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FOR EXCELLENCE IN MIAMI-DADE PUBLIC SCHOOLS

2025
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Ideas with IMPACT

SOCIAL SCIENCES

Global Citizenship Learning Series

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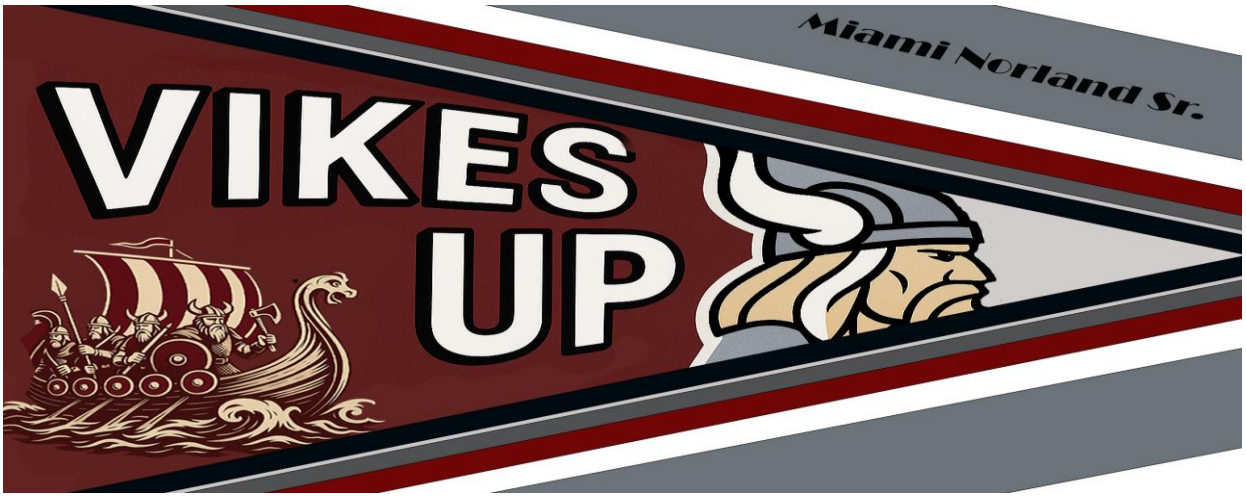

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In 2006, when I first started teaching in Miami Dade County Public Schools, I have been adamant about aspiring to teach about the importance of Creative Writing. I was passionate about helping my students to understand how the art of Creative Writing is valuable in so many ways and that this tool can prove to beneficial in all aspects of live. At Charles R. Drew Middle, I was extended this opportunity. For six years, I had the pleasure of teaching Creative Writing; helping students to see the academic benefits, artistic opportunities, and the therapeutic benefits of Creative Writing. Students learned the importance of "Telling Their Story" and why it was important to learn effective Storytelling Skills. Journaling, photography, Socratic Seminars, and scrapbooking were some of the cornerstones of the Creative Writing class; and it helped to build a welcoming writing community. In fact, this work enabled me to create my first group of "Freedom Writers." Helping students to discover different parts of their being and helping them to share their stories was fulfilling.

In 2012, I transitioned from Charles R. Drew Middle School to Miami Norland Senior High School. I was blessed to have had a principal (Mr. Reginald Lee) who not only believed and supported me; he genuinely supported and respected my research, work, and the work that my students and I did together. The day I stepped into the building of Miami Norland Senior High School for the first time, I became a #PROUDVIKING

I continued my work of teaching students the importance of Creative Writing and helping them to create authentic Creative Writing pieces. Students quickly learn that Creative Writing is storytelling; and to be effective writers, capable of sharing their stories, they have to be willing to "trust the process," to not give up, to learn from mistakes, to take risks, and to try to complete difficult tasks. Working with my students, at Miami Norland Senior High School, enabled me to continue to "Write Myself Into Existence!" When I stepped foot in the building of Miami

Norland Senior High School, I started conducting research and learning about Norse Mythology and the Viking Period. It meant a lot to me to not only learn the history of my school, but to learn about the school mascot that represents my school. Not only did I learn about the Norse people and the Vikings, but I also learned about the spirit of the Miami Norland Senior High School Vikings and what it means to embody the spirit of the Vikings of Miami Norland Senior High School. For the past 13 years, I have been doing this work with my whole heart. This was the birth of the "Viking Freedom Writers."

I have been doing the work of helping students to learn about themselves and to share their stories for over a decade; for this reason, I decided to challenge myself; so that I would be able to challenge my students. I decided to create this project, "Developing an Explorer's Mindset-Global Citizenship Learning Series" to encourage my students to learn about the world around them using the National Geographic "An Explorer's Mindset" Framework. My goal in my Creative Writing classes is to move forward to not only helping students to learn about themselves and to share their stories, but to explore the world around them, and to share those stories as well. Before I could ask my students to "lean into the discomfort," to continue to "trust the process," to remain steadfast and to not give up, to continue to learn from mistakes, to continue to take risks, and to continue to try to complete difficult tasks, I had to challenge myself first. So, I was invited to apply to three separate fellowships that would enable me to learn how to develop "an explorer's mindset, to challenge myself, and to grow. The curriculum guide serves to share my experiences of completing my field study work developing an explorer's mindset during three fellowships (NEA Foundation Global Learning Fellowship, National Geographic Grosvenor Teacher Fellowship, and Polar STEAM Fellowship), and best practices of

using the National Geographic Explorer's Mindset Framework within the classroom, the school community, and the world.

NEA Foundation Global Learning Fellowship-Costa Rica

Building community is a part of providing a quality education for students because it demonstrates the importance of learning about oneself, others around us, and how that learning should be shared and used to benefit everyone were sentiments that were demonstrated throughout the NEA Foundation Global Learning Fellowship field study. Learning more about the 17 UN Sustainable Goals through experiential learning and about the culture of Costa Rica was revolutionary for me. I really appreciated having an itinerary of the filed study before arriving in Costa Rica and being provided constant updates as the days progresses throughout the field study. I also enjoyed being provided with more knowledge as we participated in different excursions. More importantly, I loved that we were being provided opportunities to participate in experiential learning experiences; this helped the learning to stick and to kickstart ideas of how to implement projects in my classroom for the upcoming school year.

I loved visiting the school sites, working with the students, and the workshop at the University for Peace. Having an opportunity of seeing how the schools were serving students and being able to engage with the students was eye-opening. I was placed in an exceptional learning classroom. I really enjoyed how the teacher was using manipulatives, music, video, and song to get the students involved and to stay engaged; I appreciated the class size as well. The workshop helped me to dig deeper and to reflect about additional lessons, activities, or events that I could implement at my school site for the upcoming year. More importantly, it helped me to think about how I am demonstrating peacebuilding in my classroom and in my life, daily.

National Geographic Grosvenor Teacher Fellowship-Iceland

When I learned that I had been selected as a 2025 National Geographic Grosvenor Teacher Fellow and that I was being granted an opportunity to go to Iceland, a place where the Norse and Viking people had occupied and settled, I knew that it was going to be a transformational experience. For this reason, I wanted to invite my Norland Viking Family to experience this with me and an opportunity to "Wave Our Flag." And just like that…I did.

Before my expedition to Iceland, my students and I participated in a lesson that allowed us to learn more about Iceland together. This lesson resulted with the students completing 3-2-1-Charts for me to complete; 3-things that I should look for, 2- activities that I should do, and 1-question that I should ask Icelandic people. Throughout my expedition in Iceland, I worked to complete the 3-2-1 charts. I recorded videos of me completing tasks, I Facetimed students, and fellow colleagues when I arrived at :hot sites," and I posted my journey so that students, their families, and fellow colleagues could follow my expedition.

I also really appreciated that the field experience helped me to learn how to pause and to pay attention to nature and to learn how to study animals in their natural habitats. Visiting the parks, going on hikes, and the zodiac really piqued my curiosity. It motivated me to want to learn more about nature and animals, to be more open to exploring the world around me. More importantly, these excursions inspired me a lot and helped me to brainstorm and to start planning lessons for the upcoming year. While in Iceland, I started planning for my students to have a couple of field trips to National Parks within my area to provide them with opportunities to be curious and to explore; and I am excited about a Poetry Unit focused on volcanoes; this relates to the field study in Costa Rica and in Iceland. Students will be able to view the photos that I took during my time in Costa Rica and in Iceland of the volcanoes, learn or review how volcanoes are

formed, and then they will write poems as if they are volcanoes or write a poem about the formation of volcanoes. I am also working on securing materials or funding to provide students with opportunities to build their own volcanoes.

Polar STEAM Fellowship-Greenland

Polar STEAM, which stands for Science, Technology, Engineering, Arts, and Math, is an NSF-funded project that integrates and enhances two long-standing U.S. National Science Foundation (NSF) programs: the Polar Educators program and the Antarctic Artists and Writers program and facilitates virtual and deployment collaborations with scientists conducting research in the polar regions. Since I am not a scientist or a science teacher, this field study challenged me the most, mentally. Being about to learn new science content, simultaneously while you are conducting a research experiment was difficult for me. Additionally, I had to create and plan ways of how to disseminate this information using my discipline of Creative Writing. I was collaborating with an interdisciplinary team; so new knowledge was presented all the time, in different ways. Nevertheless, being a part of an actual research team on an actual research cruise was such an "out of body" experience for me.

More importantly, the landscapes in Greenland were breathtaking. I also felt nostalgic about thinking to myself, "Viking once lived here." My mind was running a mile a minute, and it was so exciting to be up close and personal to glaciers, icebergs, and the fjords. Seeing polar bears and whales in their natural habitat was mindboggling. I remained mesmerized at the scenery and being able to learn about the history, to collect samples, to study those samples, and to contribute to research was an extraordinary experience. I truly felt as if I was contributing to research and it felt amazing being a part of something bigger that will serve to improve our quality of life, to save animals, and to help to sustain our world for years to come.

Project Description Objectives:

- Students will learn about the National Geographic Explorer Mindset Framework
- Students will learn effective Storytelling Skills
- Students will learn how to take effective photos
- Students will learn how to use binoculars
- Students will learn the “observe and report” strategy
- Demonstrate critical reading and writing skills.
- Analyze primary and secondary texts both orally and in writing.
- Use writing as a tool for inquiry into personal, social, historical, cultural, and other themes and topics within the humanities.
- Complete an intensive writing course of assignments demonstrating college level skills.
- Close reading of texts from several critical approaches, including formalist, biographical, cultural, historical, gender, and others.
- Develop refined research strategies, adaptation of thesis statements, and shaped written responses considering chosen critical approaches (lenses), application in a wider global context to student writing
- Examine text from the standpoint of a given genre’s elements and conventions as they represent a broader human strategy for finding. meaning and pursuing universal goals.
- Students will be a demonstration of positivity and productivity of public education.
- Students will educate their peers and other stakeholders about societal issues.
- Students will be educated and empowered to create positive changes in their community and surrounding areas.
- Students will communicate and network with parents and the community to create solutions to societal issues.

STANDARDS:

Personal Responsibility Standards

HE.912. R.2.1 Describe the importance of leadership skills in the school and the community.

HE.912. R.2.2 Analyze different perspectives to inform responsible decision-making.

HE.912. R.2.3 Formulate a plan to attain a personal goal that addresses strengths, needs, and risks.

Research Standards

ELA.12. C.4.1 Conduct research on a topical issue to answer a question and synthesize information from a variety of sources.

ELA.11. C.4.1 Conduct literary research to answer a question, refining the scope of the question to align with interpretations of texts and synthesizing information from primary and secondary sources.

ELA.10. C.4.1 Conduct research to answer a question, refining the scope of the question to align with findings and synthesizing information from multiple reliable and valid sources.

ELA.9. C.4.1 Conduct research to answer a question, drawing on multiple reliable and valid sources and refining the scope of the question to align with findings.

ELA.8. C.4.1 Conduct research to answer a question, drawing on multiple reliable and valid sources and generating additional questions for further research.

ELA.7. C.4.1 Conduct research to answer a question, drawing on multiple reliable and valid sources and generating additional questions for further research.

ELA.6. C.4.1 Conduct research to answer a question, drawing on multiple reliable and valid sources and refocusing the inquiry when appropriate.

ELA.5. C.4.1 Conduct research to answer a question, organizing information about the topic and using multiple reliable and valid sources.

ELA.4. C.4.1 Conduct research to answer a question, organizing information about the topic, using multiple valid sources.

ELA.3. C.4.1 Conduct research to answer a question, organizing information about the topic from multiple sources.

ELA.2. C.4.1 Participate in research to gather information to answer a question about a single topic using multiple sources.

ELA.1. C.4.1 Participate in research to gather information to answer a question about a single topic.

ELA.K.C.4.1 Recall information to answer a question about a single topic.

Critical Thinking and Problem-Solving Standards

HE.912. R.4.1 Analyze the importance of character and grit to achieve successful outcomes.

HE.912. R.4.2 Generate and apply alternative solutions when solving problems or resolving conflict.

HE.912. R.4.3 Describe ways to anticipate, avoid, or de-escalate conflicts.

Reading Standards

ELA.12. R.2.3 Evaluate an author's choices in establishing and achieving purpose(s).

ELA.6. R.2.3 Analyze authors' purpose(s) in multiple accounts of the same event or topic.

ELA.5. R.2.3 Analyze an author's purpose and/or perspective in an informational text.

ELA.4. R.2.3 Explain an author's perspective toward a topic in an informational text

ELA.12. R.2.4 Compare the development of multiple arguments in related texts, evaluating the validity of the claims, the authors' reasoning, use of the same information, and/or the authors' rhetoric.

ELA.11. R.2.4 Compare the development of multiple arguments on the same topic, evaluating the effectiveness and validity of the claims, the authors' reasoning, and the ways in which the authors use the same information to achieve different ends.

ELA.12. R.3.2 Paraphrase content from grade-level texts.

ELA.12. R.3.4 Evaluate rhetorical choices across multiple texts.

ELA.11. R.3.4 Evaluate an author's use of rhetoric in text.

ELA.10. R.3.4 Analyze an author's use of rhetoric in a text.

Writing Standards

ELA.12. C.1.3 Write arguments to support claims based on an in-depth analysis of topics or texts, using valid reasoning and credible evidence from sources, elaboration, and demonstrating a thorough understanding of the subject.

ELA.10. C.1.3 Write to argue a position, supporting claims using logical reasoning and credible evidence from multiple sources, rebutting counterclaims with relevant evidence, using a logical organizational structure, elaboration, purposeful transitions, and maintaining a formal and objective tone.

ELA.9. C.1.3 Write to argue a position, supporting claims using logical reasoning and credible evidence from multiple sources, rebutting counterclaims with relevant evidence, using a logical organizational structure, elaboration, purposeful transitions, and a tone appropriate to the task.

ELA.8. C.1.3 Write to argue a position, supporting at least one claim and rebutting at least one counterclaim with logical reasoning, credible evidence from multiple sources, elaboration, and using a logical organizational structure.

ELA.3. C.1.3 Write opinions about a topic or text, include reasons supported by details from one or more sources, use transitions, and provide a conclusion.

ELA.2. C.1.3 Write opinions about a topic or text with reasons supported by details from a source, use transitions, and provide a conclusion.

ELA.1. C.1.3 Write opinions about a topic or text with at least one supporting reason from a source and a sense of closure.

ELA.K.C.1.3 Using a combination of drawing, dictating, and/or writing, express opinions about a topic or text with at least one supporting reason.

Creating and Collaborating Standards

ELA.12. C.5.1 Design and evaluate digital presentations for effectiveness.

ELA.11. C.5.1 Create digital presentations to improve the experience of the audience.

ELA.10. C.5.1 Create digital presentations to improve understanding of findings, reasoning, and evidence.

ELA.9. C.5.1 Create digital presentations with coherent ideas and a clear perspective.

ELA.8. C.5.1 Integrate diverse digital media to emphasize the relevance of a topic or idea in oral or written tasks.

Speaking Standards (Oral)

ELA.4. C.2.1 Present information orally, in a logical sequence, using nonverbal cues, appropriate volume, and clear pronunciation.

ELA.3. C.2.1 Present information orally, in a logical sequence, using nonverbal cues, appropriate volume, and clear pronunciation.

ELA.2. C.2.1 Present information orally using complete sentences, appropriate volume, and clear pronunciation.

ELA.1. C.2.1 Present information orally using complete sentences and appropriate volume.

ELA.K.C.2.1 Present information orally using complete sentences.

School:	Miami Norland Senior High School	Subject:	Creative Writing	Teacher:	Dr. Symonette	Lesson Plan Date:	TBD

PRE-PLANNING

OBJECTIVE	**BENCHMARK**:
• Students will learn about the National Geographic Explorer Mindset Framework • Students will develop a question of inquiry related to nature or animals. • Students will use tools (journal, pen, camera, and binoculars to observe as aspect of nature or an animal.	**Standard/s-:** Research Standard ELA.12. C.4.1 Conduct research on a topical issue to answer a question and synthesize information from a variety of sources. Standard 4 HE.912. R.4: Critical Thinking and Problem Solving

ASSESSMENT:

Students will produce a Creative Writing piece to demonstrate their learning about an aspect of nature or an animal that they observed during a school walking tour.

ESSENTIAL QUESTION:

- How does developing an explorer's mindset help us to become better citizens of our world?

HIGHER ORDER QUESTIONS :(3-5)

- Identify a text -to -the world, text- to- text, or a text- to –self-connection from a National Geographic Article.
- What questions have developed in your mind as you read the text?
- How does the content in this article compare or contrast to your environment?

LESSON CYLCE

	TIME Approximate
BELLRINGER: Students will view: **VIDEO:** National Geographic Video Students will complete: -A writing response pertaining to the National Geographic Video (Science and Storytelling) -Share- Out Activity	*10 min*
INTRODUCTION	*5-10 min*
• Review CBC • Review Bell Ringer (Share Out) Focus Lesson-Developing an Explorer's Mindset -Reflection: What are some aspects of the world that pique your curiosity?	

	• Read/Discuss Text: National Geographic Article. • Socratic Seminar • Reflection	
	MODELING *"I DO"*	*10-15 min*
	• Teacher will begin modeling by presenting the National Geographic Explorer Mindset Framework • Teacher will discuss the attitudes, skills, and knowledge attributes of the Explorer's Mindset Framework • Teacher will discuss what attribute resonated with them and explain why	
	GUIDED PRACTICE *"WE DO"*	*15-25 min*
	• Teacher will continue to read and discuss the National Geographic Explorer Mindset Framework • -Students will be placed in groups of 3-5 to discuss the National Geographic Explorer Mindset Framework -Students will be required to identify one attitude, one skill, and one knowledge attribute that resonates with the group and to explain why - Perform checks for understanding. • Students will share with the class	
	INDEPENDENT PRACTICE *"YOU DO"* • Students will be required to identify an aspect of nature or an animal that they have questions about. • Students will participate in a walking tour of the school: 1. Students will identify an object in nature or an animal to observe (Students will take notes about the things that they observe.) 2. Students will be required to take photos 3. Students will be required to record video	*15-35 min*
	CLOSURE	*10 min*
	• Students will share out with the class. • Students will participate in a Roses & Thorns Activity.	
	HOME-LEARNING	
	• Students will write in their personal journals. • Students will compose a Creative Writing piece to demonstrate their learning about an aspect of nature or an animal that they observed during the school walking tour.	


If you want peace, work for peace. Si quieres la paz, trabaja por la paz.
UPEACE
University for Peace
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Parque Nacional
Volcán Irazú
Sector Cráteres
Irazú Volcano
National Park
Istarú: Cerro del temblor y el trueno.
Istarú: Tremble and thunder Hill
MINAE
SINAC
ProParques


Cráter Principal del volcán Irazú
Irazú Main Crater
CNE
COSTA RICA
SINAC
ACC
VOLCÁN
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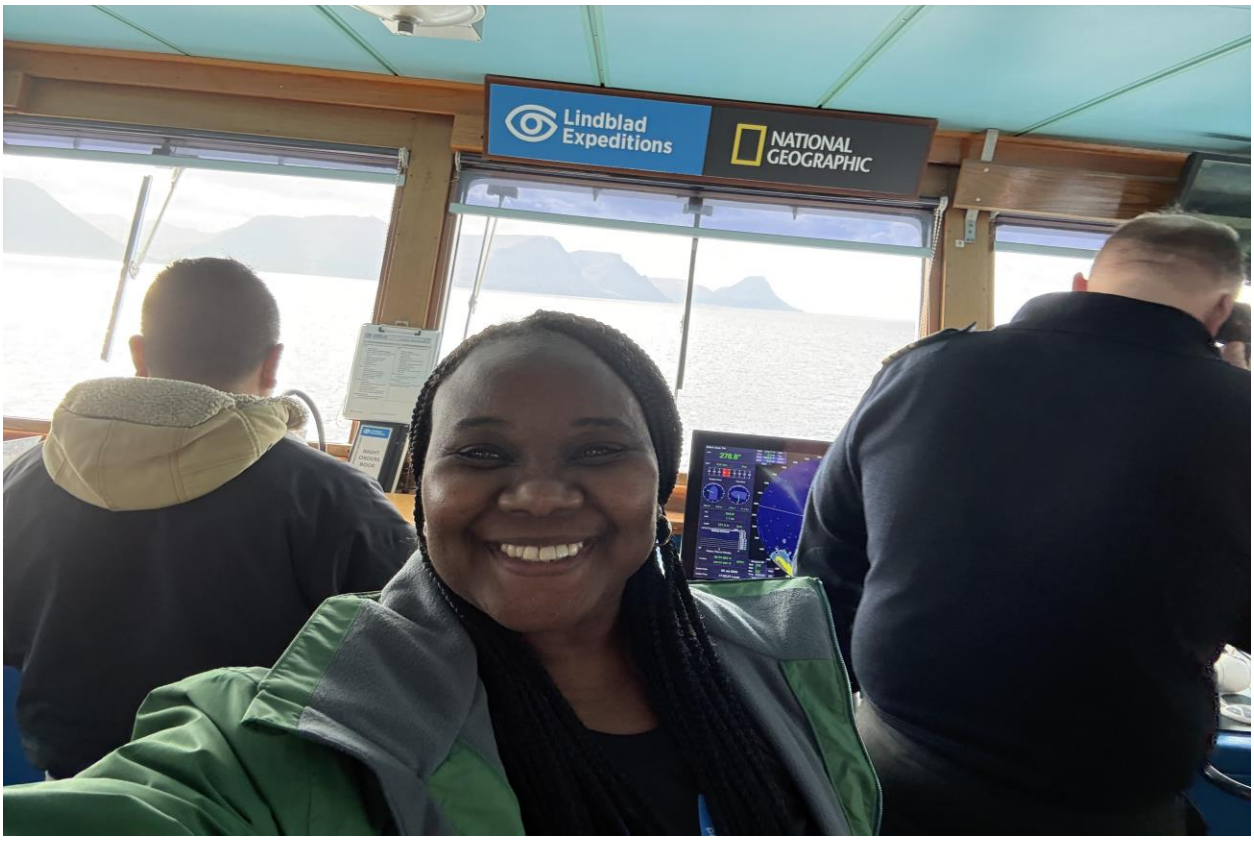
CINE
VIDEO
FOTO
RETRATO

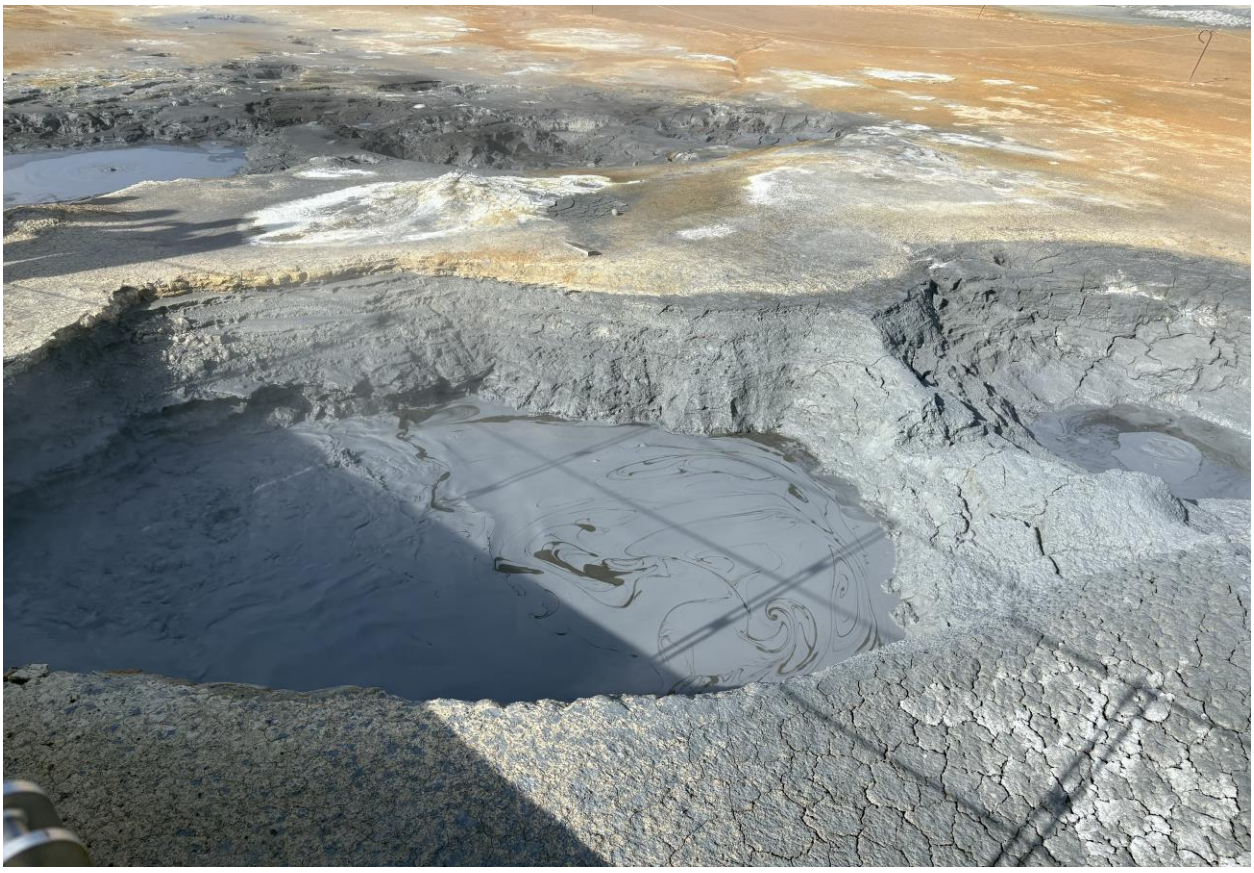

NATIONAL GEOGRAPHIC EXPLORER
NASSAU


Lindblad Expeditions
NATIONAL GEOGRAPHIC


VIKES
UP

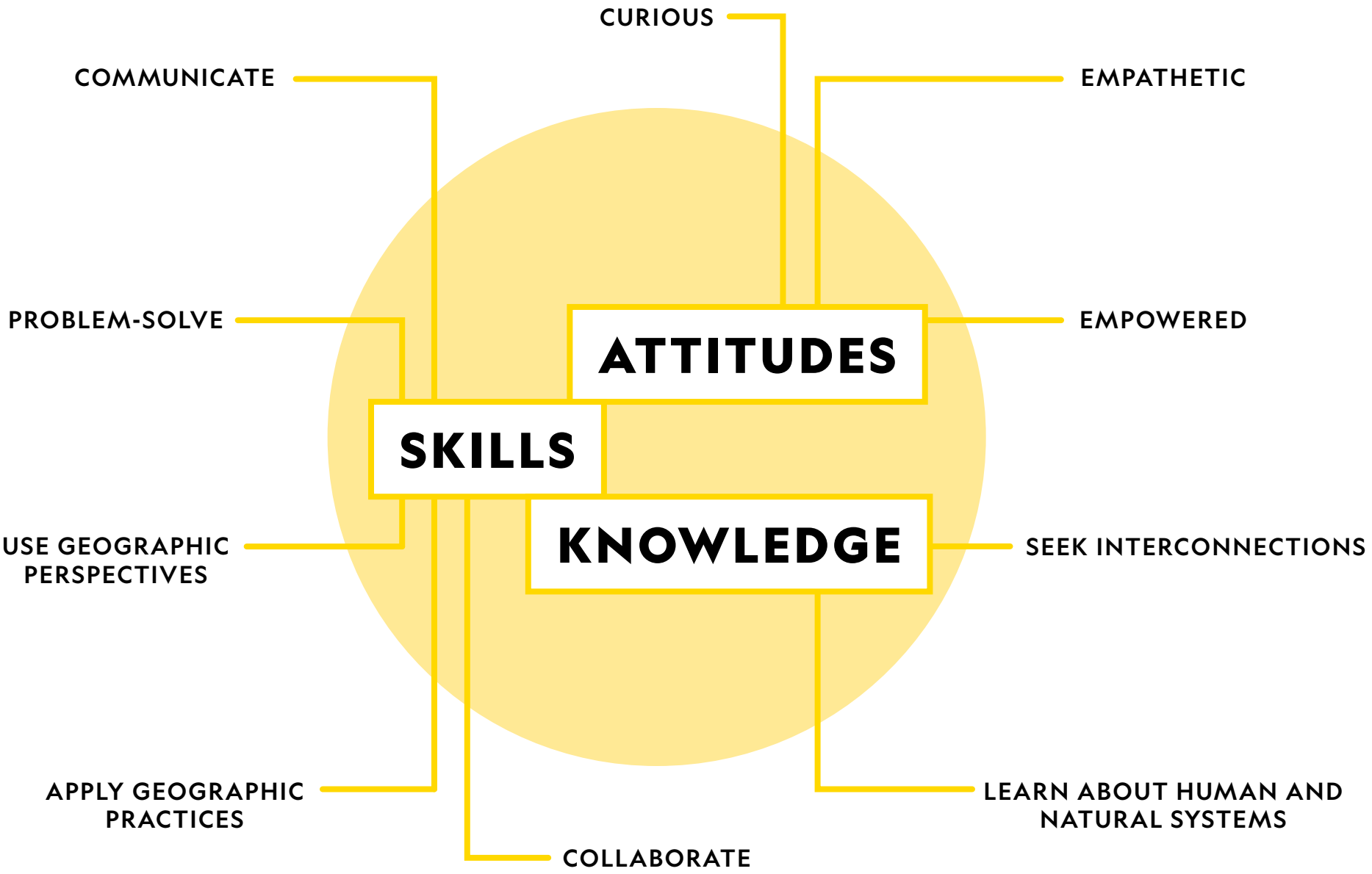

Grimsey
Sydney 16317 km
Tokyo 8494 km
1949 km
VIKES
UP
ARCTIC
CIRCLE


VIGUR ISLAND
VIGUR ISLAND




NATIONAL GEOGRAPHIC


EXPEDITIONS
BESTO


CURIOUS
COMMUNICATE
EMPATHETIC
PROBLEM-SOLVE
ATTITUDES
EMPOWERED
SKILLS
KNOWLEDGE
USE GEOGRAPHIC PERSPECTIVES
SEEK INTERCONNECTIONS
APPLY GEOGRAPHIC PRACTICES
LEARN ABOUT HUMAN AND NATURAL SYSTEMS
COLLABORATE

SKILLS

COMMUNICATE
Explorers are storytellers who communicate about their work through a variety of methods (scientific, academic, and narrative) and media. Explorers communicate to inspire others to protect and sustain the wonder of our world.

PROBLEM-SOLVE
Explorers seek solutions to problems to protect and sustain the wonder of our world. Explorers are capable decision-makers, able to identify alternatives and weigh trade-offs to make well-reasoned decisions based on factual knowledge. Explorers pursue bold ideas and persist in the face of challenges.

USE GEOGRAPHIC PERSPECTIVES
Explorers use geographic perspectives (including geological, ecological, historical, economical, political, cultural and spatial perspectives) at different scales (local, regional, and global) as they observe, analyze, visualize, and model spatial patterns, processes, and change over time of the human and natural systems.

APPLY GEOGRAPHIC PRACTICES
Explorers apply geographic practices such as mapping, inquiry, and citizen science to explore geographic questions, investigate, examine, assess problems. Explorers think critically as they create new insights and understanding.

COLLABORATE
Explorers engage with the communities in which they work. They create and foster a global community, supporting DEI across fields, countries, and cultures. They include diverse stakeholders, work productively and inclusively to achieve goals toward a sustainable future.

ATTITUDES

CURIOUS
Explorers are curious and engage with the world around them. Explorers observe, document, and ask questions about where things are and why they are there.

EMPATHETIC
Explorers care about other people, cultural resources, and the environment. They are respectful and committed to making the world a better place. They value and understand their own and others' points of view, acknowledging differences.

EMPOWERED
Explorers recognize their ability to protect people, cultural resources, and the environment. Explorers are leaders who utilize their knowledge, confidence, means, and ability to take action and make a difference.

KNOWLEDGE

SEEK INTERCONNECTIONS
Explorers strive to recognize and understand the intricate and interconnected systems of the changing planet we live on. They examine how humans coexist and interact with the environment and the ways places and people impact each other.

LEARN ABOUT HUMAN AND NATURAL SYSTEMS
Explorers become informed as they study the physical properties of the planet, the human and natural systems spread across it, and the diverse creatures we share our world with.

EXPLORER MINDSET LEARNING FRAMEWORK

The Explorer Mindset Framework is intended to define the unique attitudes, skills, and knowledge NGS believes it takes to develop an Explorer mindset - as characterized by its Explorers - and It articulates the competencies and practices that show the mindset in action.

		How does it manifest in this video
ATTITUDES *Explorers wonder about the world*	**CURIOUS** - Explorers engage with the world around them. Explorers observe, document, and ask questions about where things are and why they are there.	
	EMPATHETIC - Explorers care about other people, cultural resources, and the environment. They are respectful and committed to making the world a better place. They value and understand their own and others' points of view, acknowledging differences.	
	EMPOWERED - Explorers recognize their ability to protect people, cultural resources, and the environment. Explorers are leaders who utilize their knowledge, confidence, means, and ability to take action and make a difference.	
SKILLS *Explorers learn by doing*	**USE GEOGRAPHIC PERSPECTIVES** - Explorers use perspectives (including geological, ecological, historical, economical, political, cultural and spatial perspectives) at different scales (local, regional, and global) as they observe, analyze, visualize, and model spatial patterns, processes, and change over time of the human and natural systems.	
	APPLY GEOGRAPHIC PRACTICES - Explorers use practices such as mapping, inquiry, and citizen science to explore geographic questions, investigate, examine, assess problems. Explorers think critically as they create new insights and understanding.	

EXPLORER MINDSET LEARNING FRAMEWORK

	COLLABORATE - Explorers engage with the communities in which they work. They create and foster a global community, supporting DEI across fields, countries, and cultures. They include diverse stakeholders, work productively and inclusively to achieve goals toward a sustainable future.	
	PROBLEM SOLVE - Explorers seek solutions to problems to protect and sustain the wonder of our world. Explorers are capable decision-makers, able to identify alternatives and weigh trade-offs to make well-reasoned decisions based on factual knowledge. Explorers pursue bold ideas and persist in the face of challenges.	
	COMMUNICATE - Explorers are storytellers who communicate about their work through a variety of methods (scientific, academic, and narrative) and media. Explorers communicate to inspire others to protect and sustain the wonder of our world.	
KNOWLEDGE *Explorers build geographic knowledge*	**LEARN ABOUT HUMAN AND NATURAL SYSTEMS -** Explorers become informed as they study the physical properties of the planet, the human and natural systems spread across it, and the diverse creatures we share our world with.	
	SEEK INTERCONNECTIONS - Explorers strive to recognize and understand the intricate and interconnected systems of the changing planet we live on. They examine how humans coexist and interact with the environment and the ways places and people impact each other.	

ARTICLE

343

Plate Tectonics and Volcanic Activity

A volcano is a feature in Earth's crust where molten rock is squeezed out onto Earth's surface. Along with molten rock, volcanoes also release gases, ash and solid rock.

GRADES
9 - 12+

SUBJECTS
Earth Science, Geology, Geography, Physical Geography

1/38

PHOTOGRAPH

Shishaldin

A volcano is a feature of Earth's crust that allows molten rock from beneath the crust to reach the surface. This gorgeous volcanic cone is Shishaldin, a volcano on Unimak Island, Alaska, United States.

PHOTOGRAPH BY J. BAYLOR ROBERTS, NATIONAL GEOGRAPHIC

BACKGROUND INFO VOCABULARY

Learning materials

MAPS

- National Geographic MapMaker: Volcanoes Around the World
- National Geographic MapMaker: Significant Volcanic Eruptions

Print

A volcano is a feature in Earth's crust where molten rock is squeezed out onto the Earth's surface. This molten rock is called magma when it is beneath the surface and lava when it erupts, or flows out, from a volcano. Along with lava, volcanoes also release gases, ash and solid rock.

Volcanoes come in many different shapes and sizes but are most commonly cone-shaped hills or mountains. They are found throughout the world, forming ridges deep below the sea surface and mountains that are thousands of meters high. About 1,900 volcanoes on Earth are considered active, meaning they show some level of occasional activity and are likely to erupt again. Many others are dormant volcanoes, showing no current signs of exploding but likely to become active at some point in the future. Others are considered extinct.

Volcanoes are incredibly powerful agents of change. Eruptions can create new landforms, but can also destroy everything in their path. About 350 million people (or about one out of every 20 people in the world) live within the "danger range" of an active volcano. Volcanologists closely monitor volcanoes so they can better predict impending eruptions and prepare

nearby populations for potential volcanic hazards that could endanger their safety.

Plate Tectonics

Most volcanoes form at the boundaries of Earth's tectonic plates. These plates are huge slabs of Earth's crust and upper mantle, which fit together like pieces of a puzzle. These plates are not fixed, but are constantly moving at a very slow rate. They move only a few centimeters per year. Sometimes, the plates collide with one another or move apart. Volcanoes are most common in these geologically active boundaries.

The two types of plate boundaries that are most likely to produce volcanic activity are divergent plate boundaries and convergent plate boundaries.

Divergent Plate Boundaries

At a divergent boundary, tectonic plates move apart from one another. They never really separate because magma continuously moves up from the mantle into this boundary, building new plate material on both sides of the plate boundary.

The Atlantic Ocean is home to a divergent plate boundary, a place called the Mid-Atlantic Ridge. Here, the North American and Eurasian tectonic plates are moving in opposite directions. Along the Mid-Atlantic Ridge, hot magma swells upward and becomes part of the North American and Eurasian plates. The upward movement and eventual cooling of this buoyant magma creates high ridges on the ocean floor. These ridges are interconnected, forming a continuous volcanic mountain range nearly 60,000 kilometers (37,000 miles)—the longest in the world.

Another divergent plate boundary is the East Pacific Rise, which separates the massive Pacific plate from the Nazca, Cocos and North American plates.

Vents and fractures (also called fissures) in these mid-ocean ridges allow magma and gases to escape into the ocean. This submarine volcanic activity accounts for roughly 75 percent of the average annual volume of magma that reaches Earth's crust. Most submarine volcanoes are found on ridges thousands of meters below the ocean surface.

Some ocean ridges reach the ocean surface and create landforms. The island of Iceland is a part of the Mid-Atlantic Ridge. The diverging Eurasian and North American plates caused the eruptions of Eyjafjallajökull (in 2010) and Bardarbunga (in 2014). These eruptions were preceded by significant rifting and cracking on the ground surface, which are also emblematic of diverging plate movement.

Of course, divergent plate boundaries also exist on land. The East African Rift is an example of a single tectonic plate being ripped in two. Along the Horn of Africa, the African plate is tearing itself into what is sometimes called the Nubian plate (to the west, including most of the current African plate) and the Somali plate (to the east, including the Horn of Africa and the western Indian Ocean). Along this divergent plate boundary are volcanoes such as Mount Nyiragongo, in the Democratic Republic of Congo, and Mount Kilimanjaro in Kenya.

Convergent Plate Boundaries

At a convergent plate boundary, tectonic plates move toward one another and collide. Oftentimes, this collision forces the denser plate edge to subduct, or sink beneath the plate edge that is less dense. These subduction zones can create deep trenches. As the denser plate edge moves downward, the pressure and temperature surrounding it increases, which causes changes to the plate that melt the mantle above, and the melted rock rises through the plate, sometimes reaching its surface as part of a volcano. Over millions of years, the rising magma can create a series of volcanoes known as a volcanic arc.

The majority of volcanic arcs can be found in the Ring of Fire, a horseshoe-shaped string of about 425 volcanoes that edges the Pacific Ocean. If you were to drain the water out of the Pacific Ocean, you would see a series of deep canyons (trenches) running parallel to corresponding volcanic islands and mountain ranges. The Aleutian Islands, stretching from the U.S. state of Alaska to Russia in the Bering Sea, for instance, run parallel to the Aleutian Trench, formed as the Pacific plate subducts under the North American plate. The Aleutian Islands have 27 of the United States' 65 historically active volcanoes.

The mighty Andes Mountains of South America run parallel to the Peru-Chile Trench. These mountains are continually built up as the Nazca plate subducts under the South American plate. The Andes Mountains include the world's highest active volcano, Nevados Ojos del Salado, which rises to 6,879 meters (over 22,500 feet) along the Chile-Argentina border.

Hot Spots

For many years, scientists have been trying to explain why some volcanoes exist thousands of kilometers away from tectonic plate boundaries.

The dominant theory, framed by Canadian geophysicist J. Tuzo Wilson in 1963, states that these volcanoes are created by exceptionally hot areas fixed deep below Earth's mantle. These hot spots are able to independently melt the tectonic plate above them, creating magma that erupts onto the top of the plate.

In hot spots beneath the ocean, the tectonic activity creates a volcanic mound. Over millions of years, volcanic mounds can grow until they reach sea level and create a volcanic island. The volcanic island moves as part of its tectonic plate. The hot spot stays put, however. As the volcano moves farther from the hot spot, it goes extinct and eventually erodes back into the ocean. A new and active volcano develops over the hot spot, creating a continuous cycle of volcanism—and a string of volcanic islands tracing the tectonic plate's movement over time.

For Wilson and many scientists, the best example of hot spot volcanism is the Hawaiian Islands. Experts think this volcanic chain of islands has been forming for at least 70 million years over a hot spot underneath the Pacific plate. Of all the inhabited Hawaiian Islands, Kauai is located farthest from the presumed hot spot and has the most eroded and oldest volcanic rocks, dated at 5.5 million years. Meanwhile, on the "Big Island" of the U.S. state of Hawai'i—still fueled by the hot spot—the oldest rocks are less than 0.7 million years old and volcanic activity continues to create new land.

Hot spots can also create terrestrial volcanoes. The Yellowstone Supervolcano, for instance, sits over a hot spot in the middle of the North American plate, with a series of ancient calderas stretching across southern

part of the U.S. state of Idaho. The Yellowstone hot spot fuels the geysers, hot springs and other geologic activity at Yellowstone National Park, Wyoming, United States.

While some data seem to prove Wilson's hot spot theory, more recent scientific studies suggest that these hot spots may be found at more shallow depths in the planet's mantle and may migrate slowly over geologic time rather than stay fixed in the same spot.

Principal Types of Volcanoes

While volcanoes come in a variety of shapes and sizes, they all share a few key characteristics. All volcanoes are connected to a reservoir of molten rock, called a magma chamber, below the surface of Earth. When pressure inside the chamber builds up, the buoyant magma travels out a surface vent or series of vents, through a central interior pipe or series of pipes. These eruptions, which vary in size, material and explosiveness, create different types of volcanoes.

Stratovolcanoes

Stratovolcanoes are some of the most easily recognizable and imposing volcanoes, with steep, conic peaks rising up to several thousand meters above the landscape. Also known as composite volcanoes, they are made up of layers of lava, volcanic ash, and fragmented rocks. These layers are built up over time as the volcano erupts through a vent or group of vents at the summit's crater.

Mount Rainier is an impressive stratovolcano that rises 4,392 meters (14,410 feet) above sea level just south of the U.S. city of Seattle, Washington. Over the past half million years, Mount Rainier has produced a series of alternating lava eruptions and debris eruptions. These eruptions have given Mount Rainier the classic layered structure and conic shape of a composite volcano. The volcano's peak has also been carved down by a series of glaciers, giving it a craggy and rugged shape.

Volcan de Fuego and Acatenango are a pair of stratovolcanoes that stand more than 3,700 meters (12,000 feet) above sea level near Antigua,

Guatemala. While the volcanoes are considered twins because of their similar shape and size, they are made of different types of lava and have distinct eruption histories. While Acatenango erupts infrequently today, Fuego is considered to be the most active volcano in Central America, erupting more than 60 times since 1524.

Shield Volcanoes

Shield volcanoes are built almost exclusively of lava, which flows out in all directions during an eruption. These flows, made of highly fluid basalt lava, spread over great distances and cool in thin layers. Over time, the layers build up and create a gently sloping dome that looks like a warrior's shield. While they are not as eye-catching as their steep stratovolcano cousins, shield volcanoes are often much larger in volume because of their broad, expansive structure.

Shield volcanoes make up the entirety of the Hawaiian Islands. The Kilauea and Mauna Loa shield volcanoes, located on the "Big Island" of Hawai'i, rise from the ocean floor more than 4,500 meters (15,000 feet) below sea level. The summit of Mauna Loa stands at 4,168 meters (13,677 feet) above sea level and more than 8,500 meters (28,000 feet) above the ocean floor, making it the world's largest active volcano—and, by some accounts, the world's tallest mountain. The smaller volcano, Kilauea, has been erupting continuously since 1983, making it one of the world's most active volcanoes.

The Galapagos Islands are also made up of a series of shield volcanoes. Isabela and Fernandina islands have flatter tops than other shield volcanoes because lava erupts from fissures around their tops and along ridges at their bases. As a result, the volcanoes rise at the top and grow outward at the bottom—but not in the middle, making them look like an "inverted soup bowl."

Pyroclastic Cones

Pyroclastic cones are the most prolific type of volcano on Earth. They can develop as part of stratovolcanoes, shield volcanoes, or independently. Also known as cinder cones, they form after violent eruptions blow lava into the air. In the atmosphere, the lava fragments solidify and fall as "cinders"

around a singular vent. Often formed from a single eruption or short series of eruptions, pyroclastic cones only stand at heights of tens of meters to hundreds of meters.

Parícutin, Mexico, is a unique pyroclastic cone. It was the first volcano to be studied for its entire life cycle. Emerging from a cornfield in 1943, Parícutin's explosive eruptions caused it to reach 80 percent of its height of 424 meters (1,391 feet) during its first year of activity. In that time, lava and ash buried the nearby town of San Juan. Over the next eight years, Parícutin built the remainder of its cone—and then went quiet. Geologists learned a great deal about the evolution of volcanoes in Parícutin's short, nine-year life.

Lava Domes

Lava domes are like shield volcanoes in that they are built entirely of lava. This lava, however, is too thick and sticky to move great distances. It just piles up around the volcano vent. Lava domes are often found on the summit or flanks of a volcano, but they can also develop independently. Like pyroclastic cones, they only reach a few hundred meters, as they are formed during singular eruptions or slow lava releases.

One of the most iconic lava domes developed after the devastating 1902 eruption of Mount Pelée on the island of Martinique. For almost a year, a lava dome grew out of a summit crater created from the eruption, reaching a height of more than 300 meters (1,000 feet). Known as the Tower of Pelée, the obelisk-shaped structure was twice the height of the Washington Monument. It ultimately collapsed into a pile of rubble after 11 months of growth.

Other Important Volcanic Features

Calderas

Some volcanoes experience such large, explosive eruptions that they release most of the material in their magma chamber. This causes the land around the erupting vent or vents to collapse inwardly, creating circular

depressions called calderas. Depending on their intensity and duration, volcanic eruptions can create calderas as much as 100 kilometers wide.

Crater Lake, Oregon, United States, is in a caldera about 10 kilometers (six miles) wide. Crater Lake's caldera resulted from an eruption that occurred more than 7,000 years ago. The volcano's magma chamber collapsed, then filled with water from rain and snow, creating the lake. Crater Lake is the deepest lake in the United States.

Deception Island, located off the coast of Antarctica, experienced a violent eruption roughly 10,000 years ago. The volcano summit collapsed, forming a caldera seven kilometers (4.4 miles) wide and flooded with seawater. The caldera gives Deception Island its horseshoe shape, which opens to the sea through a narrow channel. Deception Island's unique geologic structure makes it one of the only places in the world where ocean vessels can sail directly into an active volcano.

Craters

Much like calderas, craters are depressions left after a volcano experiences a large eruption. While calderas are formed by the collapse of material *inside* a volcano, craters are formed as materials explode *out* from a volcano. Craters are usually much smaller than calderas, only extending to a maximum of about one kilometer (0.62 mile) in diameter.

Many volcanoes have multiple craters caused by different eruptions. The Maly Semiachik volcano, located on the Kamchatka Peninsula in far eastern Russia, has six craters at its summit. The youngest of these craters, Troitsky, filled in with water and snowmelt, creating a lake 140 meters (459 feet) deep. The lake is highly acidic, as volcanic gases continue to be released into the water from the active volcano below.

Lava lakes are also found in volcanic craters. Erta Ale, a volcano in Ethiopia, has a lava lake in its summit crater. Lava lakes are where magma has bubbled up to the surface and pooled in a crater. Volcanologists can fly over Erta Ale's summit crater to see how the lava lake is behaving and predict future behavior.

Types of Volcanic Eruptions

Volcanic eruptions are as diverse as volcanoes themselves—which is to say, very diverse! Some of the ways volcanologists have classified these eruptions are based on the heights they reach, the types of materials they eject, and the explosiveness of these ejections.

Hawaiian

Hawaiian eruptions are the calmest eruption type. They are characterized by steady lava eruptions known as lava fountains or fire fountains. Lava fountains are able to reach heights of up to two kilometers (1.2 miles). The highly fluid lava associated with Hawaiian eruptions flows easily away from the volcano summit, often creating fiery rivers and lakes of lava within depressions on the surrounding landscape.

These eruptions are named after the Hawaiian Islands, where they most often occur. Kilauea, which has been erupting continuously since 1983, has produced lava flows covering more than 100 square kilometers (37 square miles) on the island of Hawai'i. These flows continuously destroy houses and communities in their path, while also adding new coastline to the island.

Strombolian

Strombolian eruptions are characterized by short-lived outbursts of lava rather than steady fountaining. The lava is thicker and has a higher gas content than that of Hawaiian eruptions. Large gas bubbles rise from the magma chamber, pushing the pasty lava upward until the bubbles explode at the summit vent. These explosions can reach heights up to 10 kilometers (6.2 miles) although most don't go higher than a few hundred meters into the air.

Strombolian eruptions are named after the Mediterranean island of Stromboli, Italy. Considered by many to be the most active volcano on Earth, Stromboli has been erupting almost continuously for 2,000 years. The island's eruptions are almost always Strombolian in nature: Small gas explosions eject blobs of lava into the air a couple of times per hour.

Vulcanian

Vulcanian eruptions are short-lived but much more explosive than Strombolian eruptions. Very thick lava causes gas pressure to build up in the magma chamber. When this pressure is finally released it creates canon-like explosions that can travel faster than 350 meters per second (800 miles per hour). Lava, rock, and ash are propelled up to 20 kilometers (12.4 miles) in the air, although most eruption columns are between five and 10 kilometers high. These plumes of material have the ability to drift moderate distances away from the eruption site.

The 2013 vulcanian eruption of Sakurajima, on the island of Kyushu, Japan, covered the nearby city of Kagoshima in a thick coat of ash.

Plinian

Reaching as high as 50 kilometers (35 miles) in the atmosphere, Plinian eruptions are the largest of all eruption types. Much like vulcanian eruptions, they eject materials at speeds of hundreds of meters per second. Plinian eruptions, however, are more sustained than the coughing fits of vulcanian eruptions. These consistent eruptions result from the volcano's magma and growing gas bubbles rising at a similar velocity.

Plinian eruptions are the most destructive type of eruption. They release a deadly mixture of lava, ash, and volcanic rocks such as scoria and pumice, which can fall kilometers away from the eruption site. They are also characterized by pyroclastic flow, a fluid mixture of fragmented materials and extremely hot, toxic gases.

In 79 C.E., a series of Plinian eruptions from Mount Vesuvius buried the nearby Roman cities of Pompeii and Herculaneum (in what is today Italy). The cities and their 13,000 inhabitants were buried in volcanic ash and rock. Rainfall mixed with the ash and created a concrete-like substance that preserved the city for thousands of years.

Surtseyan

Surtseyan eruptions occur where magma or lava interacts with water, most often when an undersea volcano reaches the ocean surface. Another term for this sort of interaction is a phreatomagmatic eruption. When heated

rapidly by lava, water flashes to steam and expands violently, creating the most explosive of all eruption types. This aggressive interaction between water and heat is able to fragment lava into very fine grains of ash that can reach heights of 20 kilometers (12.4 miles).

Tonga's islands of Hunga Tonga and Hunga Ha'apai are actually the tops of a single, large underwater volcano. In 2009, the volcano erupted for several days, causing steam and ash to explode from the water to altitudes of five kilometers (3.1 miles). While the eruptions killed all signs of wildlife on and around the islands, it also added hundreds of square meters of land to Hunga Ha'apai.

Volcanic Hazards

Volcanoes are some of Earth's most potent natural hazards and agents of change. They release enormous amounts of energy and material, engaging natural processes that can modify landscapes at a local, regional and even global scale.

Many volcanic materials and processes pose a threat to human, animal, and other ecological communities.

Volcanic Gas

Volcanoes regularly release volcanic gases that can be dangerous at concentrated levels. Carbon dioxide and fluorine can collect in soil or volcanic ash, causing crop failure, animal death and deformity, and human illness.

Volcanic eruptions can also release massive amounts of sulfur dioxide, which rises into the stratosphere. There, it reflects incoming solar radiation while absorbing outgoing land radiation, leading to a cooling of Earth's temperature.

In extreme cases, these "volcanic winters" can cause crop failures and drastically affect weather. The 1815 eruption of Mount Tambora, Indonesia, cooled the average global temperature by as much as 3° Celsius (5.4° Fahrenheit), causing the "year without a summer."

Landslides and Lahars

The enormous energy of volcanic eruptions can cause large landslides that move at speeds of more than 100 kilometers per hour (60 miles per hour). Mount St. Helens, Washington, is a stratovolcano that had an explosive Plinian eruption in 1980. The eruption produced the largest landslide in recorded history, covering a 36-kilometer (14-mile) area of land with ash and rocks. Reaching speeds of 50 to 80 meters (165 to 260 feet) per second, the landslide had enough power to surge over a ridge 400 meters (1,312 feet) high.

Landslides can mix with surrounding rivers, ice, snow, or rain to produce watery mixtures called lahars. This mixture of water, rock, and debris creates a sludge that can obliterate almost anything in its path. The 1985 eruption of Nevado del Ruiz, Colombia, caused small lahars of rock, ash, and melted snow to flow down into the surrounding river valleys. The lahars gained momentum and size as they traveled the riverbeds, ultimately destroying more than 5,000 homes and killing more than 23,000 people.

Pyroclastic Flows

Explosive eruptions sometimes produce pyroclastic flows, a mixture of hot rock fragments and toxic gases that move almost like a liquid out and away from the volcano. Reaching speeds greater than 80 kilometers per hour (50 miles per hour) and temperatures between 200-700° Celsius (392-1292° Fahrenheit), pyroclastic flows knock down, shatter, bury, or burn anything in their path.

Pyroclastic flows are responsible for the haunting figures from Pompeii and Herculaneum, Italy. While many scientists thought residents of Pompeii suffocated to death from volcanic gases released during Mount Vesuvius' eruption in 79 C.E., new studies suggest that they actually died from extreme heat produced by the volcano's pyroclastic flow.

Volcanologist Giuseppe Mastrolorenzo and the Italian National Institute for Geophysics and Volcanology recently discovered that the pyroclastic flow that reached Pompeii produced temperatures of up to 300° Celsius (570° Fahrenheit). These extreme temperatures are able to kill people in a

fraction of a second, causing them to spasm in contorted postures like those found among the plaster casts of Vesuvius' victims.

Volcanic Ash

Huge plumes of volcanic ash can spread over large areas of the sky, turning daylight into complete darkness and inhibiting air traffic. (During the eruption of Iceland's Eyjafjallajökull in 2011, flights to and from Northern Europe were suspended for more than a week.) Volcanic ash conducts electricity when wet and can contain concentrated levels of toxic materials, posing threats to humans that come in close contact with it on land.

The 1994 double eruption of Vulcan and Tavurvur in Papua New Guinea covered the nearby city of Rabaul in a layer of ash up to 75 centimeters (about two feet) deep. Rains turned the ash into a cement-like substance that was heavy enough to collapse 80 percent of the buildings in the city.

Volcanic Monitoring and Research

Volcanic hazards can be incredibly dangerous to human life. In the United States alone, 54 volcanoes are a very high or high threat to public safety. By closely monitoring volcanic activity, volcanologists can warn people of impending eruptions. While these warnings are not exact predictions, they do provide communities with the valuable time they need to protect themselves against volcanic hazards and ensure their safety.

Volcanologists predict volcanic activity by taking real-time measurements and comparing them against what happened in the past. They use a variety of instruments and technologies to monitor temperatures, gas emissions, water levels, ground movements, and changes in the landscape. These measurements paint a clear portrait of a volcano's current state, which volcanologists then interpret against historical data. Volcanologists issue eruption warnings when these measurements stray far from the norm or mirror those that preceded a historic eruption.

Different countries use different systems to issue eruption warnings to the public. All of these systems categorize their alerts based on the probability and severity of an impending eruption. Typical volcanic behavior is often

represented by the number 1 or the color green, while an imminent and potentially destructive eruption is typically represented by the number 4 or the color red.

A number of international organizations lead the way in volcanic monitoring and research, providing invaluable information to scientists, volcanologists, and the public alike. The Smithsonian Institution's Global Volcanism Program documents current activity for all the volcanoes on the planet through publicly available data, reports, and images. The program also keeps the world's only archive of volcanic activity from the last 10,000 years.

As part of the UN International Decade for Natural Disaster Reduction, the International Association of Volcanology and Chemistry of the Earth's Interior (IAVCEI) created a list of 16 "Decade Volcanoes" to study because of the high risk they pose to public safety. Mount Nyiragongo in Democratic Republic of the Congo, for example, is dangerously close to the city of Goma. Its 2002 eruption killed 50 people and forced roughly 450,000 people to evacuate their communities. The Santa María Volcano, which sits right above the city of Quetzaltenango, Guatemala, has been continuously erupting since 2003. The Decade Volcanoes program has brought together geologists, volcanologists, and government officials to closely study these volcanoes and create risk-mitigation plans for potential eruptions.

Articles & Profiles

Smithsonian: Global Volcanism Program

Website

National Geographic Environment: Volcanoes, Explained

Reference

Oregon State University: Volcano World

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CONNECT

1. EXPLORERS LEARN ABOUT THE WORLD

What is your Explorer's name and where is he/she from?	Provide a brief (1-2 sentences) description of your Explorer's work.	Mark your Explorer's area(s) of focus.
Name: Birthplace:	What: How: Where:	Land Ocean Wildlife Human History and Cultures Human Ingenuity

2. EXPLORERS ARE CURIOUS

Mark what interests you most about the Explorer's work.

ASKING QUESTIONS	COLLECTING INFORMATION	VISUALIZING INFORMATION	CREATING STORIES TO INSPIRE CHANGE	ACT
I am curious about: ■ The Explorer's work location and why it's important. ■ The Explorer's question(s) and problem(s). ■ How the human and natural worlds are affected by the problem.	I am curious about: ■ The data gathered and method of collecting it. ■ The Explorer's involvement in communities. ■ Other team members that work with the Explorer.	I am curious about: ■ How the Explorer organizes collected data. ■ How the Explorer makes sense of collected data. ■ How the Explorer uses maps and graphs.	I am curious about: ■ How the Explorer creates stories to share their work. ■ How the Explorer shares their stories. ■ How the Explorer's stories inspire others to act.	I am curious about: ■ How the Explorer will solve their question(s) and problem(s). ■ How the Explorer works with others to solve their question(s) and problem(s). ■ What motivates the Explorer to take action.

In the space below, share WHICH area initially sparked the most curiosity and WHY.

3: EXPLORERS SEEK UNDERSTANDING

Complete the following statements during your Explorer's presentation.
It fascinates me that my Explorer...
For me, the most important aspect of my Explorer's work is...
I now understand why my Explorer...
How does my Explorer's work influence...
My Explorer's work empowers me to...
Today I discovered that I can be an Explorer because...

4: EXPLORERS STOP AND THINK

Reflect on your Explorer's presentation and share one area of his/her work towards which you feel most CONNECTED.

Draw a picture or symbol that best represents this area of work and be prepared to circle up and share your WHY with your classmates.

National Geographic Explorers work with communities and invite others to join their cause. How will YOU become involved in your Explorer's work?

5: EXPLORERS IMPACT OTHERS *(EXTENSION)*

PART 1: Complete each statement below by marking the box that best represents the impact of your Explorer's work at the local, regional, and global level(s).

My Explorer impacts the local community...

a little.	somewhat.	a lot.

My Explorer impacts surrounding regions...

a little.	somewhat.	a lot.

My Explorer impacts other countries or global areas...

a little.	somewhat.	a lot.

What area (local, regional, global) does your Explorer impact the most and <u>WHY</u>?

PART 2: Think about what you heard during the session with your Explorer today. Now, read each "I CAN" statement below and write "yes" or "no" and provide an example that shows your understanding of the statement.

"I CAN" STATEMENTS	YES or NO	STUDENT EXAMPLE
I can identify where my Explorer works.		
I can explain how my Explorer's work is connected to an issue in my community, regionally or globally.		
I can summarize the factors that control and affect my Explorer's work.		
I can perceive the financial impact of the problem that my Explorer is researching.		
I can explain past events that have affected my Explorer's work.		
I can understand the impact that humans have on my Explorer's area of focus.		
I can explain how landscape has an effect on my Explorer's work and/or the problem they're trying to solve.		