Unit 3: A look Inside and Underneath the Glacier](#)
- [Unit 4: Transition from Glacier Margin to Land](#)
- [Unit 5: System Response to Climate Change](#)

Module 2:

Module 2 consists of four units. The units begin by exploring past ice margin retreat and processes of ice margin retreat and elevation change. The material then explores natural climate variability and anthropogenic forcings, and then examines potential future ice margin response to climate change.

- [Unit 1: Reconstructing Past Ice Margin Positions](#)
- [Unit 2: Processes of Ice Margin Retreat and Elevation Change](#)
- [Unit 3: Exploring Natural Climate Variability and Anthropogenic Forcings](#)
- [Unit 4: Future Ice Margin Response to Climate](#)

Teaching Notes and Tips

This lesson aligns with the standards below:

- [Polar Literacy Principle 2](#)
 - o 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
 - o 2B: Ice shapes the Polar landscape
 - o 2C: Sea ice naturally shrinks and expands with the seasons. However, this natural dynamic cycle is affected by increasing air and ocean water temperatures occurring at the Poles due to climate change
- [Polar Literacy Principle 5A](#): Arctic sea ice is declining at a rapid rate

Assessments

While no tailored assessments are designed for this lesson, consider using an exit ticket. See below for some resources on exit tickets:

- Center for Professional Education for Teachers (n. d.) *Exit Tickets as Formative Assessments*. Available at: <https://cpet.tc.columbia.edu/news-press/exit-tickets-as-formative-assessments> (Accessed: 3 September 2026).
- Center for Teaching Excellence (15 March 2024) *Exit Tickets*. Available at: <https://cteresources.bc.edu/documentation/exit-tickets/> (Accessed: 3 September 2026).

References and Resources



- Center for Professional Education for Teachers (n. d.) *Exit Tickets as Formative Assessments*. <https://cpet.tc.columbia.edu/news-press/exit-tickets-as-formative-assessments> (Accessed: 3 September 2026).
- Center for Teaching Excellence (15 March 2024) *Exit Tickets*. Available at: <https://cteresources.bc.edu/documentation/exit-tickets/> (Accessed: 3 September 2026).
- Polar Pass (2022) Module 1: *Exploring the Glacier Basin System*. Available at: https://serc.carleton.edu/polarpass/teaching_materials/glacier_basin/index.html (Accessed: 3 September 2026).
- Polar Pass (2022) Module 2: Long-term Spatial Transformations of the Glacier Basin System. Available at: https://serc.carleton.edu/polarpass/teaching_materials/glacier_basin_transformations/index.html (Accessed: 3 September 2026).
- Polar Pass (4 February 2022) *Teaching Materials*. https://serc.carleton.edu/polarpass/teaching_materials/index.html (Accessed: 3 September 2026).