POLAR TREC
Learning Resources

Details

Completion Time: More than a week

Permission: Download, Share, and Remix

Chilling Adventures

Materials

- Access tothe Internet for browsing websites

Overview

Exploration of the Antarctic continent did not occur until the late 1800's, and the South Pole was first reached on December 14, 1911. Courage, planning, and technology have been the main components of Antarctic exploration from the earliest days. This classroom activity is designed to highlight the historical elements of the past 100 years of exploration in Antarctica and provide students with insight into the types of technology that made it possible to explore and survive in the coldest, driest place on Earth. This activity is organized to allow a flexible approach in its use in the classroom. It includes several Common Core elements related to both math and language arts.

Objectives

Students will investigate a number of online resources in order to track the changes in methods and technology of Antarctic exploration in the past 100 years.

Lesson Preparation

Start by introducing students to the location and characteristics of the Antarctic continent. It's much more than just penguins and the South Pole, it's a continent that is larger than the continental U.S. (see attached Figure 1) with active volcanoes, a transcontinental mountain range, and a handful of science research stations operated by many different countries. If students need a good, quick comparison of the features of the Arctic versus the Antarctic, Woods Hole Oceanographic Institute's Polar Discovery Site is a good place to start (http://polardiscovery.whoi.edu/).

Additional background can be developed by using the websites and videos in the resources listing at the end of the activity. Each of the listed resources looks at a different age of exploration and shows the use and development of different technologies. Some technologies

worked well, some did not. Have your students explore the outcomes and compare results with one another.

Procedure

Compare and Contrast – English Language Arts and Science

One of the basic elements of Common Core is to have students use non-fiction works to compare and contrast different elements within them. The history of Antarctic exploration lends itself to this idea very well. Each explorer used a different approach. Some were interested in science, others more in the challenge that the continent presented. Some explorers received financial backing from their governments, others had to raise funds through public sources to support their work.

Here are some suggestions to explore these options. Your school library may also have books directed at younger readers that have stories about these adventurers. Don't forget about Earnest Shackleton and his epic trip to get his crew rescued after his ship was crushed in the ice. I haven't included any specific links for his expedition, but they are easy to find.

1. Using the Youtube video of North and South Pole expeditions or written accounts, compare the methods and outcomes of Amundsen and Scott on their 1911-1912 expeditions. Encourage students to be imaginative in their methods of tracking the differences. They can make tables, number lines, Venn diagrams, or use any of the many methods of tracking comparisons.

Once they have completed their comparisons, students can write a short essay of their findings, using their raw data as the input. In the case of Scott and Amundsen, the outcomes were radically different. Scott and his team did not make it back to their base, but died in storms on the return from the pole. Students may want to use their findings to analyze why this happened or use their data to identify the factors contributing to the success of Amundsen and the sad outcome for Scott. Remind students that this is an exercise in factual reporting and the outcomes associated with it.

2. Alternative Methods: Use different combinations of either the videos, blogs, or websites to build a comparison of modern methods – the use of aircraft versus the WISSARD/South Pole Traverse which uses tractors hauling sleds overland. Students might also compare methods from the 1960's to those from the 2000's. The big comparisons here would be time, cost, and perhaps reliability. For instance, why might overland hauling be more efficient than air transport or how has the reliability of the methods changed during the past 50 years?

Building Timelines from Textual Information – Math and Science

Having students analyze nonfiction texts to understand changes over time is another valuable skill that corresponds to the Common Core objectives. This is an area that is often challenging because students don't see the time relations as they read or work with documents. Having them read, note specific events and dates or relative times, and then plot

them is a good exercise that helps them develop better understanding of sequences and a time framework. They might also develop a more realistic view of the time it takes to accomplish the outcomes they are reading about. It may only take a relatively short amount of time to make the trip from the edge of the Antarctic Continent to the South Pole, but the planning and organization that takes place prior to the actual travel is many times greater. All of these elements of time are valuable to building a realistic understanding of real-world events.

1. Most of the resources listed in this activity include elements of time. Have students read the documents or view the videos and identify major milestones or events that have dates associated with them. After they build their data set, they should analyze it to determine the time span it covers and then scale out a timeline to match the data. Once the scale of the timeline is set, they should attach events to the proper place on the timeline and add sufficient explanation to describe the events and set them in the proper perspective to one-another. The addition of pictures, or development of an interesting or novel way to show the time change should be encouraged.

2. Extension of #1 – give students different versions or sources of data and have them compare their results to see if the sources agree on which events were significant and if the time frame is the same. This provides students a chance to review the validity of data or to question how the data sources are developed and reported.

A Note to Teachers
This is a set of loosely defined activities based on the idea that learning objectives can be met with some really different and interesting sources of information. I hear teachers in my school comment about the difficulty they have in meeting the Common Core objectives. I teach Earth Science and use sources such as these regularly and feel that they are well aligned with the Common Core and provide our students real-word knowledge. The only difference is that this world is colder and sometimes darker than our students are accustomed to.

Let your students see and hear about other parts of the world. Most of my students are sadly lacking in knowledge of geography and using opportunities like this gives them a little extra coverage on topics no longer in the state standards.

Extension
n/a

Resources
Historic Exploration of Antarctica
A Youtube video documenting the first expeditions to both the North and South poles. Antarctic coverage begins at approximately the 50% point:
http://www.youtube.com/watch?v=qyrOKsiRolQ

Learning Resources

Earnest Shackelton and the Endurance
http://www.pbs.org/wgbh/nova/shackleton/
http://www.south-pole.com/p0000097.htm

Admiral Byrd South Pole Expeditions
A website providing short, concise overviews of many aspects of the exploration of Antarctica. This link takes you directly to a page on the 1928 expedition of Byrd during which he flew over the South Pole:
http://www.south-pole.com/p0000107.htm

A Youtube video newsreel with both still and video images from Byrds historic 1928 expedition:
http://www.youtube.com/watch?v=A-R9PysOaxI (the South Pole flight segment begins at about 30 minutes into the video) This has both audio accompaniment and silent sections.

Navy Newsreel from 1961.
A Youtube video taken from a 1961 Navy newsreel showing the role of the Navy in the development of what would become the National Science Foundation's McMurdo Research Station on Ross Island. It provides a good look at what was then a modern, mechanized approach to exploring the continent. This makes a good comparison to both the earlier technology used by Amundsen, Scott, Shackleton, and Byrd as well as to the later technology used today in Antarctica:

http://www.youtube.com/watch?v=K9PJ6eJB9jI

"Modern" Antarctica
The South Pole Overland Traverse and Air Support Operations

Antarctic Sun Articles on Traverse Route – Several short articles describing the development of the South Pole "Road" from McMurdo Station to the Scott-Amundsen South Pole Station. This route covers 1000 miles over the Ross Ice Sheet, across the Transantarctic Mountains, and onto the high glacial plateau where the geographic pole is located.

2009: http://antarcticsun.usap.gov/features/contentHandler.cfm?id=1361.
2012-2013: http://antarcticsun.usap.gov/features/contenthandler.cfm?id=2814

From the WISSARD Project website, a blog entry and short video that describes the organization and magnitude of the WISSARD Project's traverse to get equipment into place for the project's attempt to drill into a subglacial lake environment. The traverse covered approximately 600 miles of the Ross Ice Sheet: http://scienceroadshow.wordpress.com/2012/12/31/the-wissard-traverse-and-theyre-off/ This second link is a video showing the traverse take off across the ice. It's impressive for the size of the operation and the number of sleds and

amount of equipment. Watch for the surprise (and humorous) ending: https://www.facebook.com/photo.php?v=4383049860336&set=vb.322629720135&type=2&theater

The Annual Supply Ship
The majority of supplies for McMurdo come in once a year on a container ship. Think how different this would have been for Scott and Shackelton. If you look closely in the background, on the point of land behind the ship, you see Scott's hut, still standing after 100 years: http://www.youtube.com/watch?v=_GIQ9vFSFk4 and http://antarcticsun.usap.gov/features/contenthandler.cfm?id=2813

Winfly – how technology opens up Antarctica each year

These short articles explain the importance of the first flight into McMurdo at the start of the Austral summer:

http://antarcticsun.usap.gov/features/contenthandler.cfm?id=2887
http://antarcticsun.usap.gov/features/contenthandler.cfm?id=2894

Another Winfly story by PolarTREC Teacher Michael League. He explains what Winfly is and also how the seasons affect the hours of daylight in Antarctica:

http://www.polartrec.com/expeditions/adaptations-of-marine-worms-in-antarctica/journals/2011-08-26

These links describe a first – the first ever winter fly-in to McMurdo Station by a C-17 to perform a medical evacuation. The plane had to land on the ice runway in the dark with no runway lights. Pilots used night-vision goggles to see the approaching land and land their 400,000 pound aircraft. Compare this to the options available to Amundsen and Scott in 1911, or even Byrd in the 1920's. All of the links have the same basic information (except the Boeing link), but they could be used together to allow a comparison of sources:

http://content.usatoday.com/communities/sciencefair/post/2011/07/daring-flight-evacuates-ill-mcmurdo-worker-in-antarctica/1#.Uq5IZ_RDuSo

http://antarcticsun.usap.gov/aroundTheContinent/contentHandler.cfm?id=2093 (scroll down part way)

http://www.boeing.com/Features/2012/05/bds_c17_antarctica_05_07_12.html Boeing makes the C17 aircraft that was used in the medical evacuation. Some promotion from the company, but good background.

http://www.amc.af.mil/news/story.asp?id=123347286 a military news article.

Other Sites
This site is a good general source to get good general information about Antarctica and also to provide a comparison of the characteristics of the North and South Polar regions.
http://polardiscovery.whoi.edu/poles/index.html

Have you ever wondered what sort of people want to work in the cold and dark of Antarctica? Here's another good link that lets students get a new perspective on where education and a life-long interest for adventure can take them. Read through a few of the people profiles for some ideas.
http://antarcticsun.usap.gov//features/index.cfm?cat=People%20Profiles

Credits
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Learning Resources

National Science Education Standards (NSES)

Content Standards, Grades 5-8

Content Standard E: Science and Technology
a. Abilities of technological design
b. Understandings about science and technology

Content Standard F: Science In Personal and Social Perspectives
e. Science and technology in society

Content Standard G: History and Nature of Science
c. History of science

Content Standards, Grades 9-12

Content Standard E: Science and Technology
a. Abilities of technological design
b. Understandings about science and technology

Content Standard F: Science In Personal and Social Perspectives
f. Science and technology in local, national, and global challenges

Content Standard G: History and Nature of Science
a. Science as a human endeavor
c. Historical perspectives

Other Standards
n/a

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Figure 1 – Image from NASA