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FOR STEVE, HIS ADVENTURE ISN'T ALL BLACK AND WHITE.

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PENGUINS

CELEBRATE EARTH DAY – IN THEATRES APRIL 17

EDUCATOR'S GUIDE

GRADES 2-6

Created in Partnership with Disney's Animals, Science and Environment

Disneynature

PENGUINS

IN THEATERS EARTH DAY 2019

Educator's Guide | Grades 2-6

Disneynature's all-new feature film **Penguins** is a coming-of-age story about an Adélie penguin named Steve who joins millions of fellow males in the icy Antarctic spring on a quest to build a suitable nest, find a life partner and start a family. None of it comes easily for him, especially considering he's targeted by everything from killer whales to leopard seals, who unapologetically threaten his happily ever after. From the filmmaking team behind **Bears** and **Chimpanzee**, Disneynature's **Penguins** opens in theaters nationwide in time for Earth Day 2019.

Further Explore the World of Penguins

The Disneynature **Penguins** Educator's Guide includes multiple standards-aligned lessons and activities targeted to grades 2 through 6. The guide introduces students to a variety of topics, including:

- *Animal Behavior and Natural History*
- *Habitat and Ecosystems*
- *Biodiversity*
- *Earth's Systems*
- *Culture and the Arts*
- *Making a Positive Difference for Wildlife Worldwide*

EDUCATOR'S GUIDE OBJECTIVES

✓ *Increase students' knowledge of the amazing animals and habitats of Antarctica through interactive, interdisciplinary and inquiry-based lessons.*

✓ *Enhance students' viewing of the Disneynature film **Penguins** and inspire an appreciation for the wildlife and wild places featured in the film.*

✓ *Promote life-long conservation values and STEAM-based skills through outdoor natural exploration and discovery.*

✓ *Empower you and your students to create positive changes for wildlife in your school, community and world.*

Disney.com/nature

Content provided by education experts at Disney's Animals, Science and Environment

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Allyson Atkins
Education Line of Business Manager
Disney's Animals, Science and Environment

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Educational Standards

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SCIENCE	From Molecules to Organisms: Structure and Process	3-LS1; LS1.B		4-LS1-1; LS1.A		4-LS1-1; LS1.A; 4-LS1-2; LS1.D; MS-LS1-8	
	Ecosystems: Interactions, Energy and Dynamics	3-LS2-1; LS2.D					
	Engineering Design		K-2-ETS1-2; ETS1.B		3-5-ETS1-2; ETS1.B; 3-5-ETS1-3; ETS1.C; MS-ETS1-2; MS-ETS1-4		
	Biological Evolution: Unity and Diversity	3-LS4-3; LS4.D					
ENGLISH LANGUAGE ARTS	ELA - SL Comprehension and Collaboration	2-SL2; 2- SL3; 3-SL1a.b		4-SL1a.b.c.d; 5-SL1a.b.c.d; 6-SL1a.b.c.d			
	ELA - SL Presentation of Knowledge and Ideas	2-SL4; 2- SL5; 2- SL6; 3-SL4; 3-SL5; 3-SL6		4-SL4; 4-LS5; 4-SL6; 5-SL4; 5-SL5; 5-SL6; 6-SL4; 6-SL5; 6-SL6			
	ELA - W Text Types and Purposes	2-W2					
MATH	Math - Measurement and Data						4.MD1,3; 5.MD3
	Math - Geometry						5.G1; 3; 6.G1; 4
ART	Arts - Visual Arts Creating: Anchor Standard 1	2-CR1.2.2a; 3-CR1.2.3a	2-CR1.2.2a; 3-CR1.2.3a				
	Arts - Visual Arts Creating: Anchor Standard 2	2-CR2.3.2a; 3-CR2.3.3a	2-CR2.3.2a; 3-CR2.3.3a	4-CR2.1.4a; 5-CR2.1.5a; 6-CR2.1.6a	4-CR2.1.4a; 5-CR2.1.5a; 6-CR2.1.6a		
	Arts - Visual Arts Creating: Anchor Standard 9	2-RE9.1.2a	2-RE9.1.2a				

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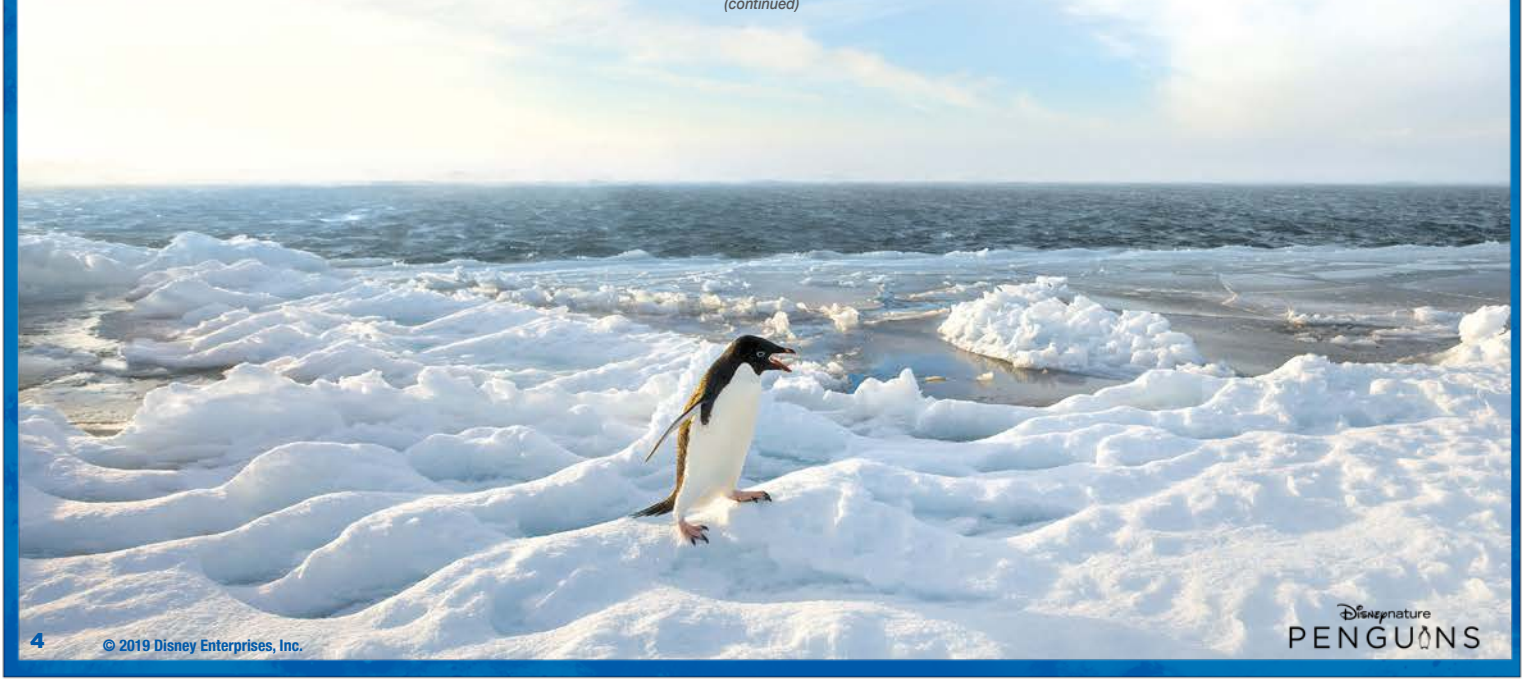

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	Standards Alignment Chart	WEATHER & CLIMATE OF ANTARCTICA Grades 4-6 • p. 21	DRAW ANIMALS TO SCALE Grades 4-6 • p. 24	ANTARCTICA SIZE & MAPS Grades 4-6 • p. 26	FROM HERE TO ANTARCTICA Grades 2-3 • p. 30	LOOKING THROUGH THE SPYGLASS Grades 4-6 • p. 34	ANTARCTICA EXPLORER SCRAPBOOKS Grades 4-6 • p. 37
SCIENCE	From Molecules to Organisms: Structure and Process		4-LS1-1; MS-LS1-5				
	Earth's Systems	2-ESS2-1; 3-ESS2-1; 3-ESS2-1; ESS2.D; 4-ESS2-1; MS-ESS2-5; ESS2.D			3-ESS1-1; 3-ESS2-2; ESS2.D		
	Earth's Place in the Universe	2-ESS1-1					
	Engineering Design	K-2-ETS1-1; 3-5-ETS1-3; MS-ETS1-3					
ENGLISH LANGUAGE ARTS	ELA - RI Key Ideas and Details	2-RI1; 2-RI3; 3-RI1; 3-RI3; 4-RI1; 4-RI3; 5-RI2; 5-RI3; 6-RI1	4-RI3; 5-RI3				4-RI1; 4-RI2; 4-RI3; 5-RI2; 5-RI3; 6-RI2; 6-RI3
	ELA - RI Craft and Structure	2-RI4; 3-RI4; 4-RI4; 5-RI4; 6-RI4	4-RI5; 5-RI5				4-RI4; 5-RI4; 5-RI6; 6-RI4
	ELA - RI Integration of Knowledge and Ideas	2-RI7; 3-RI7; 4-RI7; 5-RI7; 6-RI7	4-RI7; 6-RI7				4-RI7; 4-RI9; 5-RI7; 5-RI9; 6-RI7; 6-RI9
	ELA - SL Comprehension and Collaboration	2-SL1a.b.c; 2-SL3; 3-SL1a.b.c.d; 3-SL3; 4-SL1a.b.c.d; 4-SL3; 5-SL1a.b.c.d; 5-SL3; 6-SL1a.b.c.d; 6-SL2	4-SL1a.b.c.d; 4-SL3; 5-SL1a.b.c.d; 5-SL3; 6-SL1a.b.c.d; 6-SL2		2-SL1a.b.c; 2-SL2; 2-SL3; 3-SL1a.b.c.d; 3-SL2; 3-SL3	2-SL1a.b.c; 2-SL2; 2-SL3; 3-SL1a.b.c.d; 3-SL2; 3-SL3	4-SL1a.b.c.d; 5-SL1a.b.c.d; 6-SL1.a.b.c.d
	ELA - SL Presentation of Knowledge and Ideas	2-SL6; 3-SL6; 6-SL4			2-SL5; 2-SL6; 3-SL5; 3-SL6	2-SL5; 2-SL6; 3-SL5; 3-SL6	4-SL4; 5-SL4; 6-SL4
	ELA - W Text Types and Purposes					2-W2; 2-W2	4-W2a.b.c.d.e; 5-W2a.b.c.d.e; 6-W2a.b.c.d.e.f
	ELA - W Production and Distribution of Writing						4-W4; 4-W5; 4-W6; 5-W4; 5-W5; 5-W6; 6-W4; 6-W5; 6-W6
	ELA - W Research to Build and Present Knowledge					2-W8; 3-W8	4-W7; 4-W8; 4-W9; 5-W7; 5-W8; 5-W9; 6-W7; 6-W8; 6-W9
MATH	Math - Measurement and Data		4.MD3	4.MD1			
	Math - Geometry		4.G1; 5.G1; 6.G4	6.G1; 4			
ART	Arts - Visual Arts Creating: Anchor Standard 1				2-CR1.2.2a; 3-CR1.2.3a	2-CR1.2.2a; 3-CR1.2.3a	
	Arts - Visual Arts Creating: Anchor Standard 2		4-CR2.1.4a; CR2.3.4a; 5-CR2.1.5a; 6-CR2.1.6a			2-CR2.1.2a; 3-CR2.1.3a	
	Arts - Visual Arts Creating: Anchor Standard 9		6-CR3.1.6a			2-CR3.1.2a; 3-CR3.1.3a	
	Arts - Visual Arts Connecting: Anchor Standard 10				2-CN10.1.2a; 3-CN10.1.3a	2-CN10.1.2a; 3-CN10.1.3a	
SOCIAL STUDIES	Social Studies - Time, Continuity and Change						Middle Grades- The study of the past provides a representation of the history of communities, nations, and the world. Concepts such as chronology, causality, change, conflict, complexity, multiple perspectives, primary and secondary sources and cause and effect. That learning about the past requires the interpretation of sources, and that using varied sources provides the potential for a more balanced interpretive record of the past. The contributions of key persons, groups and events from the past and their influence on the present. Presenting findings in oral, written, visual or electronic formats.
	Social Studies- People, Places and Environments			Middle Grades - Concepts such as: location, region, place and migration, as well as human and physical systems. Middle Grades - The use of a variety of maps, globes, graphic representations, and geospatial technologies to help investigate the relationship among people, places and environments.		Early Grades - The theme of people, places and environments involved the study of location, place, and the interactions of people with their surroundings Early Grades - Concepts such as location, direction, distance, and scale. Early Grades - Tools such as maps, globes and geospatial technologies in investigating the relationships among people, places and environments. Early Grades - Creating illustrations and composing answers to geographic questions about people, places and environments.	Middle Grades - The theme of people, places and environments involved the study of the relationships between human populations in different locations and geographic phenomena such as climate, vegetation and natural resources.
	Social Studies - Individual Development and Identity						Middle Grades - How personal, social, cultural and environmental facets contribute to the development and the growth of personal identity. That individuals' choices influence identity and development. That perceptions are interpretations of information about individuals and events, and can be influenced by bias and stereotypes. Creating identify portraits that describe the factors that make them unique and shape development.

(continued)

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	Standards Alignment Chart	A MODERN ANTARCTIC EXPLORER Grades 2-6 • p. 39	ANTARCTIC PREDATOR ADAPTATIONS Grades 2-3 • p. 42	ADAPTATION SURVIVAL STORIES Grades 2-3 • p. 43	HUMAN MADE ADÉLIE PENGUIN PERILS Grades 4-6 • p. 45	RECYCLED PLASTICS PENGUIN SCULPTURE Grades 4-6 • p. 47	WHERE DO ADÉLIE PENGUINS MIGRATE IN WINTER Grades 4-6 • p. 50
SCIENCE	From Molecules to Organisms: Structure and Process						4-LS1-1; 4-LS1-2; LS1.D
	Ecosystems: Interactions, Energy and Dynamics		3-LS2-1; LS2.C; 3-LS4-2; LS4.B				5-LS2-1; LS2.A; MS-LS2-1; LS2.A
	Earth and Human Activity				4-ESS3-1; 4-ESS3-2; ESS3.B; ETS1.B; 5-ESS3-1; ESS3.C; MS-ESS3-4; MS-ESS3-5; ESS3.C; ESS3.D	4-ESS3-1; 4-ESS3-2; ESS3.B; ETS1.B; 5-ESS3-1; ESS3.C; MS-ESS3-4; MS-ESS3-5; ESS3.C; ESS3.D	
	Biological Evolution: Unity and Diversity			2-LS4-1; 3-LS4-2; 3-LS3-3; 3-LS4-4; LS4.B; LS4.C			
	Heredity: Inheritance and Variation of Traits			3-LS3-1; 3-LS3-2; LS3.A; LS3.B			
ENGLISH LANGUAGE ARTS	ELA - RI Key Ideas and Details		2-RI1; 2-RI3; 3-RI1; 3-RI3	2-RI1; 2-RI3; 3-RI1; 3-RI3	4-RI1; 4-RI2; 4-RI3; 5-RI2; 5-RI3; 6-RI2; 6-RI3		
	ELA - RI Craft and Structure		2-RI4; 3-RI4	2-RI4; 3-RI4	4-RI4; 4-RI5; 5-RI4; 5-RI5; 6-RI4		
	ELA - RI Integration of Knowledge and Ideas			2-RI9; 3-RI9	4-RI7; 4-RI9; 5-RI7; 5-RI9; 6-RI7; 6-RI9		
	ELA - SL Comprehension and Collaboration		2-SL1a.b.c; 2-SL2; 2-SL3; 3-SL1a.b.c.d; 3-SL2; 3-SL3		4-SL1a.b.c.d; 4-SL2; 4-SL3; 5-SL1a.b.c.d; 5-SL3; 6-SL1.a.b.c.d; 6-SL2; 6-SL3	4-SL1a.b.c.d; 4-SL2; 4-SL3; 5-SL1a.b.c.d; 5-SL3; 6-SL1.a.b.c.d; 6-SL2; 6-SL3	4-SL1a.b.c.d; 4-SL2; 4-SL3; 5-SL1a.b.c.d; 5-SL3; 6-SL1.a.b.c.d; 6-SL2; 6-SL3
	ELA - SL Presentation of Knowledge and Ideas		2-SL5; 2-SL6; 3-SL5; 3-SL6		4-SL4; 4-SL5; 5-SL4; 5-SL5; 6-SL4; 6-SL5		
	ELA - W Text Types and Purposes			2-W2; 3-W2a.b.c.d	4-W2a.b.c.d.e; 5-W2a.b.c.d.e; 6-W2a.b.c.d.e.f		
	ELA - W Production and Distribution of Writing				4-W4; 4-W5; 5-W4;5-W5; 6-W4; 6-W5		
	ELA - W Research to Build and Present Knowledge			2-W7; 2-W8; 3-W7; 3-W8	4-W7; 4-W8; 4-W9; 5-W7; 5-W8; 5-W9; 6-W7; 6-W8; 6-W9		
ART	Arts - Visual Arts Creating: Anchor Standard 1	2-CR1.2.2a; 3-CR1.2.3a	2-CR1.1.2a; 2-CR1.2.2a; 3-CR1.1.3a; 3-CR1.2.3a			4-CR1.1.4a; 5-CR1.1.5a; 6-CR1.1.6a	
	Arts - Visual Arts Creating: Anchor Standard 2	2-CR2.3.2a; 3-CR2.3.3a; 4-CR2.1.4a; 5-CR2.1.5a; 6-CR2.1.6a	2-CR2.1.2a; 3-CR2.1.3a			4-CR2.1.4a; 5-CR2.1.5a; 6-CR2.1.6a	
	Arts - Visual Arts Creating: Anchor Standard 9		2-CR3.1.2a; 3-CR3.1.3a				
	Arts - Visual Arts Presenting: Anchor Standard 5		3-PR5.1.3a			4-PR5.1.4a; 5-PR5.1.5a; 6-PR5.1.6a	
	Arts - Visual Arts Presenting: Anchor Standard 6		2-PR6.1.2a				
	Arts - Visual Arts Connecting: Anchor Standard 10		2-CN10.1.2a; 3-CN10.1.3a			5-CN10.1.5a; 6-CN10.1.6a	
	Arts - Visual Arts Connecting: Anchor Standard 11					5-CN11.1.5a; 6-CN11.1.6z	
SOCIAL STUDIES	Social Studies - Time, Continuity and Change	Early Grades - Key people, events and places associated with the history of community, nation and world. Middle Grades- The study of the past provides a representation of the history of communities, nations, and the world. The contributions of key persons, groups and events from the past and their influence on the present.					
	Social Studies- People, Places and Environments	Early Grades - The theme of people, places and environments involves the study of location, place, and the interactions of people with their environment. Middle Grades - The theme of people, places and environments involved the study of the relationships between human populations in different locations and geographic phenomena such as climate, vegetation and natural resources.					Middle Grades - The use of a variety of maps, globes, graphic representations and geospatial technologies to help investigate the relationships among people, places and environments.
	Social Studies - Individual Development and Identity	Early Grades - People's interactions with their social and physical surroundings influence individual identity and growth.					

(continued)

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	Standards Alignment Chart	CAN YOU WADDLE LIKE AN ADÉLIE PENGUIN Grades 4-6 • p. 52	ADELIE PENGUIN SURVEYS Grades 2-3 • p. 55	INFOGRAPHICS: SHOW, DON'T TELL Grades 4-6 • p. 59
SCIENCE	From Molecules to Organisms: Structure and Process	4-LS1-1; LS1.A		4-LS1-1; 4-LS1-2; MS-LS1-4; MS-LS1-5
	Ecosystems: Interactions, Energy and Dynamics		3-LS2-1	5-LS2-1; MS-LS2-2
	Engineering Design	3-5-ETS1-2; 3-5-ETS1-3; ETS1.B	K-2-ETS1-1; K-2-ETS1-2	3-5ETS1-1
	Biological Evolution: Unity and Diversity		2-LS4-1; 3-LS4-2; 3-LS4-3; 3-LS4-4	MS-LS4-3; MS-LS4-5; MS-LS4-6
	Motion and Stability: Forces and Interactions	MS-PS2-2		
	Energy	4-PS3-1		
ENGLISH LANGUAGE ARTS	ELA - RI Key Ideas and Details		2-RI1; 2-RI3; 3-RI3	4-RI1; 4-RI2; 4-RI3; 5-RI2; 5-RI3; 6-RI2; 6-RI3
	ELA - RI Craft and Structure		2-RI4; 3-RI4	4-RI4; 4-RI5; 5-RI4; 5-RI5; 6-RI4
	ELA - RI Integration of Knowledge and Ideas		3-RI7	4-RI7; 4-RI9; 5-RI7; 5-RI9; 6-RI7; 6-RI9
	ELA - SL Comprehension and Collaboration	4-SL1a.b.c.d; 4-SL2; 4-SL3; 5-SL1a.b.c.d; 5-SL3; 6-SL1.a.b.c.d; 6-SL2; 6-SL3	2-SL1a.b.c; 2-SL2; 2-SL3; 3-SL1a.b.c.d; 3-SL3	4-SL1a.b.c.d; 4-SL2; 4-SL3; 5-SL1a.b.c.d; 5-SL3; 6-SL1.a.b.c.d; 6-SL2; 6-SL3
	ELA - SL Presentation of Knowledge and Ideas		2-SL5; 2-SL6; 3-SL5; 3-SL6	4-SL4; 4-SL5; 5-SL4; 5-SL5; 6-SL4; 6-SL5
	ELA - W Research to Build and Present Knowledge			4-W7; 4-W8; 4-W9; 5-W7; 5-W8; 5-W9; 6-W7; 6-W8; 6-W9
MATH	Math - Measurement and Data	4.MD1; 2	2.MD10; 3.MD3	
ART	Arts - Visual Arts Creating: Anchor Standard 1			4-CR1.1.4a; 5-CR1.1.5a; 6-CR1.1.6a

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Overview

There are currently 18 recognized species of penguins and they all live south of the equator in the planet's southern hemisphere. Penguins can be found in chilly places like Antarctica all the way to tropical **climates** like the Galapagos Islands! While penguins are a type of bird, they do not fly like a "typical" bird. Instead of wings, penguins have paddle-like flippers that help propel them through the ocean waters. Their short tails, elongated bodies and webbed feet also help them swim more efficiently. In fact, some penguins spend up to 75% of their lives in the water — they will only come ashore once a year to breed and shed their feathers (a process called **molting**). Speaking of feathers, all adult penguins have some type of countershading — dark feathers on the back and white on the underside. This unique coloring is an adaptation that helps protect penguins from ocean predators like leopard seals. When the predator is above a swimming penguin in the ocean, the penguin's dark upper-side blends with the dark ocean below and when the predator is below the penguin, then the light underside of the penguin blends with the light water surface above. This combination makes it quite tricky for predators to tell the difference between a penguin or the surrounding environment.

Most scientists believe penguins deviated from flying birds at least 60 million years ago! Penguin ancestors grew to adapt to their ocean environment (swimming and diving), which eventually led to the loss of their flying abilities. The oldest known penguin fossils date back nearly 62 million years — all known penguin fossils have been found in the southern hemisphere, which is where penguins still live today! There are more than 40 recognized species of extinct penguins. Most scientists believe their extinction began around the same time the number of seals and whales began to increase. Because of this, they could have all been competing for the same food source or the penguins might have become prey for the other animals. The modern penguin was first documented by Europeans in 1497 — they described African penguins along their journey.

ADÉLIE PENGUINS

Adélie penguins average 27.5 in (69.85 cm) long and weigh between 6.6-13.2 lbs. (2.99 and 5.98 kg), making them one of the smallest species of penguin. Consuming mainly krill, fish and small squids, Adélie penguins are above these animals on the food chain, but they must be on alert for predators. Adélie penguins live in large groups called colonies and mate with one partner for life. Though they are very social animals, Adélie penguins do not make good neighbors, as they often steal pebbles from each other's nests to add to their own!

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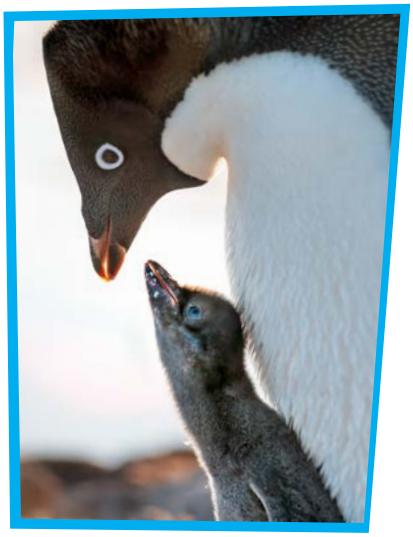
1 Adélie Penguin Family Life Cycle

Each year, Adélie penguins are capable of migrating nearly 11,000 mi (17702 km) to reach their breeding colony. They begin the breeding process at the start of the spring season — spring begins at the end of September and runs through the end of December in Antarctica. During this time, male Adélie penguins will arrive to the rookery or nesting colony first and start to construct a nest for their potential chicks. Antarctica is covered in ice, so finding traditional nest-building items like twigs, leaves, seedpods or cones is impossible in this region. The Adélie penguins must use a different method — rocks and pebbles! Nest-building is one way male Adélie penguins try to attract and find a female mate. They will even attempt to steal "better" stones from other nests in order to impress their potential mate.

Once the female Adélie penguins have arrived to the breeding **colony**, they will pair up with their former mates from previous years. That's right, Adélie penguins mate with one partner for life. By performing unique **vocalizations** and displays, previous mates are able to locate one another among the thousands of other Adélie penguins in the breeding colony. Female Adélie penguins typically lay two eggs in their nest and both parents work hard to keep those eggs warm and safe – they will take turns sitting on the eggs, keeping them warm and safe from **predators**. While in this **incubation stage**, the eggs are at risk of being snatched from their nest by polar skuas, large birds that inhabit the region. The south polar skuas typically eat only fish and **krill**; however, during the Adélie penguin breeding seasons, they will prey on the Adélie eggs and young. After about 30 days, those baby Adélie penguins will begin to break out of their protective eggs and learn how to be a penguin themselves! However, their parents' work isn't done quite yet. During this guarding stage, mom and dad will alternate **foraging**, feeding and protecting their chicks for up to four weeks after hatching. The following few weeks of the chicks' lives will be spent in a **creche** — a group of young Adélie penguins — for added protection while mom and dad both search for food. An Adélie chick spends about 55 days in the creche. During that time, they will begin to replace their down feather coats with waterproof feathers. Once the chicks have their waterproof feathers, they're ready to **fledge** and enter the water. While in the water, Adélie penguins must watch out for their biggest predator — leopard seals. Leopard seals have a long, slender body that is designed for speed. Males are slightly smaller than females and both will feed on almost anything (penguins, fish, squid).

Typically, right after breeding season, penguins will go through a process called **molting**, where they will shed their feathers. Throughout the year, a penguin's feathers become worn through natural events like rubbing against other penguins, going in and out of the water or coming in contact with the ground. Because of this, most penguins will completely shed their feathers once a year. During this time, about two weeks for an Adélie penguin, they must stay out of the water because their new plumage is not yet waterproof. Upon completion of each breeding season and molt, adult Adélie penguins will disperse into the coastal waters to feed and the migration process will start all over again.



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Grades 2-3 | Content Areas ELA, Art & Science

Family Life Cycle Story Stones

ESSENTIAL QUESTION

What are Adélie penguin parents' responsibilities as they raise their chicks from "nest to empty nest?"

Materials

- seven smooth stones per student or small group
- black permanent markers and white chalk paint pens, or acrylic paints and paint brushes
- pencils
- paper
- *Activity Sheet: Sketching Penguin Pictographs*

Vocabulary

- creche-stage
- fledglings
- guard-stage
- incubation
- molting

Process

Making story stones helps students review members of Adélie penguin family units. Using the stones to retell life events in order reinforces the roles parents play in a cycle of feeding and protecting chicks from "nest to empty nest."

WARM UP

Ask students to discuss something new they tried and the challenges they faced. Ask students to imagine how difficult it is for first time parents, like Steve in Disneynature **Penguins**, to figure out parenting stages from "nest to empty nest."

MAKING STORY STONES

Direct individuals or small groups to complete *Activity Sheet: Sketching Penguin Pictographs* to make a set of seven story stones. Explain that story stones are a collection of small painted stones that can be used as prompts for telling a story. Display Adélie penguin photos as the class discusses the Disneynature **Penguins** characters, things in the penguins' environment and events. Instruct students to paint each stone with markers, paint pens or acrylics depending on the stone color.

WRAP UP

Instruct students to take turns in small groups arranging story stones into a circle to retell Steve's family life cycle story. Students may also step into the flippers of one of the family members and use the stones to tell their own story. Discuss together how they felt during each stage, what did they wonder about and what new things did they have to figure out?

Note

"Take a Turn" stories allow each student to pick a stone from an array, tell part of the story, and collaborate on the ending.

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Activity
GRADES 2-3

SKETCHING PENGUIN PICTOGRAPHS

NAME _____ DATE _____

Directions: Choose 7 items from the lists below to sketch on your story stones.

Characters

- Mother penguin
- Chick #1
- Father penguin
- Predators
- Chick #2
- Other?

Actions

- Swimming
- Sliding on belly
- Diving into water
- Walking
- Eating
- Leaping out of water

Things

- Nest
- Ocean waves
- Pebbles
- Krill
- Other?

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Grades 2-3 | Content Area Art

Penguin Paper Mosaic

ESSENTIAL QUESTION

How is combining paper tiles on a mosaic to form an image similar to the process Adélie penguins use to combine pebbles to form a nest?

Materials

- 8x10 inch blue card stock
- pencils
- recycled construction paper (black, white, orange, dark blue)
- scissors
- glue sticks
- acrylic sealer

Vocabulary

- mosaic
- tiles

WARM UP

Ask students to imagine they are an Adélie penguin who is making a pebble nest for the first time. Tell them, as a penguin, you need to select pebbles that won't crumble when you pick them up with your beak. You would also carry each pebble to the nesting site to arrange large and small pebbles into a sturdy nest. Like solving a jigsaw puzzle, making an Adélie penguin nest, or making a **mosaic**, involves taking smaller objects, like **tiles**, glass, paper or rocks, and assembling them into a larger image.

MAKING A PAPER MOSAIC

Remind students that a mosaic is like making a nest, or a jigsaw puzzle — all of the little pieces fit together to make something larger. Instruct students to follow the steps below to create their own paper mosaic.

a) Draw the outline of an Adélie penguin on blue card stock.

b) Make mosaic tiles by cutting out black and white construction paper the size of thumbnails.

c) Use a glue stick to fix paper tiles around the edge of the outline.

d) Fill in the middle with the other tiles.

e) Complete the face with black circles, white circles and an orange triangle.

f) Fill in the background design.

g) Dry and then apply acrylic sealer.

WRAP UP

Discuss as a class: What is a mosaic? Ask students the following discussion questions.

a) What did you notice about the paper when you tried to put them together?

b) How did you make your image stand out?

c) How did you use color, shape, texture, or pattern?

d) What was your favorite part of creating this artwork?

e) How easy or hard was it for Steve to make the nest?

f) How is making a mosaic like the process of using pebbles to make a nest?

Challenge

Some students may enjoy tearing construction paper into shapes of feathers. In this case, suggest students start at the bottom of the mosaic, applying glue to the tops of the paper feathers only. Then layer the feathers in ways that cover all parts and follow the body contours. Carefully seal the finished artwork with acrylic sealer by stroking the brush from top to bottom.

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Grades 4-6 | Content Areas ELA, Art & Science

Family Life Cycle Story Cups

ESSENTIAL QUESTIONS

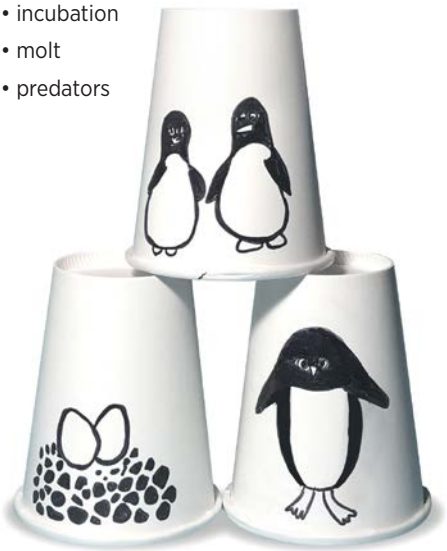
What are Adélie Penguin parents' responsibilities as they raise their chicks? What are the stages of the family life cycle?

Materials

- seven white, paper, drinking cups per student or small groups of students
- black permanent markers
- pencils
- *Activity Sheet: Match & Sketch*

Vocabulary

- creche-stage
- fledgling
- forage
- krill
- guard-stage
- incubation
- molt
- predators



Process

Making story cups helps students review members of Adélie penguin family units. Using the cups to retell life events in order reinforces the roles parents play in a cycle of feeding and protecting chicks from "nest to empty nest."

WARM UP

Invite students to think about and discuss something they did for the first time that wasn't very easy. Discuss how the family life of Adélie penguins begins anew each year. Ask students to imagine how difficult it is for first time parents, like Steve in Disneynature **Penguins**. Share with the class that they will learn about parenting stages that range from "nest to empty nest."

FAMILY LIFE CYCLE

Ask individual students or small groups to complete *Activity Sheet: Match & Sketch*. Students will follow directions to create a set of seven stacking cups. Display photos of Adélie penguins as the class discusses the roles family members play during each stage of the family life cycle: migration, nest building, mating, **incubation**, **guard-stage**, **creche-stage**, **fledgling** and adult post **molt**.

STORY TELLING

Students in small groups take turns selecting and arranging sets of cups in a circle to retell Steve's family cycle story from migration to empty nest. Students take the point of view of one family member — male, female or hatchling — and describe how they felt, what they learned, etc. at different stages of the cycle.

WRAP UP

Students discuss Adélie penguin parent responsibilities as they raise their chicks. At which stages did the parents need to feed themselves or feed the chicks? Discuss how the family cycle begins anew each year and what challenges that might pose for the penguin families.

Note

Remind students to use signal words for retelling, such as first, second, next, then, after, following, finally, soon, now and/or before.

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Activity
GRADES 4-6

MATCH & SKETCH

NAME _____ DATE _____

Directions: Draw a line from the life event to the matching action.

LIFE EVENT	ACTION
Male Penguin Arrives	Mrs. Penguin lays two eggs and she and Steve take turns foraging for food.
Female Penguin Arrives	Chicks forage. Parents no longer feed or protect fledglings who learn to swim.
Incubation Stage	Chicks congregate into large groups. Parents forage further away.
Guard-stage	Steve collects pebbles and builds a nest.
Creche-stage	Chicks hatch and grow. Mrs. Penguin and Steve take turns foraging, feeding and protecting chicks from predators.
Fledgling Molt	Mrs. Penguin and Steve meet.

Make a set of 7 stacking cups: Use the spaces below to draw thumbnail sketches for each cup.

Cup 1: **STEVE**

Cup 2: **PEBBLE NEST**

Cup 3: **MRS. PENGUIN**

Cup 4: **NEST WITH TWO EGGS**

Cup 5: **NEST WITH TWO EGGS EVE**

Cup 6: **2 MOLTING CHICKS**

Cup 7: **STEVE AND CHICKS ON WAVES**

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Grades 4-6 | Content Area Art

Penguin Pebble Mosaic

ESSENTIAL QUESTION

How is combining pebbles on a mosaic to form an image similar to the process Adélie penguins use to combine pebbles to form a nest?

Materials

- non-toxic water-based glue
- 11x15 inch watercolor paper
- 11x15 inch cardboard or other sturdy material for backing
- black permanent markers
- pencils
- newsprint
- tracing paper
- found or purchased rocks/pebbles
- paint (optional)

Vocabulary

- mosaic
- mosaic tiles

WARM UP

Ask students to imagine they are an Adélie penguin making a pebble nest for the first time. Describe and discuss the process such as selecting pebbles that won't crush when you pick them up with your beak, carrying each pebble to the nesting site and arranging large and small pebbles into a sturdy nest. Explain that, like solving a jigsaw puzzle, making an Adélie penguin nest, or making a mosaic, involves taking smaller objects, like tiles, glass, paper or rocks and assembling them into a larger image.

PREPARE YOUR MOSAIC TEMPLATE

Request students adhere to the following directions.

a) sketch 3 mosaic ideas on newsprint.

b) use tracing paper to copy their favorite design.

c) flip the tracing paper over and trace the lines with a pencil.

d) glue the watercolor paper to the backing.

e) place tracing paper pencil side down on the watercolor paper (as students trace over the lines, the pencil graphite transfers the image to the watercolor paper).

f) use a black permanent maker to trace over the pencil marks on the watercolor to create the mosaic pattern.

CREATE YOUR MOSAIC

Share the following directions with your students.

a) select rocks to be used or painted.

b) paint or wash, then dry the rocks.

c) arrange the rocks to fill in the image and background pattern .

d) lift each rock, put glue on the bottom, reposition and allow the mosaic to dry.

WRAP UP

Discuss the following questions as a group.

a) What is a mosaic?

b) What did students notice about the pebbles when they tried to put them together?

c) How did students make their image stand out and how did they use color, shape, texture or pattern?

d) What was your class's favorite part of creating this artwork?

e) How easy or hard do your students think it was it for Steve to make his nest and how is combining pebbles on a mosaic to form an image similar to the process Adélie penguins use to combine pebbles to form a nest?

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Extension for Grades **4-6** | Content Areas **Music & Science**

Find Your Family
The Adélie Penguin Way

ESSENTIAL QUESTION

How do family members use unique calls and vocalizations to find each other?

Materials

- game cards (4 hearts, 4 diamonds, 4 spades, 4 clubs)

Vocabulary

- calls
- colony
- vocalization

Note

Game vocalizations are based on a 4/4 time signature - four steady, evenly spaced beats. To start, clap hands evenly on every beat (1, 2, 3, 4) and repeat the pattern.

Process

By stepping into the flippers of an Adélie penguin, students will experience the communication skill of using unique **vocalizations** to identify their penguin mom, dad and chicks within a larger **colony** through play.

WARM UP

Many people use a Global Positioning System (GPS) to find a specific location. One way Adélie penguin families locate each other is with a made-up game name that we will call a PFLS — Penguin Family Locating System — where they will make and listen for unique **calls**. After students listen to a recording of a **colony** of thousands of penguins, ask them to try to distinguish one **vocalization** from another. Discuss if and how that might be challenging.

FINDING YOUR FAMILY

a) Practice clapping in 4/4 time until the class maintains a steady beat.

b) Request that 16 students select and keep secret a game card. Help students figure out their PFLS vocalization. Explain, if a student has a heart card, their call will be "La - La - Clap - Clap." If a student has a diamond card, their call will be "La - La - La - La," and so on. Students with no card will clap to the beat.

c) All students spread out, so they can't touch anyone. They take one step for each beat, making their vocalizations, and listening for students with their pattern.

d) Students cluster into family groups of four. After all groups are formed, the winners are the first 3 groups to assemble.

e) Repeat the game to see if students improve and give students a chance to choose a card they might not have had in the previous round.

WRAP UP

Discuss the ease or difficulty involved in locating the small group of family members from the larger group. How did using unique vocalizations help or hinder their search?

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Extension for Grades **4-6** | Content Area **Math**

Nests Take Shape
Platonic Solids

ESSENTIAL QUESTIONS

What are the platonic solids? If platonic solids shapes were pebbles, which ones would make the best Adélie penguin nest and why?

Materials

- 3 tennis balls per small group
- *Activity Sheet: Chart for Recording Faces, Vertices (Points) and Edges*
- set of polyhedral dice
- pencils
- rulers
- card stock
- scissors
- *Activity Sheet: Platonic Solids Nets*

Vocabulary

- regular tetrahedron
- cube
- octahedron
- dodecagon
- icosahedron
- sphere
- platonic solids
- radius
- face shape
- net

WARM UP

Tell students it takes hundreds of pebbles to build a nest. Pebbles keep eggs off the ground and avoid melting snow. Remind students how the pebbles Steve used either stayed in place or rolled away. Let's figure out which shapes would make the best nest.

SHAPE EXPLORATION

a) Ask students to gather into groups of three or four and give each group a **regular tetrahedron** die, a **cube** die, an **octahedron** die and a **sphere** (tennis ball). Ask groups to compare shapes and discuss which shapes are the **faces** of each solid?

b) Ask each group to fill in *Activity Sheet: Chart for Recording Faces, Vertices (Points) and Edges* together.

c) Instruct groups to discuss if the pebbles were made out of the **platonic solids**, which shapes, would make the best nest and why?

d) Give each group a set of **nets** to make three platonic solids. Students then cut out, fold and tape the edges.

e) Collect the platonic solids and split the class into four even groups.

f) Give one type of solid to each group and challenge them to make as big a nest as possible.

g) Ask groups to measure, then compare their biggest nests with others. Discuss how high each nest was, how wide, how comfortable it would be for a penguin and if it would hold two penguin eggs safely.

WRAP UP

Introduce the **dodecagon** and **icosahedron**. Note face shape, number of faces, number of vertices and number of edges together as a class. Discuss how these two solids might work as nest building rocks. Ask students what properties in a rock shape and texture might the penguins search for in order to make their nest.

Platonic Solids Quick Reference

Regular Tetrahedron: 4 equilateral triangles

Cube: 6 squares

Octahedron: 8 equilateral triangles

Dodecagon: 12 regular pentagons

Icosahedron: 20 equilateral triangles

Note

Scientific Research Study Findings!

Scientists completing a research study on Adélie penguin nests discovered the quality of the nest depends on compactness and form. Highest quality nests had a radius of only 18 cm and a rim height of 2 cm!

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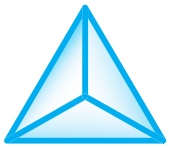
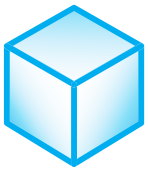
Activity
GRADES 4-6

CHART FOR RECORDING FACES, VERTICES (POINTS) AND EDGES

NAME _____ DATE _____

Directions: Chart the number of faces, vertices (points) and edges.

	Number of faces	Number of vertices	Number of edges
 **Tetrahedron** FACE SHAPE _____			
 **Cube** FACE SHAPE _____			
Octahedron FACE SHAPE _____			
Sphere FACE SHAPE _____			

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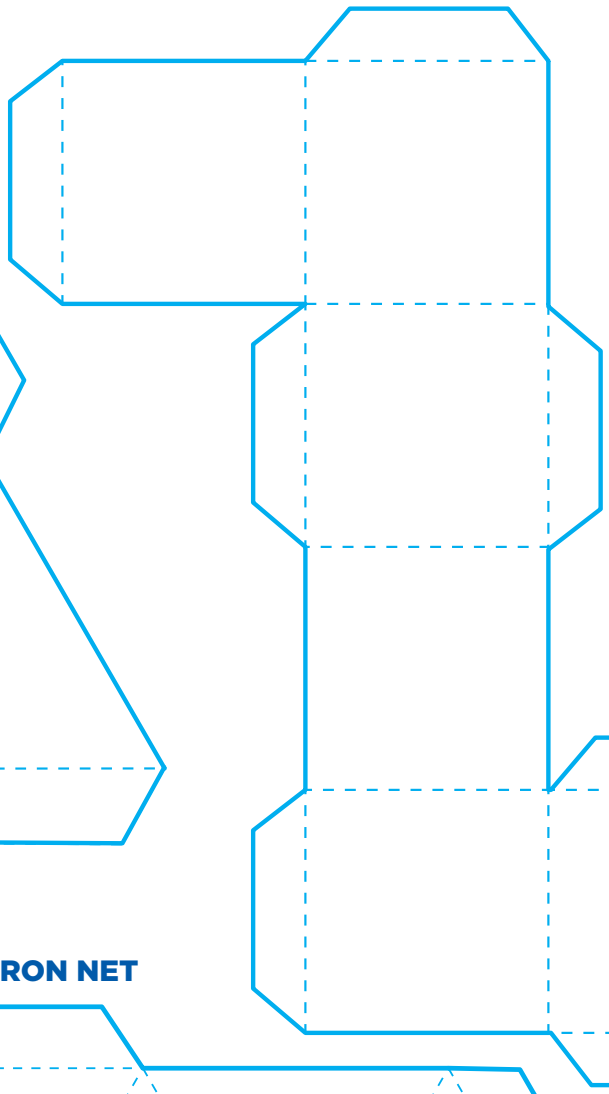
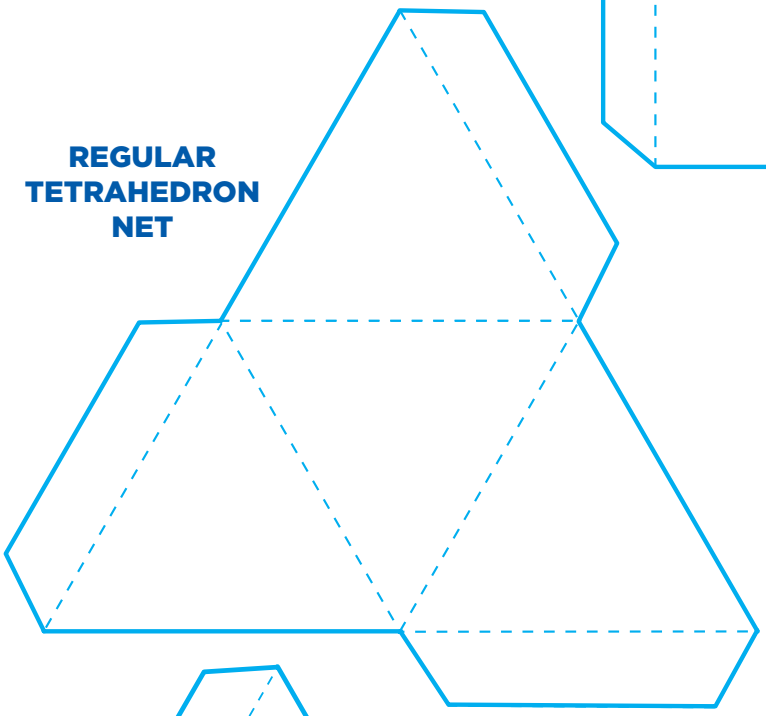
Activity
GRADES 4-6

PLATONIC SOLIDS NETS

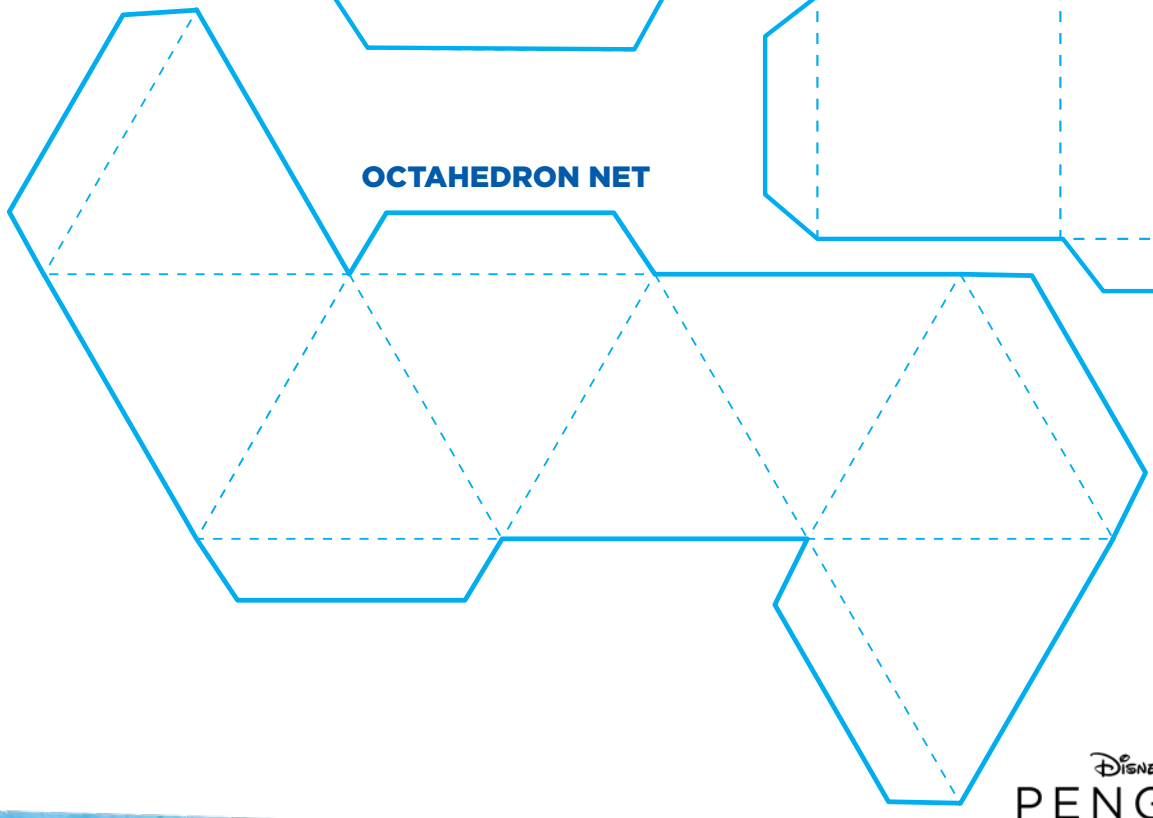
CUBE NET



REGULAR TETRAHEDRON NET



OCTAHEDRON NET



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2 Antarctica & Weather

Antarctica is known for being cold, windy and almost completely covered in ice. However, the continent is not only covered in ice, but also surrounded by ice! This surrounding ice band is known as pack ice — a type of sea ice that is highly mobile and moves with the wind and sea currents. You'll also find fast ice along the Antarctic coastline — unlike pack ice, this type of sea ice is physically attached to something (shores or ice walls) and can extend several hundred miles seaward from the coast.

With all that ice, you might think it's always snowing in Antarctica. However, this continent is the driest on earth – receiving about as much precipitation as the world's hottest deserts. When it does happen to snow, the falling flurries accumulate on the cold ground and do not melt. Years and years of accumulated snow coupled with strong winds make for a blizzard-like appearance throughout Antarctica; however, it's typically just the strong winds blowing around the accumulated snow! All that ice and wind makes for a chilly region. Temperatures typically range from 14 °F (-10 °C) on the coast to -76 °F (-60 °C) on elevated inland areas; however, it's been known to drop as low as -112 °F (-80 °C) during the winter months.

When looking at the continent of Antarctica on a typical map, it may seem a bit small; however, it's quite the opposite! Covering over 5 million square miles (13 million square km), Antarctica is larger than Europe and nearly twice the size of Australia. The icy continent is divided in two by the Transantarctic Mountains — one of the world's longest mountain chains. This mountain range stretches for more than 2,000 miles (3218 km) and reaches a peak of over 14,855 feet (4527 m) at Mount Kirkpatrick. These mountains, combined with the beautiful variations of ice across the region make for some incredibly breathtaking landscapes.

WEATHER INFORMATION

Climate is a measure of how the atmosphere acts over a long period of time; whereas, **weather** is a measure of what the atmosphere is doing over a shorter period of time. Meteorologists study and predict the weather (sunshine, thunderstorms, blizzards, etc.), like the weather expert on your local news. Weather patterns are when the weather stays the same for multiple days or weeks (hot and dry, cold and rainy, etc.) and are tied to the four seasons (winter, spring, summer, fall).

A **climatologist** completes similar work, but they focus on a much longer timeframe and study weather trends over many months or years in a particular area. The earth is split into five different climate types – tropical, dry, temperate, continental and polar. Tropical climates are hot and humid, dry climates lack moisture, temperate climates are warm and humid with mild winters, **continental** climates have very cold winters and **polar** climates are extremely cold year-round. Climatologists study climate and changes in climates because those changes will affect people around the world. Changes in climate could impact water supplies, crop yields and even human health, animals or ecosystems.

Because Antarctica is situated over the earth's South Pole, its seasons are highly dictated by the earth's orbit and relationship to the sun. During the summer season, Antarctica is positioned towards the sun and exposed to direct sunlight. However, during the winter season, Antarctica is on the opposite side of the earth's tilt towards the sun and the continent basically remains dark for six months.

During the winter months, there might be a period of roughly three weeks where the sun never makes it over the horizon. Conversely, during the summer months, there might be a period of time where the sun never completely disappears! However, a good portion of both seasons is not spent in either total darkness or 24-hour sunlight. For several hours a day, you might see a twilight effect along the horizon rather than a completely dark night sky. Twilight is when the sun has dipped just below the horizon line, but some light still reaches and illuminates the atmosphere to make for some truly beautiful views of the surrounding landscape.

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Grades 2-6 | Content Area Science

Weather & Climate Of Antarctica

ESSENTIAL QUESTIONS

How does tracking weather patterns, seasons and climates help scientists make better weather predictions? How can tracking weather patterns help scientists raise awareness of climate change?

Materials

- *Activity Sheet: Recording the Weather*
- *Activity Sheet: Predicting the Weather*
- chart paper
- markers

Vocabulary

- climatologist
- climate
- temperate
- continental
- polar
- weather
- season

WARM UP

a) Explain that students will be keeping track of the **weather** at their school and McMurdo station in Antarctica for two weeks using *Activity Sheet: Recording the Weather*. Discuss current weather conditions at your school as a class. Was it the same yesterday or over the weekend? Will it be the same tomorrow?

b) Look up current weather conditions at McMurdo Station Antarctica online and note them on the daily weather chart on *Activity Sheet: Recording the Weather*. Do the same for your local daily weather. Spend five minutes a day for two weeks for students to take turns reporting the weather and filling out the charts.

Time Scale Differences in Weather Patterns

Weather describes what is happening right now.

A season describes similarities in the weather over three months.

A climate describes similarities in the weather over one hundred years.

WEATHER COMPARISONS

a) Following your two-week data collection, request students work in small groups to look for patterns on the weather charts for their school and McMurdo station. Ask each group to share one pattern they notice. As a class, discuss time scale differences in weather patterns such as **season** and **climate**.

b) Show students climate zones on a map of the United States. As a class, find your location and identify what type of climate you live in. Discuss the following questions.

1. What patterns do students notice on the map?
2. Are all five types of climates present in the US?
3. Would knowing about the climate and seasons help **climatologist**s predict the long-term weather?

WRAP UP

Major Climates

1. Tropical
2. Dry
3. Temperate
4. Continental
5. Polar

As a class, fill out the prediction chart on *Activity Sheet: Predicting the Weather*. Note that the further in the future you predict, the less accurate predictions will be. Explain that because of this, when scientists make predictions at longer time spans, they use more general terms like “hot” or “rainy.” Remind students that scientists have noticed that the average weather patterns are changing — seasons are getting warmer all over the globe. Thus, predicting the weather for school and for McMurdo station might take this trend into account. Discuss how the average temperature might be different in 100 years and how or why conservation efforts might positively impact the average temperature in 10, 20 or 100 years.

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Activity
GRADES 2-6

RECORDING THE WEATHER

NAME _____ DATE _____

Directions: Record the weather on the Daily Weather Chart for two weeks. Use what you know about weather patterns, seasons and climate in weather zones to fill in the chart on *Activity Sheet: Predicting the Weather*

	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
	DATE_____	DATE_____	DATE_____	DATE_____	DATE_____	DATE_____	DATE_____
At my school							
At McMurdo Station							

	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
	DATE_____	DATE_____	DATE_____	DATE_____	DATE_____	DATE_____	DATE_____
At my school							
At McMurdo Station							

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Activity

GRADES 2-6

PREDICTING THE WEATHER

NAME _____ DATE _____

Weather predictions for our school

Tomorrow	In 1 week	In 6 months	In 1 year	In 10 years	In 100 years
What information did you use to make the prediction?					

Weather predictions for Antarctica

Tomorrow	In 1 week	In 6 months	In 1 year	In 10 years	In 100 years
What information did you use to make the prediction?					

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Grades 4-6 | Content Areas Art, Math & Science

Draw Animals To Scale

ESSENTIAL QUESTIONS

What are the sizes of Antarctic animals who come into contact with Adélie penguins? How do the animals compare in size from smallest to largest? How does drawing animals to scale provide a way to grasp the size of the animals?

Materials

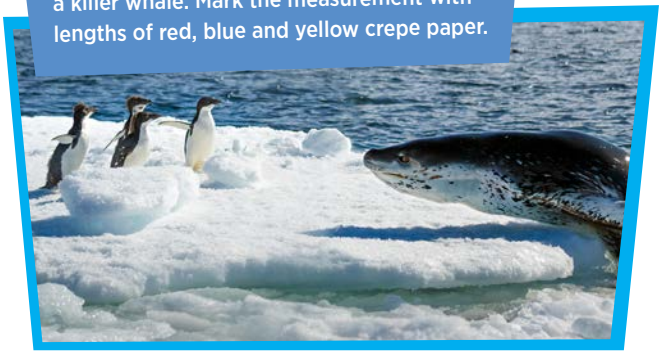
- *Activity Sheet: Size Comparison*
- butcher paper
- measuring tape
- scale rulers

Vocabulary

- cartographers
- estimate
- foraging
- habitat
- scale

Challenge

Challenge students to use tape measures to work out the actual length of an Adélie penguin (on its belly), a leopard seal and a killer whale. Mark the measurement with lengths of red, blue and yellow crepe paper.



WARM UP

Discuss with students how animals come in many shapes and sizes. From small to large, species require different amounts of food, living spaces and adaptations. Explain that you'll be comparing the sizes of Antarctic animals to see how they measure up to the Adélie penguin!

Antarctic Animal Sizes

1) Polar Skua: 53.34 cm
2) Adélie Penguin: 68.5 cm
3) Elephant Seal: 3.6 m
4) Emperor Penguin: 1.1-1.3 m
5) Leopard Seal: 3-3.5 m
6) Killer Whale: 7-9.7 m

MEASURING UP TO AN ADÉLIE PENGUIN

a) Have students use *Activity Sheet: Size Comparison* to rank photographs in order from smallest to largest. Ask students to compare their lists and discuss why the lists varied from one another. Discuss why photographs are not good resources for considering animal size. Mention, for example, the variation in distance from camera, perspectives and points of view variations, such as overhead shot, angled shot, action shot and still shot.

b) Post and share the list of Antarctic Animal Sizes. Instruct students to use a scale ruler to measure in units (centimeters) and make drawings of each animal on butcher paper to a 1:10 scale in which ten centimeters represent one meter. For instance, instead of drawing a leopard seal that is 3 meters long, students will draw a leopard seal that is 30 centimeters long.

c) To show how each animal's size compares to the others, display the drawings on a bulletin board and sort them together from smallest to largest. Ask students to discuss what advantages or disadvantages size makes. For example, larger animals require more food and may need to spend longer time hunting. Smaller animals are at risk of being hunted by larger predators. Larger animals may have more blubber, providing increased warmth in the cold environment, etc. Ask students if they think drawing animals to scale was more accurate and helpful in comparing sizes than using pictures.

WRAP UP

Ask students to brainstorm other things in their environment they can draw to scale and why that would be helpful. Discuss different ways scientists use scale to better understand how animals use resources in shared habitats. What other careers might use photographs, estimation and sizing to scale in their roles?

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Activity
GRADES 4-6

SIZE COMPARISON

NAME _____ DATE _____

Directions: Look at the pictures of six Antarctic animals. Consider anything in the pictures that might help you estimate the size of each animal. In the space provided, list the animals from smallest to largest. Compare your list with the list of another student. What was the same about the order of the animals? What was different? Why? (possible answers: different camera angles, different distances from each animal).

Make A Guess

List the Antarctic animals from smallest to largest.

1 _____

2 _____

3 _____

4 _____

5 _____

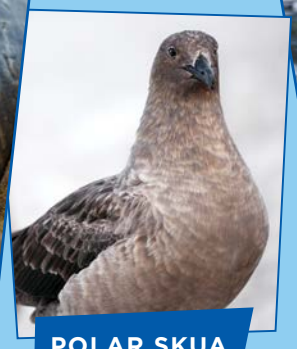
6 _____

EMPEROR PENGUIN

ADÉLIE PENGUIN

KILLER WHALE

ELEPHANT SEAL



POLAR SKUA

LEOPARD SEAL

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Grades 4-6 | Content Areas Math & Social Studies

Antarctica Size & Maps

ESSENTIAL QUESTION

What is the estimated size of Antarctica and how does it compare in size with the other six continents of the world?

Materials

- *Activity Sheet: Estimating Area*
- *Activity Sheet: Dymaxion Map*
- *Activity Sheet: Colored Map of the Seven Continents*
- crayons
- globe
- scissors
- tape
- transparency with a half-centimeter grid

Vocabulary

- continent
- dymaxion map
- globe
- icosahedron

Teacher Preparation

Cut out and fold a copy of *Activity Sheet: Dymaxion Map* into the icosahedron approximation of the world's sphere.

WARM UP

Display a satellite image of Antarctica. Ask students if the shape of Antarctica seen from space looks like representations on maps. Compare the globe, *Activity Sheet: Dymaxion Map*, and *Activity Sheet: Colored Map of the Seven Continents* together as a class and discuss how the size and shape of continents — especially extreme northern and southern continents — look different on each map.

Note

The icosahedron and unfolded (flat) Dymaxion are not as realistic as the globe but are more realistic than a standard wall map.

ESTIMATING AREA

Instruct students to gather in groups of 3 and use *Activity Sheet: Estimating Area* to complete the steps listed below:

1) Color the continents on the Dymaxion map to match the colors used for the Colored Map of the Seven Continents.
2) Lay a half-centimeter transparency grid over each map outline.
3) Estimate the area of each continent by counting the number of grid squares needed to cover each landmass. Each group should record the number of whole squares, then record the number of partial squares that cover each continent. Then, divide the number of partial squares by 2 and add it to the number of whole squares to determine the total number of squares that cover each continent (see example recording table).
4) Compare the sizes of the seven continents.
5) Sort the continents by size and determine where Antarctica falls on the list.

WRAP UP

Students calculate the area of one of the grid squares on the map (1 million square kilometers). Next, students calculate the actual area in square kilometers of each continent, using the information in their recording table (multiply that number by 1 million). Compare students' estimates with data from the table. Were their estimates close to the actual areas (within a million sq. km)? If not, what could have caused the errors? Request all small groups share their continent list from largest to smallest with one another and discuss differences. Identify where Antarctica should be ranked on the list as a class and discuss if it is bigger or smaller than Europe.

Data on Area of Each Continent in Square Kilometers

CONTINENT	Area in Square Kilometers (Sq. Km)	% of Total Land Area on Earth
All continents combined	148,429,000 Sq. Km	100%
Asia (including the Middle East)	44,579,000 Sq. Km	30.0%
Africa	30,065,000 Sq. Km	20.3%
North America	24,256,000 Sq. Km	16.3%
South America	17,819,000 Sq. Km	12.0%
Antarctica	13,209,000 Sq. Km	8.9%
Europe	9,938,000 Sq. Km	6.7%
Australia (plus Oceania)	7,687,000 Sq. Km	5.2%

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Activity
GRADES 4-6

ESTIMATING AREA

NAME _____ DATE _____

Standard map

CONTINENT	Africa	Asia	North America	South America	Europe	Australia	Antarctica
A Number of whole squares							
B Number of partial squares							
C Divide number of partial squares (B) by 2							
= Total number of squares: A+C							

Dymaxion map

CONTINENT	Africa	Asia	North America	South America	Europe	Australia	Antarctica
A Number of whole squares							
B Number of partial squares							
C Divide number of partial squares (B) by 2							
= Total number of squares: A+C							

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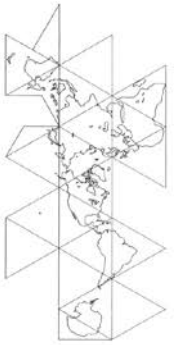
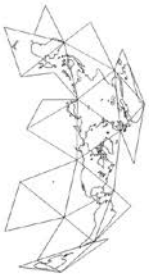
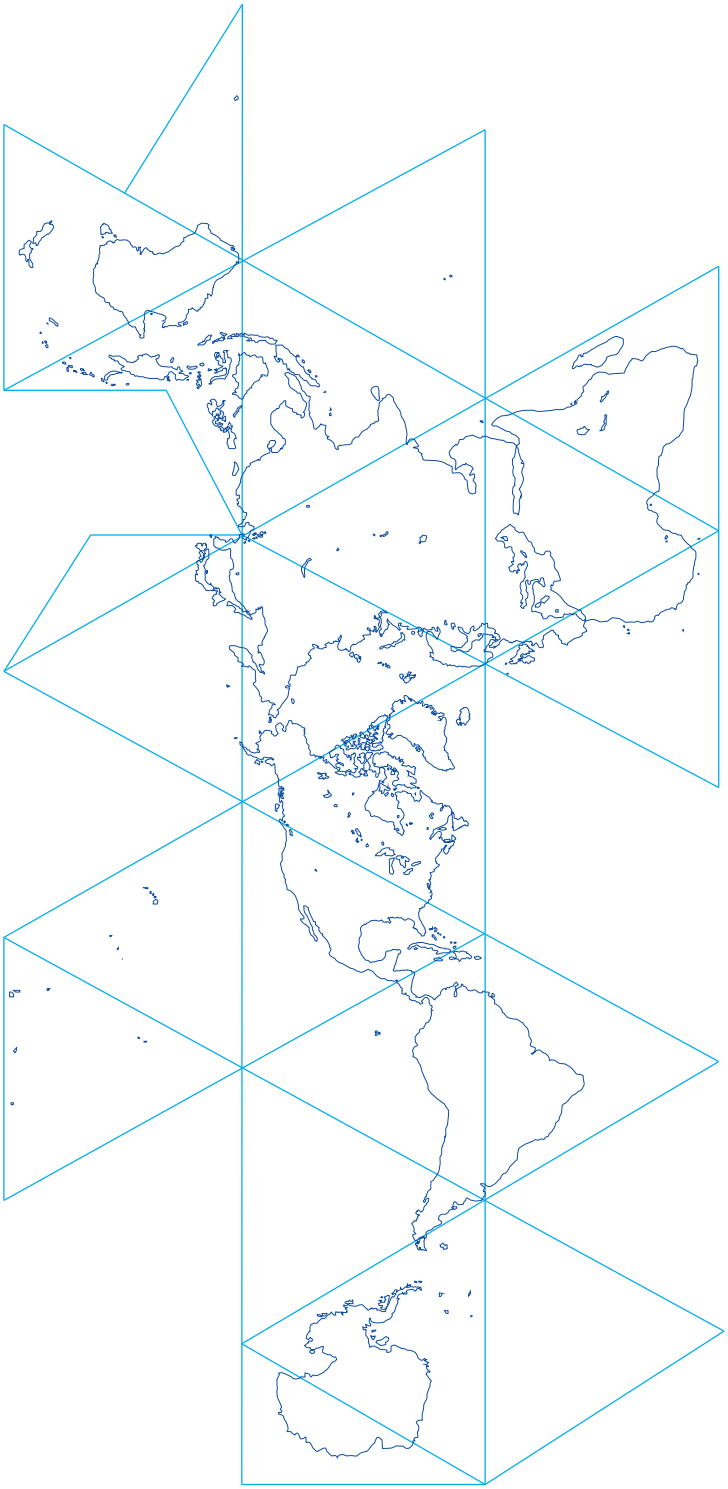
Activity
GRADES
4-6

DYMAXION MAP





ASSEMBLY INSTRUCTIONS



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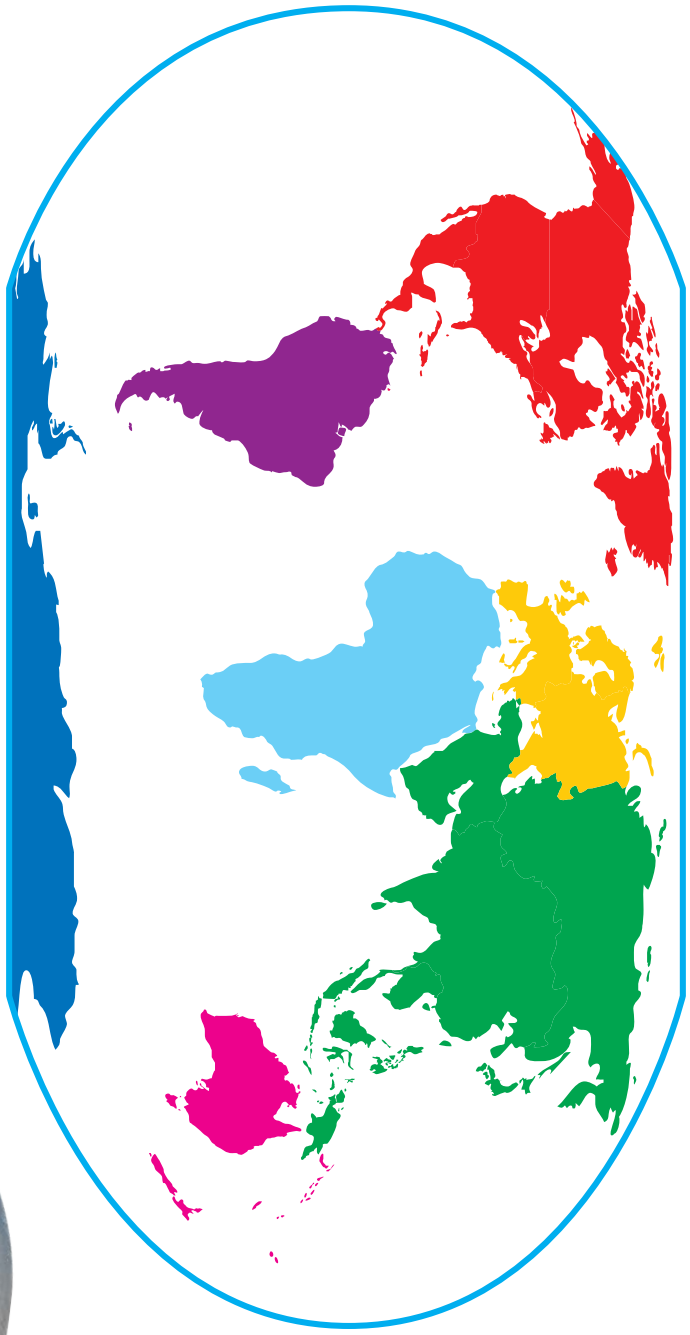
Activity
GRADES
4-6

COLORED MAP OF THE SEVEN CONTINENTS



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Extension for Grades **2-3** | Content Areas **Art & Science**

From Here To Antarctica
Contrasting Seasonal Landscapes

ESSENTIAL QUESTIONS

What are the weather conditions like in Antarctica? How are seasonal weather conditions different in Antarctica from students' local weather conditions?

Materials

- *Activity Sheet: Months and Seasons*
- crayons
- watercolors or tempera paint
- paint brushes in a variety of sizes
- watercolor paper, index cards

Vocabulary

- cool colors
- landscape
- warm colors
- monochromatic
- mood

WARM UP

Explain to students that when learning about new places, it helps to compare what we know with what we don't know. Discuss seasons and explain how long they last varies depending on geographic location. Ask students how the **landscape** in springtime is different where students live from Antarctica. Mention that one way to represent the contrast between seasons is through painting. Display and discuss the inspiration for the activity: Nerys Levy — Arctic and Antarctic. Notice how the artist uses color and simple lines to represent Antarctica landscapes.

EXPLORING SEASONS

Have students select a month written on down facing index cards and then complete *Activity Sheet: Months and Seasons* according to which month they chose. Explain the process of wax resist and watercolor painting. Suggest students select watercolors that will create the "feeling" of each season. Have students label contrasting paintings by location, month and season and display artwork for each month in the classroom.

WRAP UP

Discuss how students used color, shape, texture or pattern in the paintings. Ask how the mood of the finished pieces reflect the weather of each location, how are the seasons different and why.

Process: Crayon Resist

1. Trace over a sketch with a crayon (Use white for dramatic effect).
2. Brush watercolor paint over the crayon lines and watch as crayon lines show through the paint.

Relevant Art Terms

- Monochromatic
- Cool vs. Warm Colors
- Foreground
- Middle Ground
- Background
- Horizon Line

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Activity
GRADES 2-3

MONTHS AND SEASONS

NAME _____ DATE _____

Directions: Identify the season for both USA and Antarctica during the month you selected using the chart below. Sketch your ideas for your local landscape and Antarctica landscape in the spaces provided. Next, use your drafts from this page to inspire your final sketch on two watercolor papers and complete with watercolor, using crayon resist techniques. Be sure to label your final works with your name, the month you chose and the season for your location and the corresponding Antarctic season.

	USA	ANTARCTICA
SEPTEMBER	Fall	Shifting to summer
OCTOBER	Fall	Summer
NOVEMBER	Fall	Summer
DECEMBER	Winter	Summer
JANUARY	Winter	Summer
FEBRUARY	Winter	Summer

	USA	ANTARCTICA
MARCH	Spring	Shifting to winter
APRIL	Spring	Winter
MAY	Spring	Winter
JUNE	Summer	Winter
JULY	Summer	Winter
AUGUST	Summer	Winter

Local Seasonal Landscape

Month:

Antarctica Seasonal Landscape

Month:

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3 Antarctica Exploration

Antarctica was the very last continent to be discovered on our planet. Its far distance from other land masses and the icy waters that surround it made exploration nearly impossible. It's widely believed that Captain James Cook, an English explorer, was the first to cross through the Antarctic Circle in 1773. Like the equator, the Antarctic Circle is an imaginary line around the globe that people use to help describe locations on Earth. The Antarctic Circle is in the southern hemisphere and the continent of Antarctica lies south of the Antarctic Circle. While Captain Cook didn't sight land, it was the first time an explorer had ever journeyed that far south.

Although there is much debate as to when the first explorer laid eyes on Antarctica and who actually stepped foot on the continent first, most historians agree Cartsen Borchgrevink and his crew were the first to spend an entire year on the icy land. Borchgrevink, a Norwegian scientist, is said to have landed at Cape Adare in February of 1899. He and his crew members then built huts on the shore and wintered on the land until their departure in February of 1900.

Borchgrevink was just the beginning of what is known as the Heroic Age of Antarctic Exploration — a time of historic journeys across this frozen region. Starting in the late 19th century and spanning throughout 1922, this period of exploration saw some of the most profound Antarctic discoveries and produced a set of storied explorers from around the world.

In 1901, sailing aboard the ship *Discovery*, Robert Falcon Scott began his first journey to Antarctica with a crew that included a physicist, a geologist, a naturalist, a botanist and a surgeon, among others. While their expedition consisted of many scientific explorations, the core of their trip was to reach the South Pole. Unfortunately, Scott and his crew turned back before they reached their final destination; however, they held the title for "furthest southern journey" for a number of years following their attempt. By 1904, Scott and his remaining crew left Antarctica and made their way back north. Scott's initial ship, the *Discovery*, is now on public display for future explorers to visit in Dundee, Scotland.

Ernest Henry Shackleton joined Scott on his 1901 journey to Antarctica and would return two more times during his life. The first Shackleton-led Antarctic exploration commenced in 1908 aboard the ship *Nimrod*. After reaching land, Shackleton and his crew conducted various research from meteorological to biological projects. Once spring came, Shackleton and his crew of three others set out to reach the South Pole. While the group did not reach their destination, they did make it further south than Scott's initial expedition years earlier. Shackleton and the remaining *Nimrod* crew members returned home and Shackleton soon began planning his next Antarctic adventure.

Roald Amundsen was no stranger to the Antarctic region — he had been part of the first ever crew to winter in the waters surrounding the continent in 1899. However, in 1910, Amundsen led his own expedition to Antarctica aboard the ship *Fram*. The *Fram* was unique in that it was built specifically for these types of explorations — rather than having a previous life as a coal ship or something similar, the ship was designed to withstand run-ins with the inevitable pack-ice it would encounter in icy waters. The *Fram* was perfect for their journey and the Amundsen-led crew reached the Bay of Whales and setup camp in early 1911. They named their camp Framheim, which means "home of the *Fram*" in the Norwegian language. The crew used the remaining summer months to construct many **depots** that would assist them in their journey to the South Pole in the spring. On December 14, Amundsen and a crew of four other men reached the South Pole — the very first time in history. They constructed a small tent,

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left a letter inside and began their journey back to the coast. The public can now view the famous *Fram* ship and learn about its many polar expeditions at The Fram Museum in Norway.

At the same time as Amundsen's exploration, Robert Falcon Scott had begun another attempt at reaching the South Pole via the ship *Terra Nova*. Scott and his crew made landfall in January 1911 and unloaded their supplies on Ross Island. The *Terra Nova* then journeyed east in an effort to conduct additional scientific research — on their way back to Ross Island, the crew encountered Amundsen's *Fram* in the Bay of Whales. While Scott was noted as being a bit disappointed to learn Amundsen's crew was so close, he carried on with his initial plan and set out for the South Pole. On January 17, 1912, Scott and four other crew members finally reached their destination, only to find the note left by Amundsen from a month earlier.

In 1921, Shackleton began preparations to explore Antarctica once more aboard the ship *Quest*. Unfortunately, in January 1922, Shackleton passed away during his journey south — this marked the end of the Heroic Age of Antarctic Exploration.

While this heroic age might have ended in 1922, the fascination with Antarctica and desire to explore this frozen land did not cease. As technology advanced and ships became better suited for icy water, scientists and researchers from around the world began to journey to Antarctica more frequently. There became so much interest in this land from so many different countries that a treaty was signed to insure Antarctica would remain a peaceful place with a freedom of scientific research and information sharing. This treaty is called The Antarctica Treaty and was signed in December 1959 by the 12 countries active in the International Geophysical Year (IGY) in 1957-58. The IGY was the first major multi-national research program to take place in Antarctica including Argentina, Australia, Belgium, Chile, France, Japan, New Zealand, Norway, South Africa, United Kingdom, United States and the former Soviet Union.

Prior to the IGY, most of the initial 12 nations had already constructed permanent research stations throughout Antarctica. The United States established McMurdo Station in December of 1955 on Ross Island and it serves as the core of the U.S. Antarctic Program. McMurdo Station includes landing strips for planes, a harbor for ships, a helicopter pad and over 80 buildings serving as dormitories, stores, administration offices and much more. Research conducted at McMurdo Station ranges from biology and medicine to geology and astrophysics. You'll even find participants of the Antarctic Artists and Writers Program around the station.

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Grades 2-3 | Content Areas Art, Social Studies, ELA

Looking Through The Spyglass

ESSENTIAL QUESTIONS

What is a spyglass? How did a spyglass help explorers on their journey? Which explorer goals need to change when expectations and predictions aren't met?

Materials

- *Activity Sheet: Looking Through The Spyglass*
- *Activity Sheet: Spyglass Creation*
- two 1 inch strips of cardstock paper for each student
- scissors
- non-toxic glue
- small binder clips
- paper for sketching
- clear plastic sheet protectors
- tape
- small paint brushes
- acrylic craft paints
- acrylic sealer
- glue gun
- decorative loose parts (sequins, stickers, beads, etc.)

For Each Group of 4 Students

- a paper towel roll
- paper cup
- paints (iridescent paints are a good choice for decorating the telescopes)

Vocabulary

- landfall
- landscape
- magnification
- navigation
- prediction

WARM UP

Explain to students one of the tools early explorers used to navigate their way to unknown lands was a small telescope called a spyglass. Discuss how a spyglass makes objects in the distance appear closer, providing explorers with more detail as they observe their surroundings. Students will make cardboard spyglasses with interchangeable painted lenses that 1) show what they might expect to see as an Antarctic explorer upon landfall, and 2) show what explorers actually did see when they made landfall. Ask students to complete the "what would you expect to see" column on *Activity Sheet: Looking Through The Spyglass*. Then, instruct students to work in small groups of four to complete *Activity Sheet: Spyglass Creation.*

MAKING A SPYGLASS

First, have students go to *Activity Sheet: Looking Through The Spyglass* to complete the first column: "What would you expect to see?" Second, have them complete steps 1-2 of *Activity Sheet: Spyglass Creation* to draw spyglass images of what things they would expect to see on landfall. Then, request students listen to a book read aloud about features of Antarctica, such as Rebecca Hirsch's *Antarctica*. Students are now equipped to discuss which of their predictions were correct and which were not. Third, students fill in column 2 of *Activity Sheet: Looking Through The Spyglass* —"what did explorers actually see?" Finally, students will make another lens image that shows what explorers did see upon landfall (a natural landscape with no people or research station, but with abundant natural wildlife, ice shelves and penguin colonies).

WRAP UP

After the spyglasses are finished, students in small groups take turns looking through the spyglasses at the images each student created. They compare how their predictions were the same or different from the second lens of what explorers actually saw. How would an explorer have to adjust his or her approach to exploration if their expectations and predictions were wrong? What effect would having wrong expectations have on: type of equipment, plans for scientific studies, collecting data, where to make landfall?

How Does a Spyglass Work?

A spyglass works by using glass lenses. One lens is used to magnify the image you are looking at and bring it closer to your eye. The other lens is used to gather the light and bend it into focus, so you can see the image in sharp details instead of fuzzy shapes.

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Activity
GRADES 2-3

LOOKING THROUGH THE SPYGLASS

NAME _____ DATE _____

	1 What would you expect to see?	2 What did explorers actually see?
Types of people:		
Types of animals:		
Landscape-landforms, vegetation:		
Types of weather:		
Other:		

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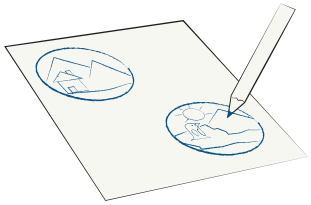
Activity
GRADES 2-3

SPYGLASS CREATION

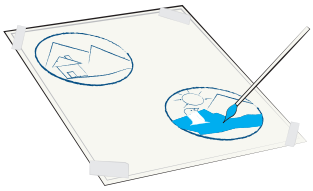
Make two lenses:

1. Measure and cut a strip of cardstock to fit around the outer edge of a paper cup, leaving an extra .5 in (1.5 cm) for overlap. Form a ring and glue together the ends of the cardstock. Secure the seam with a binder clip and leave to dry. Repeat to make a second ring.



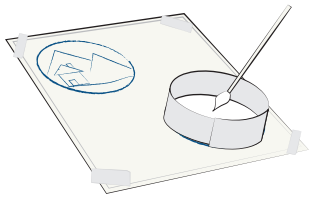
2. Use the paper cup to trace a circle on sketching paper. Draw a picture of **what things you'd expect to see** through the spyglass upon landfall.

3. Use the paper cup to trace another circle on sketching paper. In the second circle, draw a picture of **what explorers actually saw.**



4. Tape the plastic sheet protector over your sketches. Use craft paint to color in your images on the plastic, using the sketches underneath as a guide. Allow to dry completely.

5. Place a cardstock ring over your painting. Apply a heavy coat of acrylic sealer on top of the painting so that the acrylic sealer covers both the painting and the inside edge of the ring. Repeat for the second image and allow to dry overnight.



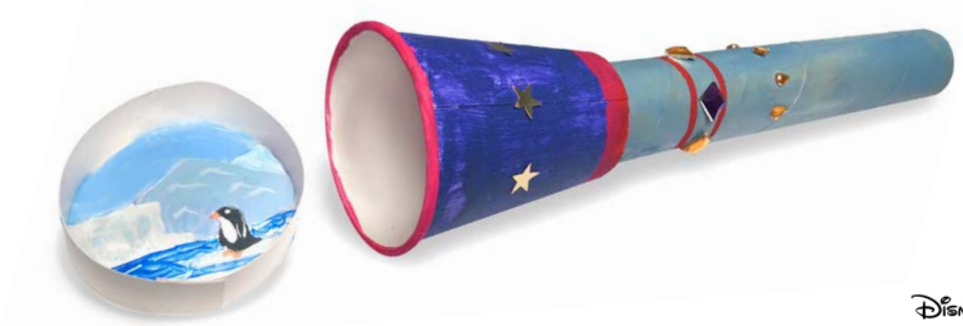
6. Once completely dry, peel away the plastic sheet protector. The paintings will remain on the acrylic sealer. These are the interchangeable landscape lenses for the spyglass.

Make one spyglass for a group of four:

1. Place the paper towel roll on the bottom of the paper cup and trace around the roll. Cut out the circle so that the paper towel roll can fit through the bottom of the cup. Glue the paper towel roll in place using the glue gun.

2. Paint and decorate the spyglass with sequins, beads, stickers or other items.

3. Once dry, take turns placing the landscape lenses on the end of the spyglass. When the telescope is aimed at the window or a light, the translucent image will be seen at the end of the spyglass. Compare the lenses showing **what you'd expect to see** with the lenses showing **what explorers actually saw.**



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Grades 4-6 | Content Areas Social Studies & ELA

Antarctica Explorer Scrapbooks

ESSENTIAL QUESTIONS

What hardships did each team overcome to make discoveries and contribute scientific knowledge? What are the characteristics of explorers?

Materials

- *Activity Sheet: Scrapbook Table of Contents & Explorer Data*
- pencils

Vocabulary

- agitated
- cairn
- depot
- Fram
- Framheim
- man-hauling
- pemmican
- skua gulls
- sledge
- Terra Nova
- Vidda

WARM UP

a) As a class, discuss how the history of Antarctica is an adventure story of exploration. Speculate as to why some people lead expeditions in harsh locations such as Antarctica. Some examples might include scientific discovery, testing strength and wit while living in an unforgiving environment, charting geography of the inlands or charting the coasts and seas surrounding Antarctica. Discuss why students think it might be important to some explorers to be the first to explore a land.

b) In small groups, ask students to conduct research about explorers Robert Falcon Scott, Ernest Shackleton and Roald Amundsen. Students should search for and deeply examine primary source documents (see resource section for links and excerpts) such as diary entries of the explorers. To aid research, students should utilize *Activity Sheet: Scrapbook Table of Contents & Explorer Data*. Following research, students will be asked to complete a South Pole Exploration Timeline based on what they've found. Finally, ask students to consider the character traits that promote a life of exploration.

REFLECTING ON ANTARCTICA'S AGE OF EXPLORATION

Have students work in small groups using books, websites, and primary sources, such as diaries and maps, to make an Antarctica Explorer Scrapbook using file folders. Students will share scrapbooks, complete Explorer Comparison Charts and discuss their Exploration Timelines.

WRAP UP

Student groups will share their scrapbooks with the rest of the class and then discuss the following questions as a class.

a) How have the diaries changed over time?

b) Which character traits motivated explorations in foreign lands?

c) What character traits impacted their leadership skills?

d) What do students think will be the next great exploration area?

FAUX LEATHER FILE FOLDER SCRAPBOOK

Materials

- tissue paper cut into 5" squares
- acrylic sealer
- brown acrylic paint
- sponge or paint brushes
- newspaper
- 9 sheets of copy paper per group

Faux Leather Steps

1. Mix a few drops of brown acrylic paint into acrylic sealer.
2. Place opened file folder (outside showing) on sheet of newspaper.
3. Using the brown acrylic sealer, paint about 1/4 of the file folder surface at a time. Carefully place overlapping tissue squares on the wet acrylic sealer & continue until the surface is covered (squares will wrinkle).
4. Slightly bend on the fold and stand up like a tent. After the acrylic sealer dries, apply another layer if needed.

Add Pages

1. Open the folder.
2. Place 9 sheets of paper between fold and edge on non-treated side with folder tab at top.
3. Position 5 staples on the left edge of stack of pages.
4. Add research information to each page.

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Activity
GRADES 4-6

SCRAPBOOK TABLE OF CONTENTS & EXPLORER DATA

NAME _____ DATE _____

Antarctica Explorer Comparison

SHACKLETON	AMUNDSON	SCOTT
Country of origin	Country of origin	Country of origin
Childhood influences to become an explorer	Childhood influences to become an explorer	Childhood influences to become an explorer
Departure Date	Departure Date	Departure Date
Arrival on Antarctica Date	Arrival on Antarctica Date	Arrival on Antarctica Date

SCRAPBOOK TABLE OF CONTENTS

Cover:
Explorer Name

Inside Cover:
Names of students, Teacher's name, Date

Page 1:
About the explorer's life and motive for the expedition

Page 2:
Antarctica map that traces the expedition journey

Page 3:
Timeline of the journey (start and end dates, dates of significant events)

Page 4:
Planning for the expedition or stages of the expedition

Page 5:
Drawings, pictures and diary entries of everyday life — tools, clothing, transportation, chores, entertainment

Page 6:
Drawings, pictures and diary entries of crucial events (obstacles, discoveries, struggles, successes)

Page 7:
Outcomes and summary of expedition

Page 8:
Character traits that helped the explorer through difficult times

Page 9:
List of references and resources

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Extension for Grades 2-6 | Content Areas Music & Social Studies

A Modern Antarctic Explorer

ESSENTIAL QUESTIONS

What is a soundscape? What are natural-object instruments? How can soundscapes accompanied by natural-object or recycled-object instruments perform in ways that express the mood related to life or conditions on Antarctica?

Materials

- sound recorders
- markers
- paper plates
- rocks
- potato chip tubes with plastic caps
- recycled plastic eggs
- recycled plastic water bottles
- twigs, leaves, gravel
- masking tape
- *Activity Sheet: Natural-Object and Recycled-Object Musical Instruments*

Vocabulary

- acoustic
- ecology
- avant-garde
- sound art
- percussion
- soundscape

WARM UP

Read a book that introduces the concept of exploration, such as *My Season with Penguins: An Antarctic Journal* by Sophie Webb. Discuss with students how scientists and explorers journey to Antarctica to learn more about the wildlife, ecology, or the natural history of our planet in order to predict the future. Some explorers, like Cheryl Leonard, a modern-day Antarctic explorer of the arts created "Polar Music," an avant-garde genre. View Cheryl Leonard's "The Rocks Sing" to see how she designs natural-object instruments and composes music that captures natural sounds and highlights ecological climate change. Students will record soundscapes at their school, make instruments out of natural or recycled objects from their environment and combine them to improvise a composition.

Suggestions for Recording Soundscapes at School

1) Get permission from administration.
2) Record 20-30 seconds of playground sounds.
3) Record 20-30 seconds of lunch-room sounds.
4) Record 20-30 seconds of feet walking in the hallway.
5) Make one recording that combines the soundscapes.

SOUND EXPLORATION

Play the first minute of a Leonard Performance "Greater than 20 Knots" for the class. Instruct students to follow directions to complete the first and second columns on *Activity Sheet: Natural-Object and Recycled-Object Musical Instruments* to create and explore their new instruments.

WRAP UP

Ask students to gather in small groups of 4-5 students and take turns playing along with a 1 to 2-minute soundscape of their school. Following their composition creation, discuss the effects of their natural or recycled musical instruments on the performance as a class. Ask questions such as, what moods were expressed in the different performances, how could soundscapes, collected over time, demonstrate changes in time of day or season at school.

Leonard's Soundscapes & Field Note Recordings Include

- gusts of wind
- Adélie penguin vocalizations
- Adélie penguin footsteps
- seals splashing
- icicles dripping
- icicles falling
- an iceberg melting

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Activity
GRADES 2-6

MAKING NATURAL-OBJECT & RECYCLED-OBJECT MUSICAL INSTRUMENTS

NAME _____ DATE _____

Directions: Select at least 2 or 3 objects from natural and recycled items collected at school and follow the steps below to explore your own, unique instrument. Most items will make a percussion instrument. A percussion instrument makes a sound by being gently struck by a stick or rock, scraped by a beater or shaken.

CREATE

List the materials you selected:

_____

_____

_____

_____

Sketch your instrument:

Name your instrument:

PRACTICE

Sketch 2 or 3 different ways to shake or strike your instrument to get different sounds.

Describe each different sound for each movement and what mood it might produce:

SOUND:	**SOUND:**	**SOUND:**
MOOD:	**MOOD:**	**MOOD:**

PRACTICE WITH CLASSMATES

Gather with a small group of 3-4 classmates. Place a check for each task you complete.

- ☐ Establish a beat (4/4 time) for everyone to follow.
- ☐ Take turns being the leader. Watch and follow the movements of the leader's instrument.

Try making the instruments sound:

☐ louder ☐ softer ☐ faster ☐ slower

Talk about how different sound levels or speeds changed the mood or feeling of the sounds.

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4 Adélie Penguins In Peril

Although Adelie penguins are not listed as an endangered species by the IUCN Red List, they face several threats that could eventually lead to a more concerning status for these flightless birds. Natural threats to the Adélie penguins come in the form of predators like leopard seals, killer whales and south polar skuas. The leopard seal is their most common threat, but will only prey on them when the penguins are in the water. Leopard seals only come to land to sleep and rest, so they will typically not bother the penguins on the shore. In the water, penguins swimming in large groups are typically able to avoid being bothered by leopard seals all together. South polar skuas, a type of large bird, are only a threat to penguin eggs and unguarded chicks on land.

Human made threats to Adélie penguins are not quite as evident as their natural predators; however, unnatural threats are still of great concern when it comes to survival of these unique animals. At the top of this list is the threat of significant climate change, including the threat of rising temperatures in the home region of Adélie penguins. As a result of warmer temperatures, the Antarctic ecosystem and animals, like Adélie penguins, with cold-weather adaptation will be adversely impacted. Most notably, rising temperatures will cause sea ice to melt and disappear at a faster rate — ice that Adélie penguins, and many other animals, call home and depend on for survival. Krill, the main source of food for Adélie penguins, use sea ice to breed and feed under. Loss of ice could mean the loss of krill which could eventually lead to the loss of Adélie penguins.

While there are clearly a number of threats for Adélie penguins, there is also a great deal of conservation work taking place to help these animals and their homes. Adélie penguins are one of the most studied animals in the Antarctic region and research into their colonies allows scientists to better understand the effects of climate change and human impact in their area.

MAKING A POSITIVE DIFFERENCE FOR WILDLIFE

By sharing what you have learned about Adélie penguins, you are on your way to helping protect this unique species! Shared knowledge creates awareness and can lead to action. A positive attitude towards all wildlife can also help make a conservation impact when combined with actions that benefit the world around us. While you may never visit Antarctica or see an Adélie penguin in the wild, you probably do live with a wide variety of animals near your own home. Think about ways you can help these animals.

- **Observe wildlife from a distance.** Observing wildlife from a distance ensures that animals continue to depend on their natural instincts to find food and use nature's resources. Feeding wildlife can be dangerous and change their behavior. It's important to let wild animals be wild.
- **Choose pets wisely.** Though many regulations exist around the world to protect wild animals, the illegal pet trade still takes many wild animals directly from their homes. When the time comes to add a furry, feathery or scaly addition to your family, be sure you know where it came from.
- **Create habitats!** Consider creating a friendly place for wildlife to thrive in your yard. Provide a water source, a place for animals to live and plants that provide food. Before you know it, your backyard could be home to all kinds of insects, plants, and animals. The National Wildlife Federation can even certify your habitat as wildlife friendly!
- **Reduce waste.** Reduce your consumption (achieve a small "footprint"). Reuse items that normally are just tossed into the trash and recycle everything you can.
- **Make wise conservation choices.** Finding alternative ways to travel such as carpooling, biking and walking are all great options to lessen your impact on the environment.
- **Discover more.** Check out conservation organizations such as the Disney Conservation Fund (DCF) to learn more about the efforts to protect all kinds of wildlife in wild places. You can even visit an AZA-accredited zoo or aquarium to learn about other wildlife and conservation efforts being made around the world to protect animals like Adélie penguins.

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Grades 2-3 | Content Areas Science, Art, ELA

Antarctic Predator Adaptations

ESSENTIAL QUESTIONS

What predators put Adélie penguins in peril? What adaptations make predators of Adélie penguins successful hunters?

Materials

- toilet paper rolls
- chicken wire
- medium foam ball
- smooth and crumpled newspapers
- cardboard
- shoe boxes
- plastic bottles
- white glue
- water
- medium and large craft brushes for gluing
- bowls for mixing paste
- acrylic paints
- paint brushes
- scissors, masking tape

Vocabulary

- adaptation
- paper maché
- predator
- prey
- stencil

Process

Making paper maché animal sculptures of Adélie penguin predators helps students identify predators' adaptive behaviors and physical features.

WARM UP

a) As a class, discuss how Antarctica is a harsh place, yet many animals are able to survive. Ask students to think about how Antarctic predators have **adapted** survival skills that allow them to thrive. View pictures of **predators** and video of their actions and then instruct students to select a penguin predator to create using **paper maché** techniques.

b) Have students research their animal online or in books and make notes of interesting adaptations. As a class discuss how students' animal adaptations compare with other students' findings (teachers can use the Disneynature Penguins Educator's Guide background sections to compare their findings). Next, ask students to sketch their animal, trace it on cardboard and cut out the tracing to make a stencil. The stencil will serve as the base shape for the sculpture.

BUILDING AN ANTARCTIC PREDATOR

Instruct students to follow the steps below.

Creating the Basic Shape: Use a variety of materials to build the animal base shape — try a foam ball for circular shapes, toilet paper rolls for cylindrical shapes and tape crumpled newspaper into place to create shapes. To strengthen the base shape, cover all pieces with tape.

Forming the Body: Tear long and short newspaper strips and mix equal parts water and white glue. Place newspaper strips over the basic shape and paint a coat of glue mix over the strip to secure it to the base shape. Repeat the process one strip at a time until the whole basic shape is covered in a sturdy layer of newspaper strips.

Adding the Details: Once the paper maché is completely dried, paint animal details.

WRAP UP

a) Ask students to gather in small groups with different predator designers to discuss what they learned through the design and problem-solving process. Suggest they use the following questions to guide their discussion.

1) Why did you choose your animal?

2) What materials helped you mimic the shape of your animal?

3) What was the easiest and most difficult part of working with paper maché?

4) What was your favorite part of creating this artwork?

b) Set up a classroom natural history or art museum. Organize the sculptures so that all the same predators are near each other. Instruct students to make 3x5 index cards with the name of their predator and a poster that labels adaptations on their sculptures. Ask students to take turns being "museum docents" or "tour guides," that will be prepared to share facts and answer questions about their predator while giving tours to each other, students from another class or parents during an open house.

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Grades 2-3 | Content Areas ELA & Science

Adaptation Survival Stories

ESSENTIAL QUESTION

Which Adélie penguin adaptations assist survival against predators - killer whales, leopard seals, skua gulls, giant petrels?

Materials

- *Activity Sheet: Semantic Analysis & Survival Stories*
- pencils
- colored pencils

Vocabulary

- adaptation
- survival
- camouflage
- creche
- down
- leopard seals
- giant petrels
- killer whales
- predators
- prey
- skuas

WARM UP

Discuss adventure survival stories students are familiar with, and how characters develop and overcome obstacles in harsh and challenging environments. Note how animals living in harsh environments, like Antarctica are constantly living out their own adventure survival stories and how today's students will imagine those through the lives of Adélie penguins. Review the definitions and examples of **adaptations**, **survival**, **predator** and **prey** as a class before proceeding.

Note on Genre

Adventure survival stories usually occur in the great outdoors. Characters must think quickly, depend on inner resolve and call on problem solving skills to overcome dangerous or threatening situations.

BECOMING ADVENTURE AUTHORS

Have students complete section A of *Activity Sheet: Semantic Analysis & Survival Stories* to help them prepare to write their survival stories. Explain that students will identify which adaptations could or could not help Adélie penguins survive encounters with specific predators and complete one together as a class before they complete the rest individually. Tell students they will then use their semantic analysis to complete Section B of the activity sheet before writing and illustrating a survival story that includes appropriate characters, setting and a happy ending.

WRAP UP

Ask students that wrote about the same predator to gather in small groups to share and compare their stories. Have students discuss whether or not they all chose to feature the same or different Adélie penguin adaptations in their stories and which adaptations were selected the most often and why.

Semantic Feature Analysis grids like on *Activity Sheet: Semantic Analysis & Survival Stories* help students consider how sets of things relate to one another. Analyzing a grid helps students make connections between sets and predict outcomes.

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Activity
GRADES 2-3

SEMANTIC ANALYSIS & SURVIVAL STORIES

NAME _____ DATE _____

A Adélie Penguin Predators Semantic Analysis

Directions: Place an **X** for each adaptation that could help Adélie penguins survive encounters with the corresponding predators and a minus sign **–** where the adaptation would not be helpful for specific predators.

ADÉLIE PENGUIN ADAPTATIONS	PREDATORS: Killer Whales	Leopard Seals	Skua Gulls	Giant Petrels
Camouflage of adults in water • Black back blends with deep, dark waters when seen from above • White belly blends with bright water surface when seen from below				
Chicks — camouflage on land • Fuzzy brown down may blend with shadows				
Chicks — gather in creches				
Adults — gather in groups to jump into waters				
Adults — can swim 75 km per hour (approx. 46 mph)				
Adults — short pointed beak				
Adults — launch or jump high out of the water and onto ice pack or land				

B Write and draw a survival story

CHARACTERS

WHICH PENGUIN: VS **WHICH PREDATOR:**

- ☐ Father Penguin
- ☐ Mother Penguin
- ☐ Chicks
- ☐ Juvenile Penguin

- ☐ Killer Whales
- ☐ Leopard Seals
- ☐ Skua Gulls
- ☐ Giant Petrels

SETTING/SCENARIO

WHAT OR WHERE:

- ☐ Sitting on nest
- ☐ Jumping into ocean
- ☐ On ice floe
- ☐ Waiting for mom
- ☐ Getting food for chicks
- ☐ Feeding on krill
- ☐ Waddling in colony

HAPPY ENDING

The adaptation(s) that help your penguin survive:

_____

_____

_____

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Grades 4-6 | Content Areas Science & ELA

Conceptual Models For Human Made Adélie Penguin Perils

ESSENTIAL QUESTION

How do human activities impact Adélie penguins?

Materials

- *Activity Sheet: Human Made Penguin Perils Concept Model*
- dry erase boards
- poster paper
- dry erase markers
- markers

Vocabulary

- climate change
- variable
- conceptual model
- deforestation
- global warming
- sea ice
- sea level

WARM UP

a) Discuss some examples of **conceptual models** scientists make to represent how a system with observable and unobservable factors works. Some examples include the solar system or the human respiratory system. Ask students to think about how successful models can guide problem solving and predicting.

b) Have students read a short article (see resource section for links) about the connection between increased rates of **sea ice** melting and **climate change** that may be caused by human made factors. Next, ask students to brainstorm other human made influences on the environment such as **deforestation**, the rise of carbon dioxide levels, landfill garbage creating methane, fossil fuel use, burning coal, creation of plastics and the release of carbon.

Note

Some conceptual models focus on natural causes for climate change such as volcanic eruptions or solar variability that are beyond humankind's control. Other conceptual models focus on how humanity's activities impact global warming.

CREATING CONCEPTUAL MODELS

Have students gather in small groups of 2-3 individuals. Request that each group choose one human made influence to add to the variables on *Activity Sheet: Human Made Penguin Perils Concept Model*. Student groups will then follow the directions to create conceptual models of how human activity impacts climate change and puts Adélie penguins in peril.

WRAP UP

Ask students to share in a round-table format and discuss how the variables they chose impacted the relationship between the variables. Remind students that models are intended to be changed based on new evidence or collaborations with other scientists. Then, request students give peer to peer feedback by providing critique and giving at least one way the content or presentation of the model could be improved. Ask students to revise their models and propose solutions in large groups to reduce the threat to Adélie penguins or generate new questions that may fill in gaps in knowledge. Collect models into a class book and make it available in the science or library corner.

"The most common misunderstanding about science is that scientists seek and find truth. They don't — they make and test models.... Making sense of anything means making models that can predict outcomes and accommodate observations. Truth is a model."

— Neil Gershenfeld, American physicist, 2011

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Activity
GRADES 4-6

HUMAN MADE PENGUIN PERILS
CONCEPTUAL MODEL

NAME _____ DATE _____

Directions: Look at the example of a simple conceptual model with 2 variables, and the questions that are represented in the example. Answer the questions below and use your answers to sketch the first draft of a conceptual model on a dry erase board or scratch paper. Then, draw the second draft in the space below. Include the variables listed below and the human made influence of your choosing.

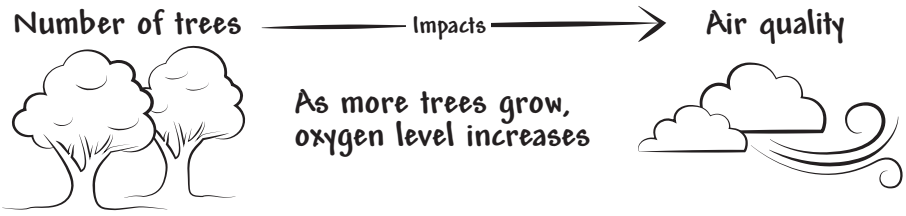
EXAMPLE

VARIABLES: **NUMBER OF TREES** **AIR QUALITY**

What is the issue? Air pollution

What is the relationship between the variables? More trees = more oxygen (resulting in improved air quality)

Include arrows and illustrations to represent the issue.



VARIABLES: **ADÉLIE PENGUINS** **PEOPLE** **ANTARCTICA ICE** **CLIMATE** **HUMAN MADE INFLUENCE:** _____

What is the issue? _____

What is the relationship between the variables? _____

_____

_____

Include arrows and illustrations to represent the issue.

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Grades **4-6** | Content Areas **Art & Science**

Recycled Plastics Penguin Sculpture

ESSENTIAL QUESTIONS

What is the purpose of WashedAshore.org? How can collecting plastics and using them to create a sculpture raise awareness of marine pollution? What are the issues created due to ocean pollution?

Materials

- *Activity Sheet: Think Tank Questions & Sculpture Directions*
- assortment of plastics in various colors
- fasteners
- wire
- glue guns
- glue dots
- tape
- non-toxic epoxy
- zip ties
- twisty ties
- rubber bands
- twine
- assorted binder clips
- poster boards
- markers

Vocabulary

- assemblage
- additive sculpture
- closed sculpture
- collaborative sculpture
- conservation
- exhibition
- freestanding
- marine debris
- open sculpture
- pollution
- public art
- sculpture base
- subtractive sculpture
- think tank

WARM UP

a) Discuss how ocean pollution is a growing threat to Adélie penguins and other animals that depend on our oceans for survival. Introduce students to organizations that are making a difference for wildlife and wild places, like WashedAshore.org. Discuss how WashedAshore.org demonstrates how art can play a powerful role in raising awareness about cleaning up marine debris and could be changing consumer habits.

b) Tell students to form think tanks of 4 members and assign one of the five "**Think Tank** questions" on *Activity Sheet: Think Tank Questions & Sculpture Directions* to explore on WashedAshore.org. Then, invite students to share their group findings with the class.

CREATING THE SCULPTURE

a) Explain to the class that together, you'll plan, design and create a collaborative piece of recycled plastics art to raise awareness of marine plastic pollution. With permission from school administration, organize a recycled plastics drive. Think tank groups make posters that explain the plastics drive — purpose, date, locations, types of plastics.

b) Consider the amount of plastic material you've collected and decide the scope of your project as a class, including size, which Antarctic species you'll represent, and how many. Follow the directions in the "Plastic Sculpture Steps" section of *Activity Sheet: Think Tank Questions & Sculpture Directions.*

c) Find a place to display the finished product in an area approved by school administration. Consider creating plastic recycling and penguin conservation pledge cards for people who view the sculpture to sign. Then, collect and display the cards on a bulletin board near the sculpture.

WRAP UP

Discuss the art the class created and what they learned through the design and problem-solving process. Ask students how the artwork/exhibit might raise awareness of plastic pollution in your community and how public art works promote conservation. Lastly, be sure to properly dispose of and recycle any plastics not used for the sculpture.

KEEP GOING

View the TED-Ed Student Talk "Cleaning our Oceans: A Big Plan for a Big Problem" Prepare your own inspirational story about how and why to deal with ocean pollution.

Basic Sculpture Concepts

open sculpture: parts of the mass reach into surrounding space

closed sculpture: seen as a solid form overall

freestanding: does not need a base to stand

base: what a sculpture is mounted on

subtractive: carving out a shape

public art: works of art designed for public display

"Never doubt that a small group of thoughtful, committed citizens can change the world. Indeed, it is the only thing that ever has."

- Margaret Mead

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Activity
GRADES 4-6

THINK TANK QUESTIONS & SCULPTURE DIRECTIONS

NAME _____ DATE _____

Directions: Each think tank has one question to explore on WashedAshore.org. Be prepared to share your answers.

Think Tank Questions

1. How can art educate the world about plastic pollution in oceans and waterways?
2. Why is it important that people understand the impact of plastic pollution?
3. What are other activities people can do to help clean up plastic pollution?
4. The United States is one of the biggest users of plastic water bottles in the world. What can the country do to reduce the waste from plastic water bottles?
5. Why is conservation and preservation of the marine environment important?

NOTES:

Sculpture Photos Credit: WashedAshore.

PLASTIC SCULPTURE STEPS

1. Collect, wash and sort plastics by color or size.
2. Determine the scope of the project.
3. Analyze pictures of Adélie penguins.
4. Sketch 3D perspectives of penguin poses and select one to guide the assembly of the sculpture.
5. Each group will create a portion of the collaborative sculpture and then all the pieces will be assembled to create the finished sculpture.
6. Sign up to create one of the following: head, upper body, lower body, right or left wing, feet and base.
7. Work collaboratively to determine the best way to secure the pieces and attain the appropriate shape and size for the body part.
8. Use glue dots to hold pieces together for shaping and glue guns and wire to secure pieces together.
9. View the sculpture up close and from a distance to analyze shape and progress at the end of each session.
10. Assemble all pieces into the larger sculpture and display in a predetermined place.
11. Attach a sign explaining the purpose of the sculpture.

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5 Movement And Migration

While on land (or ice), Adélie penguins walk at an average pace of 1.5 miles per hour (2.5 km/h); however, once they are in the water, Adélie penguins can swim 2.5-5 miles per hour (4-8 km/h) on average! We already know some Adélie penguins migrate close to 11,000 miles (17,702 km) to reach their breeding colonies during the warmer seasons; however, much less is known about where and how they spend their time during the winter season.

Scientists know Adélie penguins inhabit large ice platforms during the winter and are surrounded by plenty of food options. Krill, their primary source of food, tend to inhabit the underneath side of sea ice and offer an abundant source of nutrition for Adélie penguins. To help learn more about what happens during the winter months and where they go on their incredibly long journeys, scientists have begun tracking their routes in an effort to better understand these migration patterns. From their research, we know some Adélie penguins can swim as far as 746 miles (1,200 km) from their breeding locations in the summer months!

Adélie penguins work hard to return to the same breeding colony each year, regardless of where their winter migration led them. Once the male Adélie penguin has reached his breeding location, he will begin the process of courtship and finding his mate. In general, there are three different types of displays, or visual and auditory behaviors, the male penguin will perform to attract a female during courtship. These displays include ecstatic to initially claim the nesting site, mutual ecstatic in which the mated pair perform the display together and bowing to aide in recognition between the mated pairs. During the ecstatic stage, male penguins have been seen dipping their heads down low and then stretching their necks upward while holding out their flippers and "squawking" loudly. During mutual ecstatic, the male and female will perform the same or similar ecstatic displays together. Bowing is just like it sounds! One or both of the penguins will lower their heads and point their beaks towards their partner or nest.

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Grades 4-6 | Content Areas Science & Social Studies

Where Do Adélie Penguins Migrate In Winter?

ESSENTIAL QUESTIONS

Where do Adélie penguins migrate in winter? What factors influence migration patterns?

Materials

- *Activity Sheet: Mapping Possible Adélie Penguin Migration Patterns*
- pencils
- markers

Vocabulary

- foraging
- gyre
- migration
- polynya

WARM UP

As a class, discuss why tracking penguin migration patterns on maps is important work. List examples together such as checking the health of marine ecosystems, identifying ecological zones that need protection and identifying habitat destruction. Shift the discussion to why penguins migrate, for example to seek over-winter feeding grounds, escape the darkness of winter and to avoid harsh winter conditions. Ask students to hypothesize what factors scientists need to consider while tracking penguins. For example, Adélie penguins won't dive into the ocean in the dark — need light to confirm no predators are present; too much open water or too much thick ice keep penguins from foraging.

MAPPING MIGRATIONS

Request students work in peer pairs to complete *Activity Sheet: Mapping Possible Adélie Penguin Migration Patterns*. Move through the room and ask prompt questions to individual pairs — what distance did the penguins travel and how long do students think it would take to get to the over-winter grounds? Point out the factors that influence migration patterns to each group in Figure B.

WRAP UP

Ask students to compare the possible routes they drew in small groups and discuss what factors were the most important in deciding the route, how the routes differ and if any routes were more common than others. Discuss what distance penguins would travel on different routes and what are the implications for penguins if the ice pack melted significantly due to climate change.

KEEP GOING

Ask students to research how scientists use Geolocation sensor leg tags, chemical analysis of feathers and/or satellite tracking to shed light on Adélie penguin migratory movements, rate and direction.

Students Keep in Mind

- **Round Trip Distance: Between 780 mi (1276 km) to 1100 mi (1760 km).**
- **Some leave in June and return in October.**

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Activity
GRADES 4-6

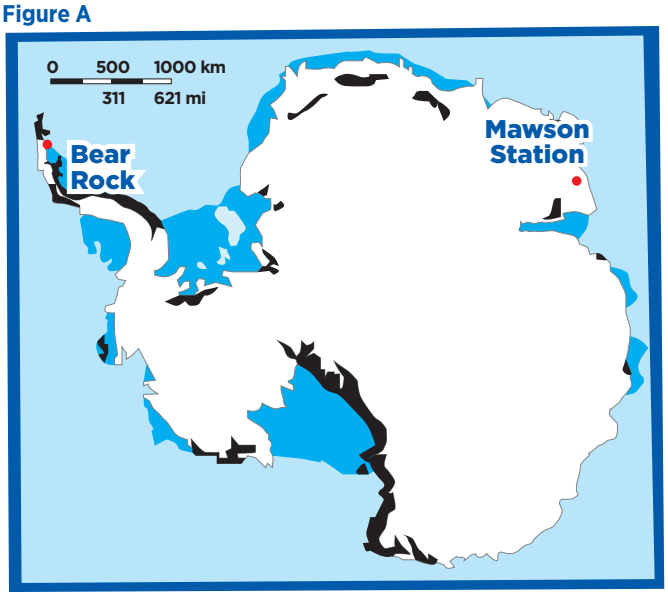
MAPPING POSSIBLE ADÉLIE PENGUIN MIGRATION PATTERNS

NAME _____ DATE _____

Directions: Locate Mawson Station and Bear Rock on the map of Antarctica in Figure A. Next, examine the Adélie penguin migration route shown from and to Mawson Station in Figure B. Consider how the factors listed below may influence migration patterns. Using these factors, draw a possible route from and back to Bear Rock in Figure C. How does your route compare to the one in Figure B? How does it compare to your classmates'?

LEGEND Ocean | Ice sheet | Ice shelf | Ice-free zones

Figure A



Migration Route Factors

TOO MUCH ICE = no access to water and food

NOT ENOUGH ICE = no place to rest

POLYNYA = access to krill
(a polynya is an area of open water surrounded by sea ice)

AREAS PREDATORS INHABIT = danger!

AREAS CLOSE TO COASTLINE = colder water and richer food sources

ICE FLOE = possible opportunity to hitch a ride moving 3.45 mi/day (5.5 km/day)

Figure B

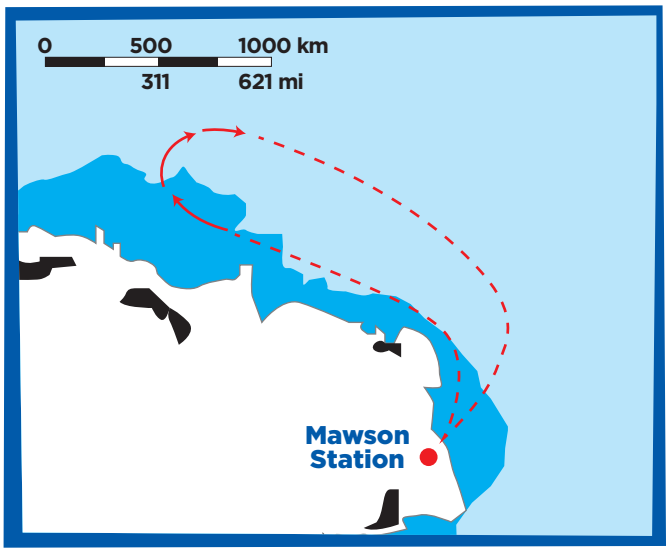
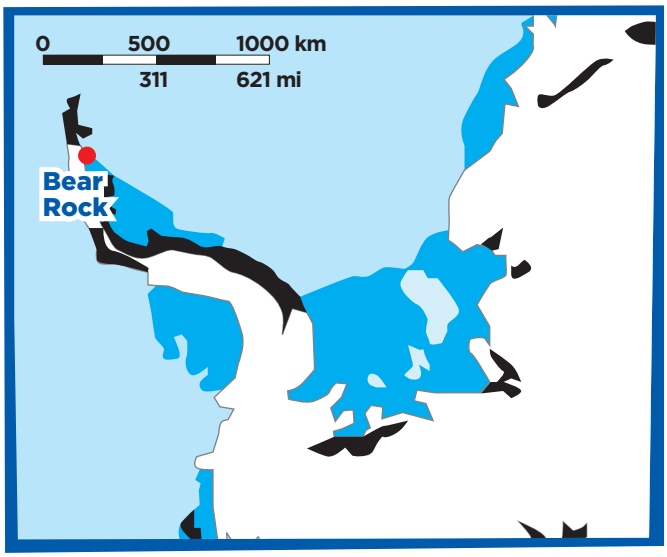


Figure C



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Extension for Grades **4-6** | Content Areas **Math & ELA**

Can You Waddle Like An Adélie Penguin?

ESSENTIAL QUESTION

How does the speed of simulating waddling or walking like an Adélie penguin compare to the walking speeds of the penguins in Disneynature Penguins?

Materials

- *Activity Sheet: Waddle Race*
- stopwatches
- medium foam ball
- tape
- meter measuring stick

Vocabulary

- plonk
- toboggan
- waddle

WARM UP

Show clips of Adélie penguins walking fast across ice and encourage students to pay attention to how the penguins move. Discuss how movements vary from a quick **waddle**, to **plonking** on their bellies and **tobogganing** or even leaping. Explain that Adélie penguins have short legs and large feet so they need to build up a forward momentum by moving from side-to-side, or waddling, and this allows them to use less energy and keep their balance.

TIME TO WADDLE

Review the stages of *Activity Sheet: Waddle Races* as a class and distribute materials students need to complete the activity in pairs. While students are completing the warm up stages of the activity sheet, mark off ten-meter racing tracks in the room, in the gym or outside for each pair to use for their test runs

WRAP UP

Tell students to discuss why they think they raced faster when they walked or waddled. Ask how did students' speed compare with the Adélie Penguin's speed of 2.5 km/hr (1.6 mi/hr) and if their race times would have been different if they could have plonked, tobogganed or leapt through part of the track. Discuss students' hypotheses and how they could test them.

KEEP GOING

Try plonking and tobogganing:

a) If you live where it snows use a plastic saucer or sled and slide face down on snow slopes.

b) If you live where it hardly ever snows, try sliding belly-down on a water slide.

c) After sliding, walk down the same area and decide which was faster and why.

Teacher Note

1 kilometer = 1000 meters = 100 x 10 meters, so with teacher support, students need to multiply their fastest time (in seconds) by 100 and then divide this number by the number of seconds in one hour (3600) to find their fastest speed in km/hr: Speed (in seconds) X 100 / 3,600 = km/hr

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Activity
GRADES 4-6

WADDLE RACES

NAME _____ DATE _____

Get Ready

Adelie penguins have very short legs and their stride length is approximately one-third their height. To determine you and your partners' penguin stride lengths, measure your height and divide this measure by 3.

STUDENT 1: NAME _____ HEIGHT _____ STRIDE-LENGTH _____

STUDENT 2: NAME _____ HEIGHT _____ STRIDE-LENGTH _____

Warm Up 1

To simulate the short legs of an Adelie penguin, take turns placing a foam ball between your knees. As one student takes a step (keep the ball in place), the other student measures the stride length. Adjust the ball above or below the knees until you get a stride length of approximately one-third your height.

STUDENT 1: BALL BETWEEN KNEES _____ ABOVE KNEES _____ BELOW KNEES _____

STUDENT 2: BALL BETWEEN KNEES _____ ABOVE KNEES _____ BELOW KNEES _____

Warm Up 2

Take turns quickly walking the 10 m (33 ft) track by two movements: by walking (without ball) and by waddling (with ball between legs).

STUDENT 1: WALKING # OF STEPS _____ TIME _____

WADDLING # OF STEPS _____ TIME _____

STUDENT 2: WALKING # OF STEPS _____ TIME _____

WADDLING # OF STEPS _____ TIME _____

Walk/Waddle Race:

Select the movement (regular walk or side-to-side waddling) that was fastest for each person. Position balls correctly between knees.

Take turns timing each other with a stop-watch. Record how much time it took when racing like an Adélie Penguin for the length of the 10 m (33 ft) track.

STUDENT 1: FASTEST TIME _____

STUDENT 2: FASTEST TIME _____

With teacher support, work out your speed in kilometers/hour and compare to the Adélie penguin speed of 2.5 km/hr (1.6 mi/hr).

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6 Adapting To The Antarctic Climate

Antarctica, the home of the Adélie penguins, is considered one of the harshest environments on earth, with temperatures dropping to as low as -112 °F (-80 °C) and strong winds creating blizzard-like conditions. Not only must Adélie penguins adapt to the weather, but they must constantly be aware of natural predators such as leopard seals, killer whales and south polar skuas who will prey not only on eggs and chicks but themselves as well. Despite these tremendous obstacles, Adélie penguins not only survive in Antarctica, but thrive, as scientists recently discovered colonies reaching sizes of 1.5 million individuals from satellite imagery.

Adélie penguins are able to successfully inhabit Antarctica due to physical adaptations that provide them with the necessary tools for survival. In order to combat the low temperatures of Antarctica, Adélie penguins have overlapping feathers that create a surface nearly impenetrable to wind and water. These feathers, along with a thick layer of body fat, provide Adélie penguins with thermal insulation to keep their body temperature regulated. Despite these physical characteristics, Adélie penguins must conserve heat by tucking their flippers close to their bodies while shivering to generate additional heat.

To avoid their natural predators, Adélie penguins also have additional adaptations to aid in their survival. The coloring of Adélie penguins allows them to hide from predators while swimming, with their dark backs blending into the ocean bottom, and their white undersides becoming nearly invisible against the light from the surface. Entering into the water, Adélie penguins work together by diving in pairs or trios to increase their odds of survival.

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Grades 2-3 | Content Areas ELA, Science & Math

Adélie Penguin Surveys

ESSENTIAL QUESTIONS

What information about Adélie penguin survival is important to capture in graphs and infographics? What are things people can do to protect Adélie penguin habitats?

Materials

- *Activity Sheet: Adélie Penguin Surveys*
- *Activity Sheet: Infographic Example*
- butcher paper
- clipboards
- glue
- markers
- pencils
- poster board
- scissors

Vocabulary

- bar graph
- layout
- infographic
- pie chart
- survey
- tally marks

WARM UP

Encourage students to take the point of view of an Adélie penguin as they ask and answer survey questions about how they would survive in Antarctica. Tell students to combine the survey information into a class infographic. Explain that one of the goals of the infographic will be to highlight things people can do to protect Adélie penguin habitats.

CREATING GRAPHS

Provide each student with *Activity Sheet: Adélie Penguin Surveys*. Students in small groups conduct survey 1, 2, 3 or 4 with classmates or other classrooms. Students will transfer data into a table, discuss and then represent the answers in a graph (pictogram, **bar graph** or pie chart) on poster board. To help students understand how the graphs will be used, display and discuss features of an infographic. Use butcher paper for the background of the infographic, follow the example on *Activity Sheet: Infographic Example* and glue graphs in place. Students should add pictures for each graph or insight.

WRAP UP

Display infographics in the room and discuss how the information invites viewers to care about Adélie penguins. Students decide and add to the infographic which way to conserve Adélie habitats they will support. Students who wish to continue gathering data may conduct their own surveys.

Key Infographic features include:

- Visually organized information.
- Focused on main points.
- Contains at least 4 sets of facts, data or information, that are clear, and in order of importance.
- Includes color, shape, size and symbols that lead viewers through the information in a logical way.

How to Conduct Your Own Adélie Penguin Survey

1) Write questions on your topic of interest.
2) Ask the questions.
3) Organize and record tally marks.
4) Show the answers on a graph.
5) Discuss what you learned from the graphs.
6) What are implications or insights?
7) What additional questions do you want to ask?

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Activity
GRADES 2-3

ADÉLIE PENGUIN SURVEYS
SURVEYS 1 AND 2

NAME _____ DATE _____

Directions:

1. In small groups, select a survey, read over the question and take turns conducting the survey with classmates and recording answers with tally marks under each question below.
2. Convert tally marks into a table that records the number of responses for each question.
3. On a piece of scratch paper, turn information from the table into a graph of your choice (pictogram, bar graph, pie chart).
4. Follow guidelines to organize graphs into an infographic.

Survey 1: If you were an Adélie penguin what adaptation would you use to get away from a predator in the ocean?

SURVEYOR NAMES:

_____
_____
_____
_____
_____
_____
_____

A Use a burst of swimming speed (22 mph)

B Leap quickly onto an ice floe

C Be still and rely on my camouflage

D Start swimming in a zig zag pattern

Survey 2: If you were an Adélie penguin what adaptation would you use to get away from a predator on land?

SURVEYOR NAMES:

_____
_____
_____
_____
_____
_____
_____

A Plop onto my belly and toboggan into the water

B Waddle quickly to mix in with a larger group of Adélie penguins.

C Move into the middle of the colony

Organize your data into a table:

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Activity
GRADES 2-3

ADÉLIE PENGUIN SURVEYS
SURVEYS 3 AND 4

NAME _____ DATE _____

Directions:

1. In small groups, select a survey, read over the question and take turns conducting the survey with classmates and recording answers with tally marks under each question below.
2. Convert tally marks into a table that records the number of responses for each question.
3. On a piece of scratch paper, turn information from the table into a graph of your choice (pictogram, bar graph, pie chart).
4. Follow guidelines to organize graphs into an infographic.

Survey 3: If you were an Adélie penguin what is the most important thing you would do to protect your chicks?

SURVEYOR NAMES:

_____
_____
_____
_____
_____
_____
_____

A	B	C	D
Build the nest in the middle of the rookery	Stand guard while my mate forages for food	Let my chicks huddle in a creche of other chicks	Fight skua gulls with my sharp beak

Survey 4: If you were an Adélie penguin what is the most important thing you want people to do to save your habitat?

SURVEYOR NAMES:

_____
_____
_____
_____
_____
_____
_____

A	B	C	D
Plant more trees	Use less energy	Raise funds at school to adopt a penguin	Recycle plastics

Organize your data into a table:

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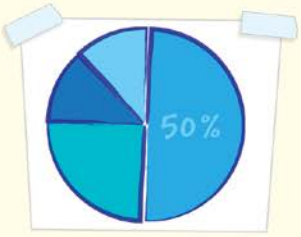
Activity
GRADES 2-3

INFOGRAPHIC EXAMPLE

If we were Adélie Penguins...

SURVEY 1 How we would escape a predator in the ocean:

(Insights and observations)



SURVEY 2 How we would escape a predator on land:

(Insights and observations)

SURVEY 3 How we would protect our chicks:

(Insights and observations)

SURVEY 4 How people could save our habitat:

Have students design pictographs or logos to represent what they can do to help save Adélie penguin habitats.

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Grades 4-6 | Content Areas Science, Art, & ELA

Infographics: Show, Don't Tell

ESSENTIAL QUESTIONS

What information about Adélie penguins can you represent (threats, lifecycle, behaviors, habitat, food sources) in an infographic? How does the design of infographics show organization and relationships among Adélie penguin data?

Materials

- computers with internet access (optional)
- Presentation or layout software for creating digital infographics
- large poster board or butcher paper, markers
- colored pencils
- crayons
- tape or display putty
- *Activity Sheet: Draft an Infographic*
- sticky notes

Vocabulary

- gallery walk
- hierarchy
- infographic
- layout

WARM UP

a) Introduce the class to infographics which use text and graphics to communicate complex ideas, organize data and show relationships. Discuss other ways of presenting information visually such as posters which represent one idea and how that compares to an infographic that has one theme with multiple ideas charts, and images.

b) Have students use *Activity Sheet: Draft an Infographic* to analyze an infographic you've displayed for the class. Discuss the layout, the main idea, what catches the students' attention first and why. Ask students why they think the text, symbols, numbers and images are arranged on the page in the way the creator chose and how the layout aligns with the purpose. Lastly, instruct students to use their findings to create a final version of their infographic.

Note

As a stand-alone lesson, researching and making an infographic helps students organize their thinking, focus on a theme and show relationships among data sources. As a folllow-up to other Disneynature **Penguins** lessons, the infographic helps students show what they have learned in a visual way.

CREATING AN INFOGRAPHIC

After brainstorming have students work in small groups to decide on a penguin related topic, conduct research or draw from previous Disneynature **Penguins** lessons and complete *Activity Sheet: Draft an Infographic.* Explain that the activity sheet is designed to help them focus their topic, organize information and create a layout for the display of their infographic.

WRAP UP

Invite students to participate in a gallery walk of their infographics that are posted around the room. Ask students to take notes about each infographic and place sticky notes including their most interesting insights from each. Following the gallery walk, discuss at least one feature that enhanced each infographic as a class.

Key Infographic Concepts to Display

- Visually organized information.
- Focused on main points.
- Contains at least 4 facts, data, information that is clear, and in order of importance.
- Includes color, shape, size and symbols to lead viewers through the information in a logical way.
- References sources of information.

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Activity
GRADES 4-6

DRAFT AN INFOGRAPHIC

NAME _____ DATE _____

Infographic Formats

TIMELINE

PURPOSE:
Visualize history of something or provide a timeframe.

LAYOUT:
- Central line shows span of time.
- Contrasting color on font highlights each event.
- Graphics and short text for each point.

PROCESS

PURPOSE:
Overview of steps.

LAYOUT:
- Numbers show steps.
- Arrows or lines connect to details.
- For a complex process use S or a snake layout.

GEOGRAPHIC

PURPOSE:
For location related data.

LAYOUT:
- Numbers show steps.
- Arrows or lines connect to details.
- For a complex process use S or a snake layout.

COMPARISON

PURPOSE:
Consider different POV or show differences and similarities.

LAYOUT:
- Split down the middle.
- Side 1 vs side 2.
- Use brighter color for option you prefer.
- Contrast background colors.

MIND MAP/WEB

PURPOSE:
How items are related to core concept.

LAYOUT:
- Oval in middle with bright color.
- Lines radiate to smaller ovals with varying. sizes of colors based on importance.

HIERARCHY

PURPOSE:
Pyramid or Inverted Pyramid.

LAYOUT:
- From not important to mid-level to details.
- From least important to mid-level to most important.

Draft your infographic

1. Write topic and title.

2. Gather data, conduct research.

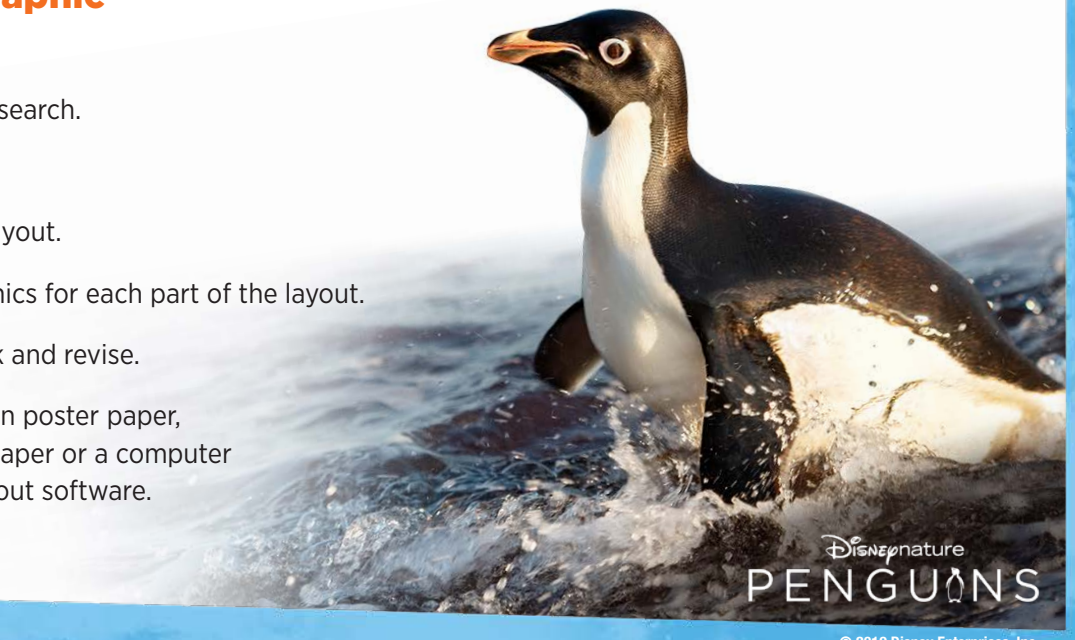
3. Select format.

4. Sketch a draft of your layout.

5. Sketch in text and graphics for each part of the layout.

6. Peer check for feedback and revise.

7. Create the infographic on poster paper, a long strip of butcher paper or a computer with presentation or layout software.



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Glossary

Acoustic The silencing, absorbing or echoing of sound relating to the sense of hearing.

Adaptation A trait that helps an animal or plant survive in its environment.

Agitated Troubled in mind; disturbed and upset.

Assemblage A collection/gathering of persons or things.

Avant-Garde New or experimental concepts, especially in the arts.

Bar Graph A visual representation of data shown with rectangles to measure differences.

Cairn A heap of stones piled up.

Camouflage A physical adaptation that helps an organism blend in with its environment.

Cartographer A person who makes maps.

Climate The average condition of weather.

Climatologist A scientist who studies climate and/or the earth's weather.

Colony A collective group of any living organism or micro-organim.

Conceptual Model A representation made up of different concepts, or possibilities, to help understand or convey something.

Conservation Planned management and protection of a natural resource.

Continent One of the seven divisions of land on the globe.

Continental Relating to, or a characteristic of a continent — one of the seven land masses of the earth.

Deforestation The process of clearing out forests of their trees and vegetation.

Depot A place for storage.

Dymaxion Map A flat map, or representation, of the earth that shows the continents in correct relative size to each other.

Ecology A branch of science that focuses on the relationship of organisms and their environments.

Estimate To tentatively judge the value, size, worth or significance of something.

Exhibition The public showing of something, often refers to art.

Fledgling A young bird that is still being cared for by its mother or an adult.

Forage To wander, or look, for food.

Freestanding When an object can stand on its own, or own foundation without support.

Globe A spherical representation of the earth.

Global Warming An increase in the Earth's atmospheric and oceanic temperatures, caused by an increase in greenhouse effects.

Gyre A giant circle-shaped oceanic surface current.

Habitat A place where plants and animals have everything they need to survive.

Hierarchy A social ranking of individuals where some are higher or lower than others.

Icosahedron A solid object made up of 20 faces.

Incubation To sit on eggs and keep them warm until they hatch.

Infographic A chart, diagram or illustration that uses graphic elements to present information in a visually striking way.

Krill Small sea organisms that are the primary food for many ocean life forms.

Landfall Reaching of land/the land that is first sighted while on a voyage.

(continued)

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GLOSSARY

Landscape A portion of land/territory that can be viewed in one place at one time.

Layout The plan, design or arrangement of something.

Magnification The enlargement of an object created by looking through a certain lens.

Marine Debris Any human made, solid material that enters the waterways directly through littering, or indirectly via streams, rivers and other bodies of water.

Migration To move from one location or place to another.

Molt The process of shedding hair or feathers.

Monochromatic Consisting of one color or hue.

Mood A conscious state of mind or being.

Navigation The science/act of getting people, ships, animals, planes and vehicles from one place to another.

Pace Rate of movement or progress.

Pemmican A paste made from dried, pounded meat, usually spread on to crackers.

Percussion The beating or playing of an instrument.

Pie Chart A circular chart cut into segments to illustrate frequencies in data.

Polar Relating to, or a characteristic of a geographic pole.

Pollution Environmental contamination.

Polynya An area of open water in ocean surface ice.

Plonk To set down suddenly, often times producing a sound.

Predator An organism (usually an animal) that eats other animals for food.

Prediction Something that is foretold, known or told in advance based on observation or knowledge.

Prey An animal that is food for another animal.

Ratio The relationship in quantity, or size between two or more things.

Rookery The breeding ground of a group of birds, especially penguins.

Scale A distinctive, relative size, extent or degree.

Sea Ice Frozen ice that floats on the ocean surface, formed in the Arctic and Antarctic.

Sea-Level The level of the surface of the sea.

Season One of four periods of the year, associated with weather or a particular activity.

Sledge A strong, heavy sled.

Soundscape A mix of musical, and non-musical, sounds.

Stencil A pattern or design that is used to help recreate the same pattern or design.

Stride To move along with measured steps.

Survey To question someone in order to collect data and information.

Survival The act of living or continuing longer than another person or thing.

Temperate A moderate weather condition, lacking extreme conditions.

Toboggan A long flat-bottomed sled.

Variable Subject to change.

Waddle To walk with short steps swinging the front of the body or arms.

Weather The state of the atmosphere, heat, cold, dryness or wetness

https://www.merriam-webster.com/

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Resources

More information about penguins and Antarctica can be found on the following websites.

ADÉLIE PENGUINS

- **National Geographic Kids - Adélie Penguins:** https://kids.nationalgeographic.com/animals/adelie-penguin/#adelie-penguin-jumping-ocean.jpg
- **National Geographic - Adélie Penguins:** https://www.nationalgeographic.com/animals/birds/a/adelie-penguin/
- **The IUCN Red List - Adélie Penguins:** http://www.iucnredlist.org/details/22697758/0
- **WWF- Adélie Penguins:** https://www.wwf.org.uk/wildlife/adelie-penguins
- **The Animal Diversity Web - Adélie Penguins:** https://animaldiversity.org/accounts/Pygoscelis_adeliae/
- **Arkive - Adélie Penguins:** http://www.arkive.org/Adélie-penguin/pygoscelis-adeliae/
- **SeaWorld – All About Penguins:** https://seaworld.org/animals/all-about/penguins/
- **Penguins World - Penguin Communication:** https://www.penguins-world.com/penguin-communication/
- **The Australian Antarctic Division - Adélie Penguins:** http://www.antarctica.gov.au/about-antarctica/wildlife/animals/penguins/adelie-penguins
- **United States Antarctic Program - Penguin migration:** https://antarcticsun.usap.gov/science/contenthandler.cfm?id=2230

ANTARCTICA

- **The Australian Antarctic Division - About Antarctica:** http://www.antarctica.gov.au/about-antarctica
- **Encyclopedia Britannica - Glaciers and Seas:** https://www.britannica.com/place/Antarctica/Glaciers-and-seas
- **NASA - What is Antarctica?** https://www.nasa.gov/audience/forstudents/k-4/stories/nasa-knows/what-is-antarctica-k4.html
- **History - Winter Solstice:** https://www.history.com/topics/winter-solstice
- **United States Antarctic Program - Facts about Antarctica:** https://antarcticsun.usap.gov/aroundTheContinent/contentHandler.cfm?id=1200
- **Ocean Conservancy - The Differences Between Antarctica and the Arctic:** https://oceanconservancy.org/blog/2016/06/30/poles-apart-the-differences-between-antarctica-and-the-arctic/

ANIMALS OF ANTARCTICA

- **National Geographic - Leopard seals:** https://www.nationalgeographic.com/animals/mammals/l/leopard-seal/
- **Arkive - Leopard Seals:** http://www.arkive.org/leopard-seal/hydrurga-leptonyx/
- **Arkive - South Polar Skua:** http://www.arkive.org/south-polar-skua/stercorarius-maccormicki/
- **Audubon - South Polar Skua:** https://www.audubon.org/field-guide/bird/south-polar-skua
- **Antarctic Bird Studies:** https://books.google.com/books?id=3a3z_Kq--4AC&pg=PA123&lpg=PA123&dq=creche+stage&source=bl&ots=zmtVnuzw9k&sig=SWoGhS5dio-S8wHW9k1y10Za2Uk&hl=en&sa=X&ved=2ahUKEwjM6eT0msDdAhURTt8KHdYLD-KIQ6AEwBnoECAgQAQ#v=onepage&q=creche%20stage&f=false
- **Arkive - Orcas:** http://www.arkive.org/orca/orcinus-orca/
- **The Animal Diversity Web - Orcas:** https://animaldiversity.org/accounts/Orcinus_orca/
- **National Geographic - Elephant Seals:** https://www.nationalgeographic.com/animals/mammals/group/elephant-seals/
- **Arkive - Elephant Seals:** http://www.arkive.org/southern-elephant-seal/mirounga-leonina/

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RESOURCES

GEOGRAPHY

- **Buckminster Fuller Institute - Dymaxion Map:** https://www.bfi.org/about-fuller/big-ideas/dymaxion-world/dymaxion-map
- **NASA Earth Observatory - Maps and images of Earth:** https://earthobservatory.nasa.gov/

WEATHER AND CLIMATE

- **NASA - What's the difference between weather and climate?** https://www.nasa.gov/mission_pages/noaa-n/climate/climate_weather.html
- **National Geographic – Climate Change:** https://www.nationalgeographic.com/environment/climate-change/
- **National Geographic - Causes and Effects of Climate Change (video):** https://video.nationalgeographic.com/video/101-videos/0000015d-3cb1-d1cb-a7fd-fcfd49980000

EXPLORATION OF ANTARCTICA

- **Captain Cook Birthplace Museum:** http://www.captcook-ne.co.uk/ccne/index.htm
- **The British Library - Captains James Cook and Robert Scott:** http://blogs.bl.uk/untoldlives/2016/01/cook-and-scott-antarctic-anniversaries.html
- **Antarctic Guide - Carsten Borchgrevink:** https://antarcticguide.com/about-antarctica/antarctic-history/early-explorers/16carsten-borchgrevink-1898-1900/
- **Discovery Point - History of RRS Discovery:** https://www.rrsdiscovery.com/plan-your-visit/
- **British Antarctic Survey - The Antarctic Treaty Explained:** https://www.bas.ac.uk/about/antarctica/the-antarctic-treaty/the-antarctic-treaty-explained/
- **The Secretariat of the Antarctic Treaty - The Antarctic Treaty:** https://www.ats.aq/e/ats.htm
- **NSF - Antarctic Artists and Writers Program:** https://www.nsf.gov/funding/pgm_summ.jsp?pims_id=503518&org=OPP

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