POLAR TREC

TEACHERS AND RESEARCHERS EXPLORING AND COLLABORATING

Investigating Penguin Populations of Antarctica

Overview

This investigation allows students to explore the geography of Antarctica and become an active member of the citizen science project, PenguinWatch.

Objectives

Students will:

- Examine maps of the World, South Polar Regions and Antarctica and interpret geographic location influence on climates
- Develop map skills by learning how to use longitude and latitude coordinates to locate 6 research stations in Antarctica
- Evaluate interactions between penguins and their ecosystems
- Become citizen scientist through engagement in the Penguin Watch project
- Practice skills of the scientific method
- Formulate a hypothesis based on student research of penguin life cycles and/or Antarctica's climate
- Gather data through the analysis of photographs shared by the Penguin Watch science team
- Analyze collected data to construct a conclusion that supports or refutes their hypothesis
- Communicate the results of their scientific investigation to their peers summarizing the results of their investigation and creating a visual representation of the key concepts about the influence of Antarctica's geography on penguin populations

Procedure

Day 1

- Distribute Antarctica pre-assessment worksheet.

Details

Lesson
Antarctic
More than a week
Download, Share, and Remix
High school and Up

Materials

Laptops
Color pencils/Markers
Paint
Tape/Glue
Poster Board
Day 1 - Antarctica Pre-Assessment worksheet (Per student), Globe and Flashlight (demonstration)
Day 2 - Penguin Species Packet (per student), World map (per student)
Day 3 - Map of the South Polar Region (1 tabletop size), Excel spreadsheet of Antarctica Research Stations precipitation and temperature, document of longitude and latitude of Antarctica Research Stations, Penguin Watch

- Students read the Antarctica encyclopedia on National Geographic taking notes on climate attributes.
- Group share: Each students share with class one interesting thing they learned from encyclopedia entry.
- Teacher lecture on the seasons of Antarctica with props.

Hypothesis/Conclusion worksheet (per student)
Day 4 - Penguin Watch Data collection worksheet (per student), Antarctica Post-Assessment worksheet (per student)

Day 2

- Introduce students to Penguin Watch online program.
- Explain the research program and how students will become involved in this project.
- Distribute packet on the five species students will be collecting data on during their investigation and a map of the world.
- Students complete penguin packet through research using the internet and label the world map on where the five species are located.

Day 3

- Mapping Antarctica Temperature
- Hand out Map of Antarctica
- As a class label remaining missing Latitude and Longitude lines
- Display coordinates of 6 research stations work as a class to label two stations positions on Antarctica. Have students place the remaining four research stations.
- Provide students Excel sheet of year round temperatures at each location.
- Assign each student a month and have them color the research center according to its temperature and the legend.
- Hand out student PenguinWatch assignment sheet and data recording sheet
- Brainstorm as a class variable that can be investigated through this data collection. Have students construct their own hypothesis and explain data collection process.

Days 4 & 5

- Students collect data from analyzing PenguinWatch photographs; Recording data to investigate their own hypothesis.

Day 6

- Students analyze the data they have collected and evaluate if they can support or not support their hypothesis. Students write a conclusion paragraph using this evidence. Conduct a class discussion on students' investigations.

Day 7, 8, 9

- Assign each student a role in creating class bulletin board to communicate their research to their peers.

Potential Final Products:

- Life size: 5 Penguin Species, Leopard seal, Skua birds
- Life cycle chart

- Tabletop Map of South Polar Region
- 6 Research station summaries: Picture and graphs of annual precipitation and temperatures (add locations to Tabletop graph)

Extension

Students may investigate current laws and acts that protect the continent of Antarctica and its species and their impacts.

Resources

- Penguin Watch website: https://www.penguinwatch.org
- Background information
- Analysis of Photographs
- Discovering Antarctica website: http://discoveringantarctica.org.uk/oceans-atmosphere-landscape/atmosphe...
- Monthly Weather Spreadsheet
- Cool Antarctica: http://www.coolantarctica.com/Community/antarctic_bases.php
- Antarctica research station coordinates
- Super coloring: http://www.supercoloring.com/
- Pictures of Penguin Species
- Super teacher Worksheets: https://www.superteacherworksheets.com/maps.html
- Modified world map for pre/post assessment
- National Geographic: http://www.nationalgeographic.org/education
  Map of the World Map of Antarctica Map of the South Polar Region Antarctica encyclopedia entry

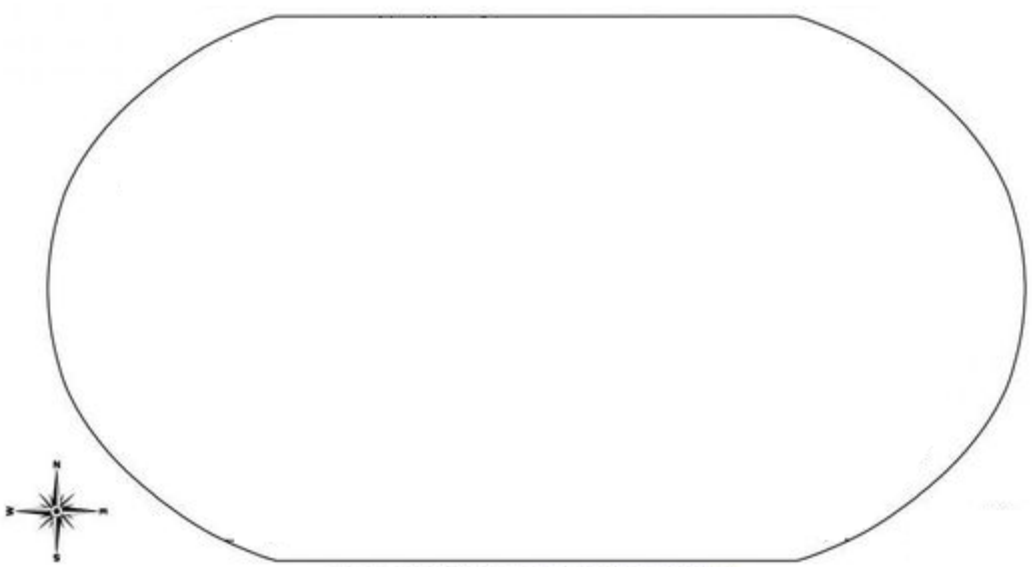
Assessment

- Antarctica Pre-assessment worksheet
- Species Packet
- Antarctica map with labeled research stations
- Student bulletin board contribution
- Hypothesis, data collection sheets, and conclusion statements
- Antarctica Post-assessment worksheet

Author/Credits

Bridget Ward

Sketch a map of the World and Label the Seven Continents



Write two facts you know about Antarctica

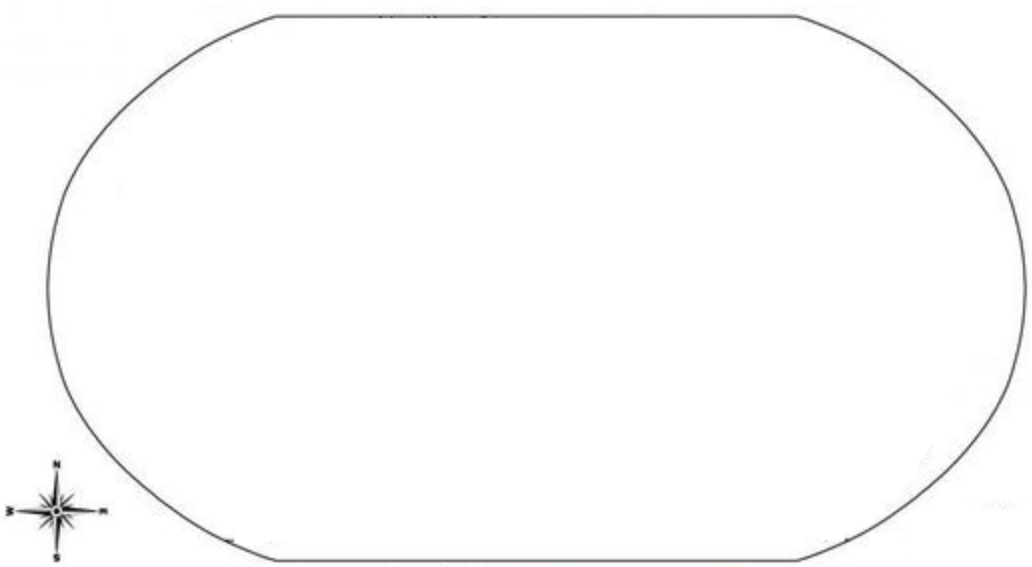
Sketch an outline of the Antarctica Continent

Write two questions you have about Antarctica

Grab a laptop and read the encyclopedia entry on Antarctica on the website http://www.nationalgeographic.org/encyclopedia/antarctica/

Annotate on the back of this worksheet any information that you believe influences the climate of Antarctica

Sketch a map of the World and Label the Seven Continents

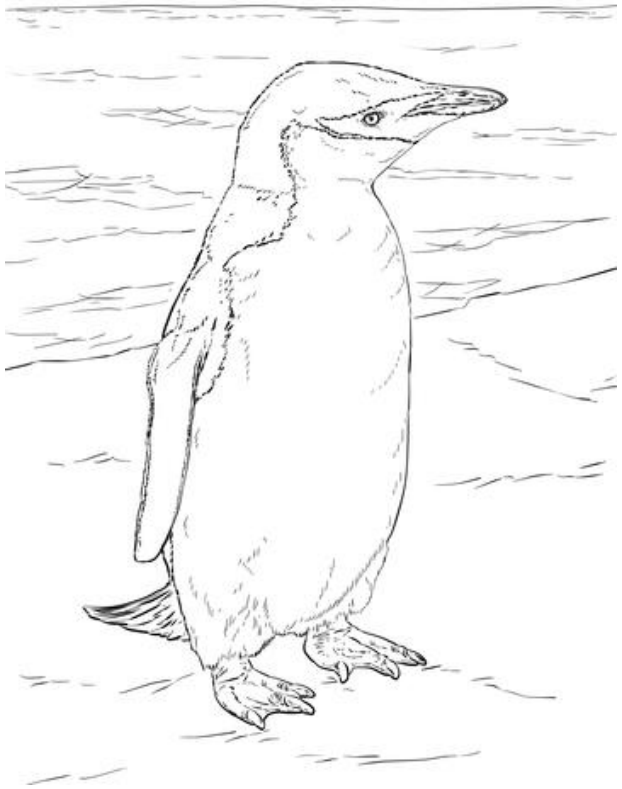


Write two facts you learned about Antarctica

Sketch an outline of the Antarctica Continent

Write two questions you still have about Antarctica

On the back write one thing you liked about this project and one thing you did not like about this project ☺



Common Name: Chinstrap Penguin

Scientific Name: _____

Height: _____

Weight: _____

Prey: _____

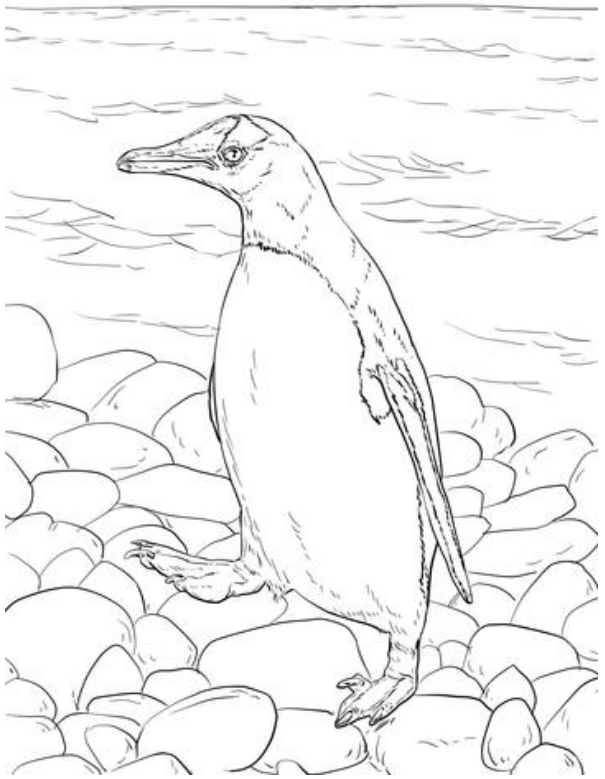
Predator: _____

Conservation Status: _____

Interesting Fact: _____

_____

World Distribution



Common Name: Gentoo Penguin

Scientific Name: _____

Height: _____

Weight: _____

Prey: _____

Predator: _____

Conservation Status: _____

Interesting Fact: _____

_____

World Distribution

Common Name: Rockhopper Penguin

Scientific Name: _____

Height: _____

Weight: _____

Prey: _____

Predator: _____

Conservation Status: _____

Interesting Fact: _____

_____

World Distribution

Common Name: Adélie Penguin

Scientific Name: _____

Height: _____

Weight: _____

Prey: _____

Predator: _____

Conservation Status: _____

Interesting Fact: _____

_____

World Distribution

Common Name: King Penguin

Scientific Name: _____

Height: _____

Weight: _____

Prey: _____

Predator: _____

Conservation Status: _____

Interesting Fact: _____

_____

_____

World Distribution

Name: _____

Penguin Watch Assignment

Penguin Watch is a citizen science project being conducted by Dr. Tom Hart and his staff. They are monitoring the effects of climate change on penguin populations. In this assignment you will be joining Dr. Tom Hart's actual research team. You will analyze pictures and submit data directly to the research team, becoming a citizen scientist.

Your assignment is to collect data from 58 pictures, recording it on your worksheet. Information to record includes Date, time, temperature, Number of individuals: Adult, Chicks, Eggs, and Other. If there are other species in the picture to the best of your ability identify that species, ie. Human, bird. If the weather is too bad in the picture just skip that picture. If there are no penguins in the picture DO NOT skip it, this data is important as well.

Create a hypothesis about weather conditions and number of penguins present, ie. If it is snowing then there will be no penguins present. Think about the type of data your collecting, date (time of year), time, and temperature.

At the end of your data collection use your collected data to support/ not support your hypothesis.

Hypothesis: _____

_____

_____

Conclusion: _____

_____

_____

_____

_____

_____

_____

_____

_____

What is one thing you found interesting about this scientific investigation?

_____

_____

_____

_____

What is one thing you found difficult about the type of data collection?

_____

_____

_____

_____

What is one benefit of this type of data collection?

_____

_____

_____

_____

Do you think anyone should be allowed to be a citizen scientist? Why or Why not?

_____

_____

_____

_____

Name:_____

			Number of Individuals		
Date	Time	Temperature	Mammals	Penguins	Other

ANTARCTICA

Station name	Latitude/longitude
Amundsen-Scott South Pole (USA)	90°S
Byrd (USA) note – station closed in 2005	80°01’S,119°32’W
Davis (Australia)	68°35’S,77°58’E
McMurdo (USA)	77°51’S,166°40’E
Rothera (UK)	67°34’S,68°08’W
Signy (UK)	60°43’S,45°36’W
Vostok (Russia)	78°27’S,106°51’E

Altitude above mean sea level

2835m

1515m

18m

24m

32m

6m

3490m

MONTHLY AVERAGES FOR SELECTED ANTARCTIC STATIONS:
Amundsen-Scott, Byrd, Davis, Mawson, McMurdo, Rothera, Signy, Vostok

Amundsen-Scott (South Pole)
(32 years of data, source: www.antarcticconnection.com)

Month	Mean Temp. (degC)	Precipitation (mm)	Mean Windspeed (mph)
Jan	-26	0	1.1
Feb	-38	0	0.9
Mar	-52	0	1.4
Apr	-56	0	4.6
May	-56	2	5.4
Jun	-57	0	4.6
Jul	-58	0	5
Aug	-58	0	5
Sep	-58	2	5.7
Oct	-50	0	1.7
Nov	-37	0	1.3
Dec	-26	0	1.1

Byrd
(16 years of data, source: v

Month	Mean Temp. (degC)
Jan	-14
Feb	-18
Mar	-26
Apr	-28
May	-31
Jun	-33
Jul	-34
Aug	-35
Sep	-35
Oct	-29
Nov	-20
Dec	-15

McMurdo
(26 years of data, source: www.antarcticconnection.com)

Month	Mean Temp. (degC)	Precipitation (mm)	Mean Windspeed (mph)
Jan	-2	15	13
Feb	-8	25	14
Mar	-17	12	17
Apr	-20	15	16
May	-22	20	16
Jun	-22	22	16
Jul	-25	15	16
Aug	-26	12	16
Sep	-23	10	16
Oct	-18	17	14
Nov	-9	10	12
Dec	-3	12	12

Rothera
(33 years of data, source: v

Month	Mean Temp. (degC)
Jan	1.4
Feb	0.7
Mar	-1.2
Apr	-3.1
May	-5.1
Jun	-8.5
Jul	-10.9
Aug	-10.5
Sep	-8.5
Oct	-5.8
Nov	-2.4
Dec	0.3

ww.antarcticconnection.com)

Precipitation (mm)	Mean Windspeed (mph)
5	16
9	18
9	20
14	23
11	24
13	23
11	21
10	24
11	23
8	23
5	20
7	16

Davis

(52 years of data, sources: www.nerc-bas.ac.uk and Austra

Month	Mean Temp. (degC)	Precipitation (mm)	Mean Windspe (mph)
Jan	0.8	1.7	14
Feb	-2.4	3.6	13.8
Mar	-8	9.3	12.5
Apr	-13	9.9	11.2
May	-15.5	10.2	10.7
Jun	-15.5	8.5	12
Jul	-17.3	7.2	12.2
Aug	-17.3	6.7	12
Sep	-16.4	4.6	11
Oct	-12	4.7	12.5
Nov	-4.8	2.5	16.1
Dec	0.1	1.9	15.4

ww.nerc-bas.ac.uk)

Precipitation (mm)	Mean Windspeed (mph)
33	11.2
46	12
70	7.4
66	13.8
100	13.8
64	12.8
43	13.6
50	15.7
81	15.9
76	15.4
48	14.6
31	12

Signy

(Source: BAS Antarctica Schools Pack)

Month	Mean Temp. (degC)	Precipitation (mm)	Windspeed (mph)
Jan	1.1	103	7.8
Feb	1.2	115	8.7
Mar	0.2	135	9.5
Apr	-2.4	147	8.7
May	-5.6	109	8.4
Jun	-8.7	89	8.1
Jul	-10.2	71	8.2
Aug	-8.3	72	9
Sep	-5.2	87	10
Oct	-2.8	98	9.9
Nov	-1.1	78	9.5
Dec	0	94	7.5