



Greenland in Your Classroom:

New college curriculum combines polar field data, 360-degree immersive field experiences & geospatial technologies

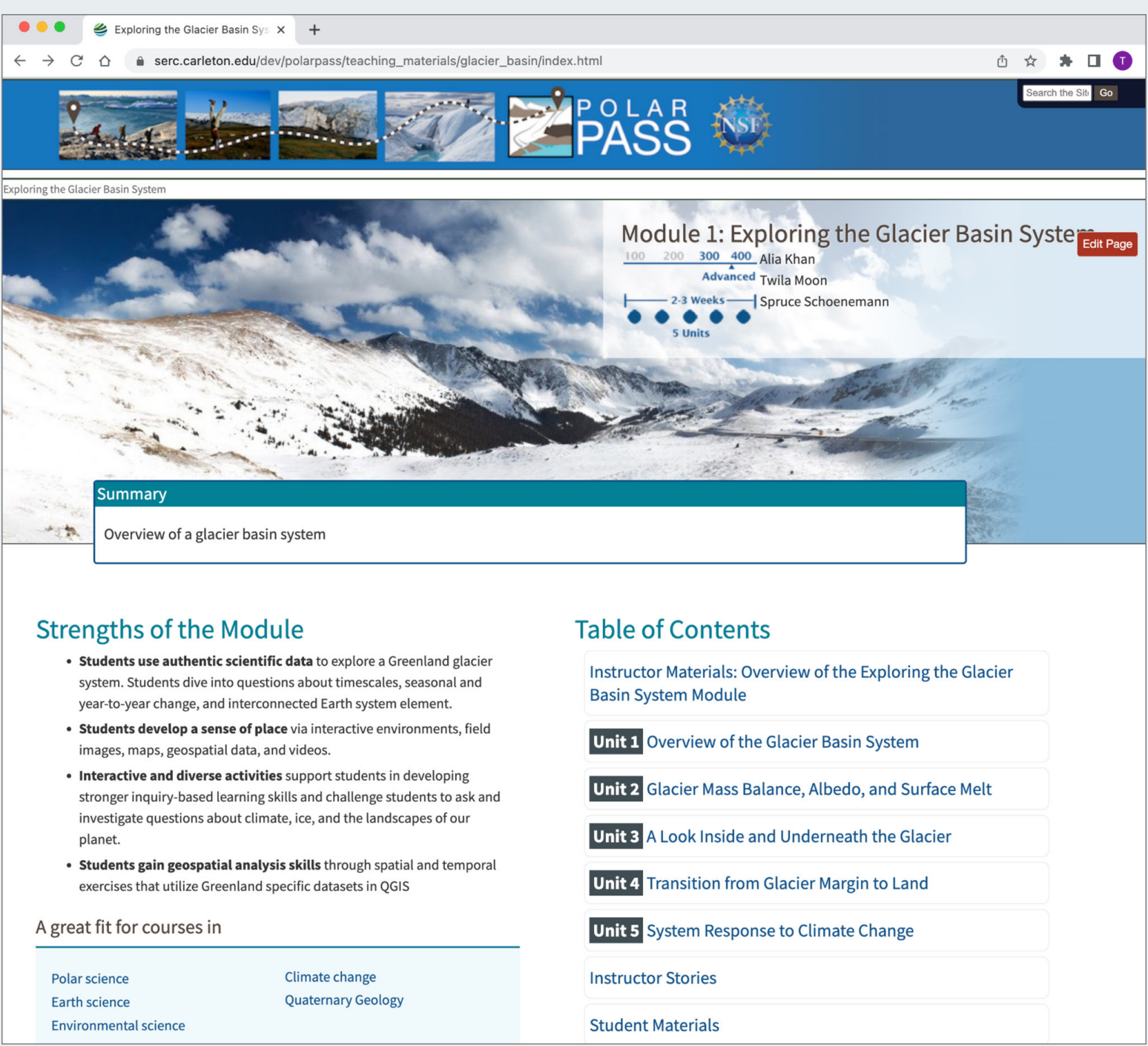
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THE NEED FOR POLAR DATA IN THE CLASSROOM

Earth’s polar environments have undergone rapid change during the 21st century and scientists have generated important new data and made groundbreaking insights. Shrinking glaciers, melting sea ice, thawing permafrost. As rapid change continues at the poles, effects on other areas of the Earth system are likely to grow, and the influence of these changes will be felt on communities, economies, ecosystems, and business and politics. Yet for many undergraduate students, the polar regions feel far away and disconnected from our day to day lives.

WHAT IS POLARPASS?

The NSF-funded Polar Space and Place (PolarPASS) curriculum is designed to bring the polar regions to life in the undergraduate classroom. The curriculum consists of two modules with 4-5 units each and combines real polar field data from Greenland with innovative teaching methods to strengthen students’ knowledge of polar science and build student connections to polar places. The units contain a series of 360-degree interactive environments, field images, maps, geospatial data, and videos to immerse students in the place and dive into questions about timescales, seasonal and year-to-year change, and interconnected Earth system elements. Students gain geospatial analysis skills through inquiry-based spatial and temporal exercises, including Geographic Information Systems (GIS) that use Greenland-specific datasets and support learning about climate, ice, and the landscapes of our planet. The first module supports an exploration of the glacier basin system before diving into long-term spatial transformation of these systems within the second module.



PRIMARY POLARPASS OBJECTIVES

- Objective 1: Advance spatial learning in the geoscience curriculum.
- Objective 2: Increase polar knowledge and interest in undergraduate STEM majors.
- Objective 3: Develop and test innovative teaching tools and methods to increase ‘sense of place’ (a primary place-based education goal) remotely.

360-degree Interactive Environments Bring Students into the Greenland Environment

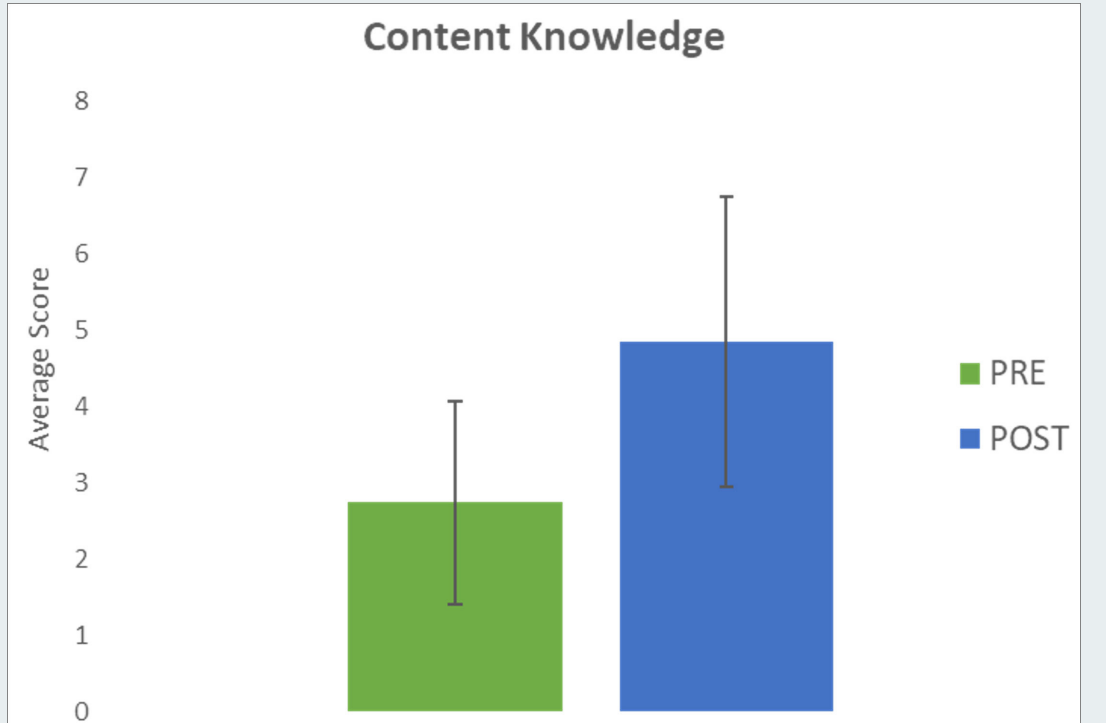
We are working with Polar Field Staff to collect 360° images from segments of the Greenland Watson River Watershed.

Images are captured from different times of the melt season to help students visually and spatially comprehend the seasonal evolution of the ice sheet and downstream hydrology. Modules are created using 3D Vista software and accessed via a URL.



TESTING CLASSROOM TOOLS

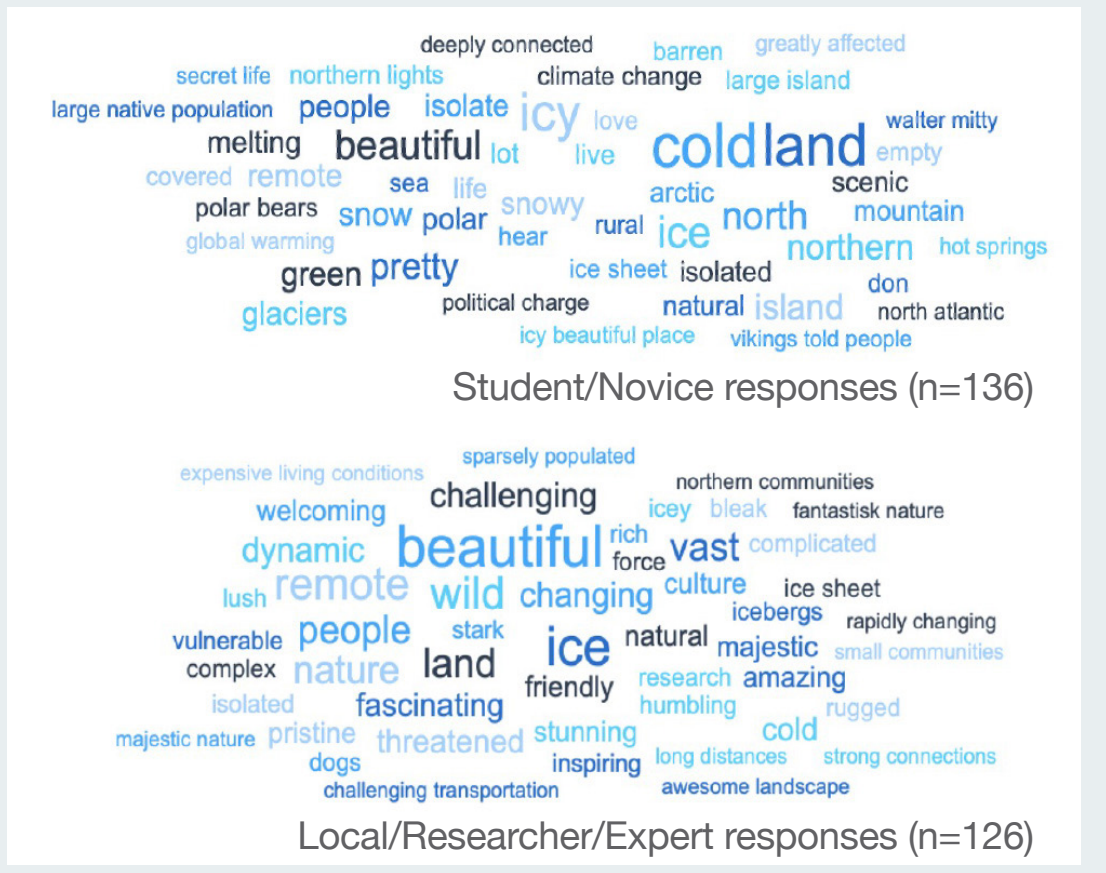
Research on student learning is embedded within the PolarPASS curriculum. The research questions focus on the effect of the 360 Interactive Environments on students’ spatial skills, sense of place, and conceptual understanding of polar systems. The pre-post survey design uses a combination of published research instruments, polar content knowledge assessments and open-ended essay prompts to collect data related to these questions. Embedded assessments provide additional context to student learning as it relates to the specific activities within the curriculum.



Pilot data from the first implementation course indicate gains in polar content knowledge (n=19).

TESTING SENSE OF PLACE

An additional goal of the research is to develop a place meaning instrument for virtual engagement in polar environments, building on existing instruments for place meaning that were designed with other places in mind. To start, a survey solicited language from undergraduate students who have never been to Greenland (“novice”) and also from people who live/have lived in Greenland and/or have spent considerable time doing research in Greenland (“expert”). The place meaning language offered by these two end member survey groups provide the basis for which a new polar place meaning instrument will be designed (see survey prompts - below).

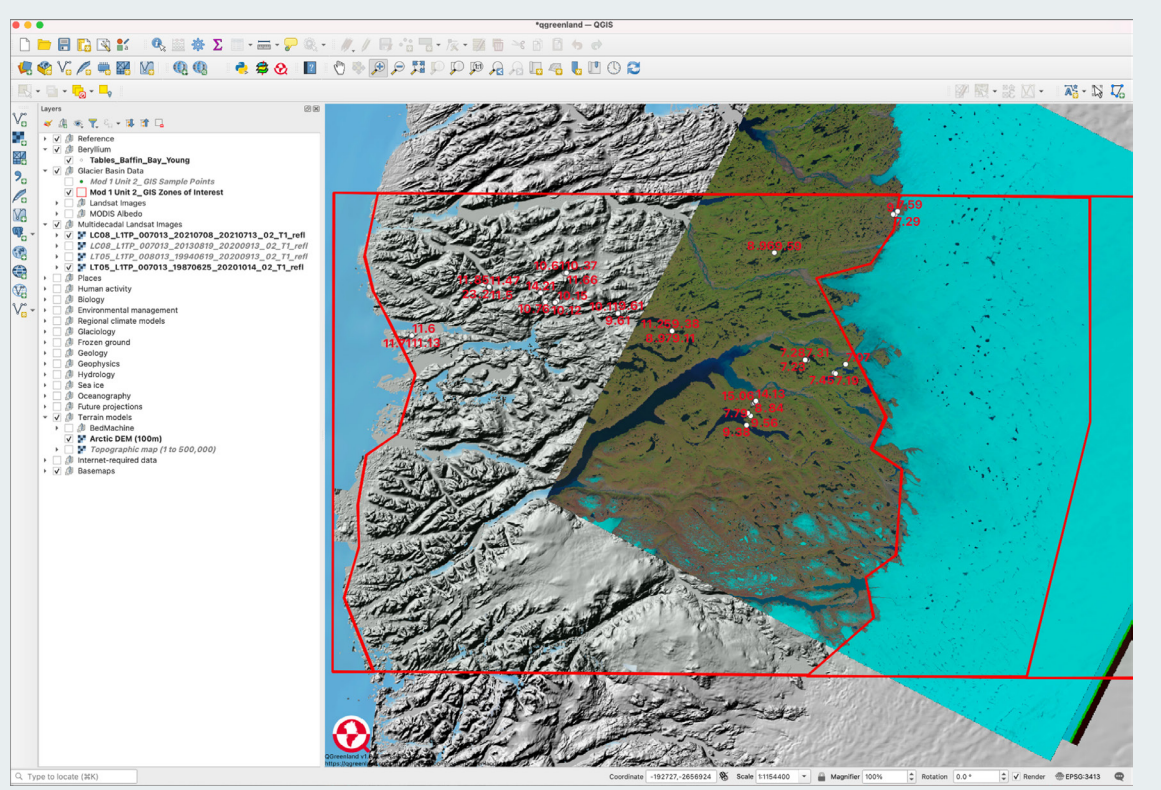


In the survey, both groups were asked two reflective prompts:

1. What words would you use to describe Greenland?
2. In no more than two sentences, how do you personally feel about Greenland?

ACTIVITIES INCORPORATE GIS VIA QGREENLAND

PolarPASS students benefit from getting to know the polar environment and by gaining data and analysis skills that can serve them in a variety of future careers. Geographic Information Systems (GIS) are a valuable tool for many geospatial applications. PolarPASS curriculum is designed to provide introductory GIS skills to students, and includes support materials so that even instructors new to GIS can teach with these tools. PolarPASS uses the free QGIS software platform and a pre-prepared data package called QGreenland, as well as authentic additional polar datasets. Students explore place while also learning valuable GIS skills.



Bring PolarPASS to Your Classroom!

Bringing PolarPASS curriculum into your classroom can develop new spatial and temporal skills, while transporting your students to polar regions. Do you have a class that you teach multiple times a year? We are seeking educators who can help us to study the effects of utilizing 360-degree Interactive Environments through comparison of class learning outcomes. We are also excited to work with educators to bring final modules into their classrooms.

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