



Disney  
**MOANA**

**EDUCATOR'S GUIDE**

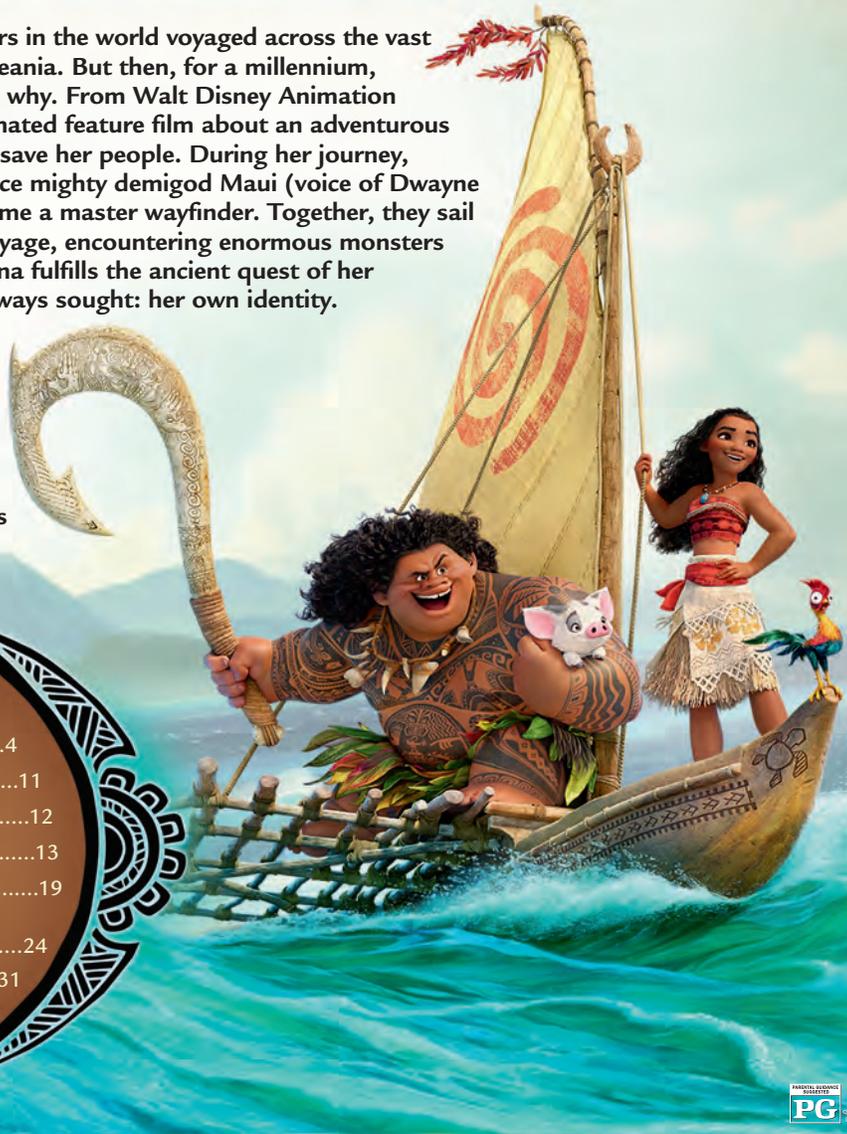
GRADES 2-6

Created in partnership with the  
Disney Nature Educational Team

# Disney MOANA

**T**hree thousand years ago, the greatest sailors in the world voyaged across the vast Pacific, discovering the many islands of Oceania. But then, for a millennium, their voyages stopped – and no one knows why. From Walt Disney Animation Studios comes “Moana,” a sweeping, CG-animated feature film about an adventurous teenager who sails out on a daring mission to save her people. During her journey, Moana (voice of Auli'i Cravalho) meets the once mighty demigod Maui (voice of Dwayne Johnson), who guides her in her quest to become a master wayfinder. Together, they sail across the open ocean on an action-packed voyage, encountering enormous monsters and impossible odds, and along the way, Moana fulfills the ancient quest of her ancestors and discovers the one thing she’s always sought: her own identity.

Directed by the renowned filmmaking team of John Musker and Ron Clements (“The Little Mermaid,” “Aladdin,” “The Princess & the Frog”), produced by Osnat Shurer (“Lifted,” “One Man Band”), and featuring music by Lin-Manuel Miranda, Mark Mancina and Opetai Foa’i, “Moana” sails into U.S. theaters on November 23, 2016.



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## FURTHER EXPLORE MOANA’S WORLD

The “Moana” Educator’s Guide includes 40 pages of lessons and activities targeted to grades 2 through 6. The complete Educator’s Guide and additional educational resources are now available at [disney.com/Moana](http://disney.com/Moana).

The guide introduces students to a variety of topics, including:

- Habitat and Ecosystems
- Biodiversity
- Learned Behaviors
- Communication
- Animal Relationships
- Life Cycle
- Earth’s Systems
- Culture and the Arts
- Making a Positive Difference for Wildlife Worldwide

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

### EDUCATOR’S GUIDE OBJECTIVES

- ✓ *Increase students’ knowledge of the amazing animals and habitats of the ocean through interactive, interdisciplinary and inquiry-based lessons.*
- ✓ *Enhance students’ viewing of Disney’s “Moana” 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.*

### ACKNOWLEDGEMENTS

The Walt Disney Studios would like to take this opportunity to thank the amazing teams that came together to develop the “Moana” Educator’s Guide. It was created with great care, collaboration and the talent and hard work of many incredible individuals.

A special thank you to Dr. Mark Penning and his team at Disney’s Animal Kingdom: Animals, Science and Environment and The Seas with Nemo & Friends for sharing all of their knowledge. Additional thanks to the Oceanic Story Trust for insuring the accuracy of the information. These materials would not have happened without the diligence and dedication of Allyson Atkins and Kyle Huetter who worked side-by-side with the scientists and educators to help create these compelling activities. A big thank you to Nette Pletcher for writing the marvelous background information. The interdisciplinary and holistic approach to these lessons could not have happened without the special talents of Dr. Linda Labbo. Thanks to Dr. Anne Savage, Dr. Blair Witherington, Rachel Smith, Lori Perkins, Sarah Kelley and Hannah O’Malley for reviewing all the materials. Thank you also to Dr. Beth Stevens, Lisa Vazquez, Kim Sams and Claire Martin for their leadership. Lastly, thank you to Paul Baribault, Peggie Birkenhagen, Kaliko Hurley, Osnat Shurer and Beatriz Ayala at Walt Disney Animation and The Walt Disney Studios for their help and unwavering support of this project. A special thanks to the wonderful people of the Pacific Islands for inspiring us on their journey as we bring the world of Disney’s “Moana” to life.

Dr. Lizabeth Fogel  
Director of Education, The Walt Disney Studios



# Disney MOANA

## STANDARDS ALIGNMENT CHART

**1**  
THE HERO'S JOURNEY

**2**  
MUSIC AND RHYTHM OF THE OCEAN

**3**  
WAYFINDING USING EARTH'S NATURAL FEATURES

**4**  
CARING FOR SEA TURTLES

| NEXT GENERATION SCIENCE STANDARDS                                     |   |  |   |   |
|---|---|--|---|---|
| WAVES AND THEIR APPLICATIONS IN TECHNOLOGIES FOR INFORMATION TRANSFER |   | 4-PS4-1, 4-PS4-3;<br>MS - PS4-1, MS-PS4-2              | 4-PS4-1   |   |
| ENERGY  |   | 4-PS3-2  |   |   |
| FROM MOLECULES TO ORGANISM  |   |  |   | 3-LS1-1; 4-LS1-1  |
| BIOLOGICAL EVOLUTION: UNITY AND DIVERSITY                             |   |  |   | 2-LS4-1; 3-LS4-2, 3-LS4-3, 3-LS4-4  |
| EARTH'S PLACE IN THE UNIVERSE   |   |  | 5-ESS1-1.A; MS-ESS1-1.A   | 2-ESS1-1  |
| ECOSYSTEMS: INTERACTIONS, ENERGY AND DYNAMICS                         |   |  |   | 3-LS2-1; 5-LS2-1;<br>MS-LS2-1, MS-LS2-4,<br>MS-LS2-5  |
| EARTH'S SYSTEMS   |   |  | MS-ESS2-2.C   | 4-ESS2-1; 5-ESS2-1  |
| EARTH AND HUMAN ACTIVITY  |   |  |   | 4-ESS3-2; 5-ESS3-1; MS-ESS3-3, MS-ESS3-4  |
| ENGINEERING DESIGN  |   |  |   | K-2-ETS1-1, K-2-ETS1-2,<br>K-2-ETS1-3; 3-5-ETS1-1,<br>3-5-ETS1-2; MS-ETS1-1,<br>MS-ETS1-2, MS-ETS1-3                                |
| COMMON CORE LANGUAGE ARTS STANDARDS                                   |   |  |   |   |
| WRITING   | Text Types and Purpose:<br>W2.3, W3.3, W4.3, W5.3,<br>W6.3  |  |   | Text Types and Purpose:<br>W2.3, W3.3, W4.3, W5.4,<br>W6.3. Research to Build<br>Present Knowledge: W2.8,<br>W3.8, W4.8, W5.8, W6.8 |
| LANGUAGE STANDARDS  |   | L.3.5.b, L.4.5.a                                       | L.4.3.a, L.5.5.a, L.6.5.a   | L.3.5.b, L.4.5.a, L.5.5.a,<br>L.6.5.a   |
| LITERATURE  | RL.2.2, RL.2.5, RL. 3.2,<br>RL.3.3, RL3.5, RL.3.7,<br>RL.4.2, RL.4.7, RL.4.9,<br>RL.5.2, RL.5.5, RL.6.3 | RI.2.4, RL.5.4, RL.6.4,<br>RL.6.7                      |   | RL.2.4, RL.2.6, RL.4.5  |
| SPEAKING AND LISTENING  |   |  | SL.5.4, SL.6.2  |   |
| INFORMATIONAL TEXT  |   |  | RI.6.7  | RI.2.3, RI2.4, RI 2.7, RI<br>3.3, RI.3.7, RI.4.3, RI.4.7,<br>RI.5.3, RI.6.6, RI.6.7   |
| COMMON CORE MATHEMATICS STANDARDS                                     |   |  |   |   |
| GEOMETRY  |   |  | 5.G1, 5.G2, 6.G1, 6.G4  |   |
| NATIONAL CORE ARTS STANDARDS  |   |  |   |   |
| VISUAL ARTS   | VA.Re8.1.2a, VA:Re8.1.3a,<br>VA.Re8.1.4a, VA.Re8.1.5a,<br>VA.Re8.1.6a                                   | VA:Cr2.3.2a,<br>VA:Cr1.14a,VA:Cr2.2.5a,<br>VA:Cr2.1.6a | VA:Cr1.2.2a, VA:Cr1.2.3a,<br>VA:Cr1.2.4a, VA:Cr1.2.5a,<br>VA:Cr1.2.6a |   |

## TEACHER'S BACKGROUND INFORMATION

Disney's "Moana" is a story about an adventurous teenager who, with the help from demigod Maui, sails out on a daring mission to prove herself a master wayfinder and save her people. Through this story, we can explore many topics and introduce students to concepts in physics, astronomy, biology and literature. This guide provides background information on four specific areas, three in the sciences and one in language arts:



### Storytelling/Mythology

Learn the key principles of writing a compelling story. (Pages 5-6)



### Waves

Learn about the physics of waves, including the similarities and differences between ocean waves and sound waves. (Page 7)



### Wayfinding Using Earth's Natural Features

Learn how to navigate using clues from the sky and the ocean and from animals that live there. (Pages 8-9)



### Sea Turtles

Learn why many sea turtles are endangered and strategies for reducing those threats. (Page 10)

## A Note on Primary Sources

Primary sources are original documents and objects related to a topic. They provide first-hand experience of events and offer a rich way of learning. Using primary sources with students is an excellent way to:

- foster critical thinking skills
- relate past events to present life
- present information in a way that is personally relevant
- promote a deeper understanding of the material
- compare and contrast multiple sources
- incorporate education standards regarding analysis and synthesis of data
- challenge existing assumptions

The Library of Congress suggests the following steps for using primary sources with students:

### 1. ENGAGE STUDENTS WITH PRIMARY SOURCES.

Draw on students' prior knowledge of the topic. Ask students to closely observe each primary source.

- Who created this primary source?
- When was it created?
- Where does your eye go first?

Help students see key details.

- What do you see that you didn't expect?
- What powerful words and ideas are expressed?

Encourage students to think about their personal response to the source.

- What feelings and thoughts does the primary source trigger in you?
- What questions does it raise?

### 2. PROMOTE STUDENT INQUIRY.

Encourage students to speculate about each source, its creator and its context.

- What was happening during this time period?
- What was the creator's purpose in making this primary source?
- What does the creator do to get his or her point across?
- What was this primary source's audience?
- What biases or stereotypes do you see?

Ask if this source agrees with other primary sources, or with what the students already know.

- Ask students to test their assumptions about the past.
- Ask students to find other primary or secondary sources that offer support or contradiction.

### 3. ASSESS HOW STUDENTS APPLY CRITICAL THINKING AND ANALYSIS SKILLS TO PRIMARY SOURCES.

Have students summarize what they've learned.

- Ask for reasons and specific evidence to support their conclusions.
- Help students identify questions for further investigation and develop strategies for how they might answer them.

Go to [www.loc.gov](http://www.loc.gov) for teacher resources and more.



TEACHING with PRIMARY SOURCES



# Disney MOANA

TEACHER'S  
BACKGROUND  
INFORMATION

## STORYTELLING/MYTHOLOGY

**S**tories have been told among civilizations since the earliest forms of communication evolved. The story of Disney's "Moana" has all the characteristics of a hero's journey.

Set in the ancient Pacific, Moana is the 16-year-old daughter of Chief Tui of Motunui who sails out on a daring mission to save her people. During her journey, Moana meets the demigod Maui, who guides her in her quest to become a master wayfinder. Together they sail across the open ocean on an action-packed voyage, encountering enormous monsters and impossible odds, and along the way, Moana fulfills the ancient quest of her ancestors and discovers the one thing she's sought: her own identity.

Over the course of their adventure, Moana learns about Maui's accomplishments as a demigod and Maui learns about her determination to fulfill her journey. Throughout the film, Maui, and his animated tattoos, act out myths that portray him performing important deeds that helped humankind. In one legend, it is said that he is responsible for lifting the sky up off the planet so that people can live more comfortably on the earth's surface. In another, he captures the sun with ropes and forces it to slow its path across the sky, allowing more time for humans to use the sun's energy and light for growing crops and other tasks. Maui is also instrumental in stealing fire from legendary birds so that people could cook their food.

All civilizations have used stories to pass along the values and beliefs that are important to their culture, as well as their attempts to explain the universe. And Polynesians are among some of the greatest storytellers in the world. Before written language, stories were conveyed through oral history; and before words and languages were developed, stories were presented through pictures, gestures and sounds.

Every compelling story has a hero, or protagonist, who must overcome obstacles. In a book titled *The Hero With A Thousand Faces*, mythology researcher Joseph Campbell first described this traditional story pattern as the monomyth. The monomyth concept has been translated into twelve distinct

stages, known as The Hero's Journey. These twelve phases outline a typical storyline through which a hero or heroine conquers the challenges presented by the antagonists, or the story's villains. Protagonists Moana and Maui go on a hero's journey together, struggling against antagonistic forces of great strength and power.

**All civilizations have used stories to pass along the values and beliefs that are important to their culture, as well as their attempts to explain the universe.**





By following the steps of The Hero's Journey anyone can write a dramatic and memorable story.

## THE HERO'S JOURNEY

- 1. THE ORDINARY WORLD.** The hero, uneasy, uncomfortable or unaware, is introduced sympathetically so the audience can identify with the situation or dilemma. The hero is shown against a background of environment, heredity and personal history. Some kind of polarity in the hero's life is pulling in different directions and causing stress.
- 2. THE CALL TO ADVENTURE.** Something shakes up the situation, either from external pressures or from something rising up from deep within, so the hero must face the beginnings of change.
- 3. REFUSAL OF THE CALL.** The hero feels the fear of the unknown and tries to turn away from the adventure, however briefly. Alternately, another character may express the uncertainty and danger ahead.
- 4. MEETING WITH THE MENTOR.** The hero comes across a seasoned traveler of the world who gives him or her training, equipment or advice that will help on the journey.
- 5. CROSSING THE THRESHOLD.** At the end of Act One, the hero commits to leaving the Ordinary World and entering a new region or condition with unfamiliar rules and values.
- 6. TESTS, ALLIES AND ENEMIES.** The hero is tested and sorts out allegiances in the Special World.
- 7. APPROACH.** The hero and newfound allies prepare for the major challenge in the Special World.
- 8. THE ORDEAL.** Near the middle of the story, the hero enters a central space in the Special World and confronts death or faces his or her greatest fear. Out of the moment of death comes a new life.
- 9. THE REWARD.** The hero takes possession of the treasure won by facing death. There may be celebration, but there is also danger of losing the treasure again.
- 10. THE ROAD BACK.** About three-fourths of the way through the story, the hero is driven to complete the adventure, leaving the Special World to ensure the treasure is brought home. Often a chase scene signals the urgency and danger of the mission.



When creating the story of Disney's "Moana", the filmmakers not only relied on these 12 steps, they were deeply inspired by the oral histories and stories of the people and cultures of Oceania. Through this combination of inspiration and narrative structure, "Moana" tells a universal story.

- 11. THE RESURRECTION.** At the climax, the hero is severely tested once more on the threshold of home. He or she is purified by a last sacrifice, another moment of death and rebirth, but on a higher and more complete level. By the hero's action, the polarities that were in conflict at the beginning are finally resolved.
- 12. RETURN WITH THE ELIXIR.** The hero returns home or continues the journey, bearing some element of the treasure that has the power to transform the world as the hero has been transformed. ☺

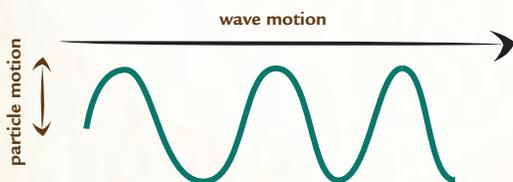
# Disney MOANA

## TEACHER'S BACKGROUND INFORMATION WAVES

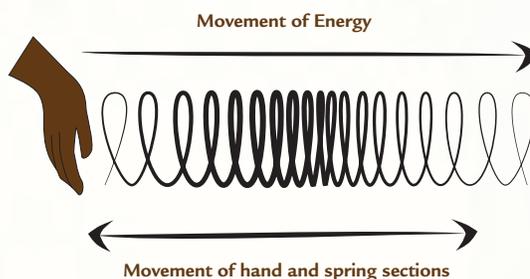
**W**hile navigating around ancient Oceania, Moana uses the power of the wind to sail her vessel.

Wind is not only responsible for helping Moana reach her destination but also creates the waves on the ocean surface. In Disney's "Moana" the ocean itself takes on the role of a character. Depending on the strength of the waves, the ocean can be interpreted as peaceful and friendly or agitated and angry. But how are ocean waves formed?

An important principle in physics is that all waves transport energy, not matter. Ocean waves are created by the transfer of energy from one source (usually wind) to water. Any disturbance to the water's surface can create waves. For instance, dropping a rock into a lake forms small ripples, which are the result of energy from the falling rock being transferred to the water. Whether small or large, the waves on the water's surface always move up and down. The energy of the wave moves in one direction, but the individual particles of water are not actually being pushed along. In other words, the water oscillates up and down with each wave but does not move closer to shore. This type of wave is called a transverse wave.



Another type of wave that exists in nature is called a longitudinal wave. Sound waves are an example of longitudinal waves. Sound is created by the transfer of energy from one air molecule to another, via vibrations. Unlike water waves, it is not possible to observe sound waves, but a longitudinal wave can be demonstrated with a spring. When springs are stretched out slightly, and one end is squeezed together, letting go of the compressed portion causes the energy from that part of the spring to transfer through the rest of the spring, moving the wave horizontally. Like the coils of a spring, sound waves are generated when energy created by a vibration causes air molecules to collide with each other in the direction that the sound is moving.



Vibrations like this are essential to every musical instrument. One instrument that is featured throughout the soundtrack of Disney's "Moana" is the Polynesian rhythm stick. Rhythm sticks are typically 8 to 12 inches long and made of bamboo or other wood, solid on one end and notched at the other to create a variety of sounds when struck together. The beat of Polynesian rhythm sticks in the film reflects the ever-changing rhythm of the ocean. The synchronization of musical sounds with varying wave action contributes to the film's choreography and portrayal of the ocean as a story character.

In nature, elements like wind and rain affect the ocean's sounds and natural changes in the tides alter the noise of the surf. The filmmakers and artists of Disney's "Moana" effectively use the rhythms and beats found in nature to further develop the character of the ocean and the soundtrack of the film. By adjusting volume, tempo and pitch, the accompanying music mimics the natural sounds, allowing the ocean character to convey a wide range of moods. ©



TEACHER'S  
BACKGROUND  
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# WAYFINDING USING EARTH'S NATURAL FEATURES

**B**efore there were compasses, navigation apps or even Global Positioning System (GPS), people who desired to travel long distances relied on cues from the earth to judge where they were and what direction they were going.

On land it was generally easier to get oriented, using landmarks like mountains and rivers. However, out on the open ocean where only water stretched to the horizon, navigators by necessity had to get creative. Ancient voyagers found their way across the seas using knowledge of nature, the stars, the waves and the currents of the ocean.

## WAYFINDING BY THE SUN, MOON AND STARS

Generally speaking, the sun rises in the east and sets in the west. During the day, you can identify which direction you are traveling by observing the position of the sun in the sky. In the morning, if your boat is headed towards the sun, you know you are traveling east. Later in the day, if you stay on an easterly course, the sun will remain behind you. This reading of the sun aided navigators in traveling toward their destination; however, on a cloudy day this method of navigating became less reliable.

After the sun sets, the moon and stars offer further clues. Generally, the moon also rises in the east and sets in the west. Because the earth rotates on its axis, the stars — like the sun and the moon — appear to move across the sky from east to west during the night. The constellation Orion (The Hunter) is easily identified by three bright stars in a short, straight line, which comprise the hunter's belt. The first of those three stars to rise in the evening points the way east. Where it sets indicates due west. Astronomers call this star Mintaka.

However, there is one star that does not change its position: The North Star, or Hōkūpa'a. The North Star remains constant while the earth rotates because it is directly above the north pole. Navigators would locate the North Star by finding the Big Dipper, which some say looks like a saucepan. The two stars that create the pouring edge of the saucepan are the "pointer" stars. By capturing the distance between the two pointer stars and moving their eyes five times that distance in the direction that they point to, navigators could locate Hōkūpa'a. Directly beneath this star is true north, which guided ancient voyagers on their journey.

**Water in the ocean moves because the Earth rotates.**



# Disney MOANA

TEACHER'S  
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## WAYFINDING Using EARTH'S NATURAL FEATURES

### WAYFINDING THROUGH OCEAN CURRENTS AND WAVES

Before exploring how ancient voyagers could use ocean currents to navigate, it helps to understand why ocean currents exist in the first place. Water in the ocean moves because the Earth rotates. The Earth's rotation on its axis from west to east causes ocean currents to move from east to west. Therefore, in still water with no wind, a boat will drift from east to west.

There are five constantly moving ocean systems, or gyres, that are created through a combination of surface winds and the rotation of the Earth on its axis: Indian Ocean Gyre, North Atlantic Gyre, North Pacific Gyre, South Atlantic Gyre, South Pacific Gyre.

Along the borders of these gyres exist currents that are also fairly stable and predictable. Because these systems of water movement remain relatively consistent, navigators who were familiar with the direction and speed of the gyres and currents could also use them to help determine their location in the ocean.

Skilled navigators could pick up information through observing the behavior of waves. Waves on the open ocean act differently than waves close to shore.

Long before an island comes into view, the waves shift slightly due to the object they traveled around. By observing these minor changes, navigators were able to predict the presence of land.

### MAPPING THE OCEAN

While learning to navigate using natural elements required one set of skills, it was also helpful to be able to describe the typical path from one point to another. Whereas a land-based route could be etched into wood or stone, ancient voyagers used other creative methods of documenting their knowledge of pathways across the sea.

One technique used to describe the best route from one island to another was a stick chart. Commonly made from coconut fibers and shells, stick charts visually represented major ocean swells and wave patterns and the known islands that influenced their size and direction. Each shell or bit of coral pebble symbolized an island, while fibers in between indicated predictable waves and currents. Each stick chart was unique and was memorized before the excursion.

Undoubtedly these talented navigators mentored younger members of their tribe, teaching them to read the sky and the waters to design their own stick charts. Just as demigod Maui taught Moana how to follow the rhythms of the ocean, learning was passed down from one generation to the next, allowing the collective knowledge of the community to grow as ancient navigators explored ever more distant islands. ©



STICK  
CHART



TEACHER'S  
BACKGROUND  
INFORMATION

SEA TURTLES



Sea turtles have existed on planet Earth since the time of the dinosaurs and play an important role within the story of Disney’s “Moana.” Today there are seven species of sea turtles: loggerhead, green, leatherback, hawksbill, Kemp’s ridley, Olive ridley and flatback.

NATURAL HISTORY

Sea turtles are marine reptiles that spend most of their lives in the ocean. How do these massive, cold-blooded, air-breathing reptiles take to the ocean so well? They do this through specialized adaptations. Sea turtles’ streamlined bodies are remarkably adapted to ocean life. Their front legs have been modified into elongated flippers that they use for swimming, while their short, wide hind flippers act as rudders for steering. Their vision underwater is better than ours, and they have an acute sense of smell for locating food. Although they live in the ocean, they must come to the surface to breathe air. Sea turtles usually surface every 20 minutes to breathe, but during periods of rest they can stay underwater for several hours.

Different species of sea turtles eat different types of food, and young sea turtles have a different diet than adults. Common prey includes jellyfish, crabs, shrimp, sponges, snails and mollusks. They also eat plants like seaweed and algae. Sea turtles are one of the few marine animals that eat seagrass. Like a regular lawn, seagrass grows best when it is regularly cut short. Seagrass beds shelter the eggs and small offspring of many species of crustaceans, fish and shellfish. Without healthy seagrass, the marine food chain is deeply affected.

Young sea turtles spend their lives resting, migrating with the seasons and moving between habitats. Male sea turtles never return to land, and females return only to lay eggs. Upon reaching maturity (25 to 50 years of age) females return to the same beach where they were born to lay their eggs. They emerge from the sea at night, crawl above the tide line and dig a nest in the sand with their wide back flippers. After laying an average of 100 ping pong ball-sized eggs, they cover the nest with sand and return to the sea. Females repeat this process five to six times during their summer nesting season—laying about 600 eggs—and then migrate back to their home waters until they return to nest again the next year.

Scientists estimate that only one in a thousand hatchlings survive to become an adult sea turtle. Beach predators like raccoons and sand crabs can snatch them up as soon as they emerge from their eggs. Hatchlings that successfully make it to the ocean can fall prey to predatory fish and birds. Sand castles, beach furniture, sand pits and trash can block their path to the sea—or their mother’s attempts to lay eggs in the first place. Hatchlings can confuse lights on roads and buildings with the natural glow of the night sky over the sea and head in the wrong direction, away from the water. ©

Five out of the seven species of sea turtles are listed as endangered, and conservation organizations around the world have focused their efforts to reduce the global decline of these species.

CONSERVATION CONCERNS

Although a number of threats to sea turtles are accidental, they are no less deadly for these peaceful marine creatures. The main reasons why many sea turtle populations are in danger include:

- Bycatch, or the entanglement of sea turtles in nets and lines of commercial fishing boats, which inhibits their ability to surface and breathe.
- Lights and barriers on nesting beaches.
- Loss of seagrass and coral reefs, which depletes an important food source for many turtle species.

Other threats to sea turtles include accidental boat strikes, water pollution from oil spills and fertilizer run-off and discarded plastics that turtles mistake for food. In some countries sea turtle eggs are harvested and eaten, and the turtles are killed for their meat and beautiful shells, which are used to make jewelry and other luxury items.

TAKING CONSERVATION ACTION

It is commonly said that in order to conserve a species, one must first care about it. This sense of caring for another living thing is called empathy. Animal scientists often develop empathy for the species they study. Being empathic helps them see the world from the animal’s perspective and can help the scientists understand how to save them. For example, recognizing that entanglement in fishing lines below the surface was causing sea turtles to drown, a NOAA scientist designed an innovation in fishing nets, called a Turtle Excluder Device, or TED. Fishing nets with TEDs provide an escape hatch for sea turtles so they can surface to breathe while keeping the intended fish catch inside the net. As a result, fewer sea turtle deaths are caused by commercial fishing.

# Disney MOANA

## RESOURCES

### The Mythology Teacher

<http://mythologyteacher.com/documents/TheHeroJourney.pdf>

### The Writers Journey

[http://www.thewritersjourney.com/hero's\\_journey.htm](http://www.thewritersjourney.com/hero's_journey.htm)

### Sea Turtles: Disney Animals

<https://disneyworld.disney.go.com/attractions/epcot/disney-animals-sea-turtles/>

### Arkive

[www.arkive.org](http://www.arkive.org)

### Sea Turtle Conservancy

<http://www.conserveturtles.org>

### Smithsonian Ocean Portal

[www.ocean.si.edu](http://www.ocean.si.edu)

### Physics for Kids

<http://www.ducksters.com/science/physics/waves.php>

### Transverse & Longitudinal Waves: Definition & Examples

<http://study.com/academy/lesson/transverse-longitudinal-waves-definition-examples.html>

### Boundless Physics Hub

<https://www.boundless.com/physics>

### Waves - Tutorvista

<http://physics.tutorvista.com/waves>

### Natural Navigator

<http://www.naturalnavigator.com>

### National Geographic Society

<http://nationalgeographic.org/media/micronesia-stick-chart/>

### Polynesian Voyaging Society

<http://www.hokulea.com>

### Polynesian Cultural Center

<http://www.polynesia.com>

### PBS NOVA Polynesia's Genius Navigators

<http://www.pbs.org/wgbh/nova/ancient/polynesia-genius-navigators.html>

Westervelt, W. D. *Legends of Ma-ui – a Demi God of Polynesia, and of His Mother Hina*. Honolulu: Hawaiian Gazette, 1910. Print. ISBN-13: 978-1125401057



# Disney MOANA

## WHAT YOU CAN DO...

**M**oana's protection of a sea turtle hatchling on the beach is a remarkable moment showcasing her kindness and empathy towards animals. On a daily basis, scientists and conservationists work to reverse the decline of endangered species and you can too. Throughout the oceans of the world animals both large and small face threats to their survival including habitat destruction, pollution and unsustainable fishing practices. You can help protect these animals. By learning more about species like sea turtles, you are on your way towards helping protect animals in your own backyard and beyond! Knowledge creates awareness, which can lead to action. A positive attitude towards all animals can help make a conservation impact when combined with actions that benefit the world around us. Think about ways you can help these animals.

### REDUCE, REUSE, RECYCLE

Reduce your consumption to achieve a smaller "footprint." Reuse items that normally are tossed into the trash and recycle everything you can. Recycling and reusing reduces waste and saves precious resources. It also keeps items like plastic bags, water bottles and balloons out of the ocean, where animals may mistake them for food.

### BECOME AN OCEAN EXPERT

To expand your knowledge of wildlife in the world around you, visit the ocean or your local AZA-accredited aquarium or zoo. You can also learn more about ocean animals like sharks, rays, coral reefs and sea turtles by visiting [DisneyAnimals.com](http://DisneyAnimals.com). Don't forget to share your ocean knowledge with family and friends by celebrating World Oceans Day on June 8th!

### CHOOSE PETS WISELY

Home aquariums are a great way to learn about animals and connect with nature. Make sure to choose a type of fish that best fits your lifestyle. Saltwater aquariums are tricky for beginners, so consider a freshwater aquarium instead. Always select appropriate aquacultured\* fish as a first choice for your home aquarium. For the well-being of your fish and other wildlife and their habitats, never release fish into the wild.

### CONNECT WITH NATURE

Explore the natural world around you. Take a nature walk or hike with your family and friends to learn more about wildlife in your community. Explore the beach and spend time watching wildlife near the shore. You can even participate in a beach cleanup during your next visit to the ocean!

### BE DRAIN SMART

Remember that all drains lead to the ocean. Keep paint, motor oil, grease, cooking oil, cleaning supplies and trash away from drains. Instead, recycle or dispose of these and other items properly.

### MAKE WISE CONSERVATION CHOICES

When shopping, before you toss an item into your cart ask yourself, is this sustainably sourced? It is important to know where products like shells and other oceans items come from. Choosing wisely while dining out is another way you can make a difference. Make sustainable seafood choices by visiting [seafoodwatch.org](http://seafoodwatch.org) to find recommendations for which seafood to buy or avoid.

\*Aquaculture is the raising of fish in managed environments to help relieve stress on wild populations.



The Disney Conservation Fund (DCF) has helped protect many of the species seen in Disney's "Moana" including coral reefs, sea turtles, sharks and rays. As part of Disney Citizenship, DCF in honor of its 20th anniversary, announced the "Reverse the Decline, Increase the Time" initiative – aimed at reversing the decline of 10 threatened species through scientific research, community collaboration and increasing the time kids spend in nature. The fund supports nonprofit organizations that work to reverse the decline of threatened wildlife, and increase the time kids and families spend in nature to inspire them to care for the planet. DCF has supported more than 300 nonprofit organizations and more than 1,000 conservation projects worldwide. Take a tour of all of these projects, present and past, by visiting the Disney Conservation Fund website at [www.disney.com/conservation](http://www.disney.com/conservation).

# THE HERO'S JOURNEY

## LESSON 1

Stories have been used since the beginning of humanity to pass along information and explain the mysteries of the earth. Every community treasures the telling of stories that reflect their culture and beliefs. While these folktales and myths feature fictional characters, they often center on a natural phenomenon and can be useful in remembering patterns and events that occur in nature. Maui, the mighty demigod, shares many stories of his own great deeds with Moana when they first meet. These folktales are based on the narrative of a hero's journey, which recounts the main character's adventure as he or she transforms the world for the better, while also transforming themselves in the process.

### WARM UP

Explain to students that even though the hero's journey has been used as a form of storytelling for untold centuries, it is still relevant today. Not only did Moana benefit from hearing about Maui's tales of his heroic deeds, she also went on to complete a hero's journey herself. By understanding the structure of a hero's journey, students will be inspired to write their own account of a momentous moment in their life, thereby discovering the hero that's inside each of them. Students will start by discussing the characteristics of the hero's journey narrative and use the framework to analyze folktales about Maui's heroic deeds.

### GET STARTED

**STEP 1:** Guide a discussion on each of the elements of the hero's journey narrative as seen in Figure 1. Invite students to think about folktales, tall tales or myths they have heard or read that fit some of the hero's journey narrative structure (i.e. Paul Bunyan, Hercules, Jack and the Beanstalk, etc.). What parts of the stories do not fit the hero's journey structure? Why or why not?

**STEP 2:** Divide students into groups of five. Provide each group with a copy of one of the Maui folktales found in the primary source *Legends of Ma-ui, a Demi God of Polynesia: and of His Mother Hina* by W.D Westervelt ([https://babel.hathitrust.org/cgi/pt?id=uc1.\\$b41147;view=1up;seq=11](https://babel.hathitrust.org/cgi/pt?id=uc1.$b41147;view=1up;seq=11)) and Activity Sheet 1. Ask students to fill in the steps of the hero's journey narrative that relate to the moments of Maui's experiences as told in one of the selected myths.

**THEME:** Storytelling & Mythology

**GRADE LEVEL:** 2 - 6

**STUDENTS WILL BE ABLE TO:**

- discuss the characteristics of a hero's journey
- read and analyze various primary source Maui myths
- write a hero's journey narrative or design a visual representation of a personal experience that incorporates both natural and fantastical events to recount the story

**VOCABULARY:**

demigod, hero's journey, myth, narrative, onomatopoeia, pacing

**YOU'LL NEED:**

- Pens, pencils & markers
- Drawing paper
- *Legends of Ma-ui, A Demi God of Polynesia: and of His Mother Hina* by W.D Westervelt
- Activity Sheet 1: *The Hero's Journey Analysis*
- Activity Sheet 2: *Planning Your Hero's Journey Story*
- Activity Sheet 3: *Planning Your Hero's Journey Wall Hanging*



Figure 1

# THE HERO'S JOURNEY

## LESSON 1

**STEP 3:** Upon completing Activity Sheet 1, each group will share their myth and explain how it fits with the hero's journey structure so all students have the opportunity to learn about Maui. The teacher should point out similar themes that run across all of the Maui tales, specifically the use of natural occurrences (sun/rain/wind) that help advance the plot.

Remind students that hero's journey narratives are written in a style that is epic or mythical in nature. By combining natural occurrences with supernatural or fantastical events, the author showcases the importance of moments in the hero's quest. For example, Moana's journey began when she was a baby after a supernatural event with the ocean occurred on the beach. Her journey continued as she learned from mentors both natural (her grandmother) and supernatural (Maui, a demigod).

**STEP 4:** Ask students to recall a specific event in their own lives that demonstrates how they have grown within their personal life journey. This could be something that happened to them over the course of summer vacation, winter break or even throughout the semester at home or at school. The hero's journey stories of students may also focus on a time they found the courage to help someone in the face of difficult circumstances.

**Students in Grades 4-6** will follow a written hero's journey narrative structure that incorporates natural and supernatural events to recount their story. Distribute and go over the sections of Activity Sheet 2. After students have answered each question, they will write and then be prepared to recount their hero's journey story. Students should present their story with an engaging title. Challenge them to use expressive storytelling techniques that involve pacing, voice inflections and figurative language such as the use of onomatopoeia to provide dramatic sound effects.

**Students in Grades 2-3** will draw symbols and create images to illustrate their hero's journey stories in a wall hanging.

Inform students that they will investigate imagery from Moana to learn how ancient Polynesians conveyed stories through symbols. Discuss the traditional barkcloth or Tapa design seen in Figure 2. Explain that Tapa cloth was used by ancient Polynesians to create clothing, bedding, wall hangings and gifts and it incorporated unique geometric shapes within the design.



Figure 2



Figure 3



Figure 4

# THE HERO'S JOURNEY

LESSON 1

Ask students to study the image of Moana's boat, seen in Figure 3. Disney animators combined the traditional art of Tapa (barkcloth) with symbolic imagery to share the navigation history of Moana's people. Lastly, ask students to examine the image of Maui seen in Figure 4. Discuss how Maui's tattoos combine both geometric shapes and images to share his own hero's journey.

Provide students with Activity Sheet 3. Students will plan their own wall hangings by drawing pencil sketches and symbols for each step in their hero's journey on a piece of recycled paper. After they have finished sketching each step in the journey, they will draw squares and rectangles on 18 X 12 inch (45 X 30 cm) drawing paper in a quilt design. Have students fill each square with the pictures and symbols they created to represent each step of the journey. Students may use markers of different colors to complete their wall hanging. Finally, have students use black markers to draw two or three tiny footprints between each square to visually connect the six different parts of the story. Be sure they write a title for the journey at the top of the wall hanging.

## WRAP UP

Students will share their stories with a peer partner in class. How were their stories alike and how were they different? Do their stories represent unique cultural ways of interpreting life events in a hero's journey? Display either the narratives from the Grades 4-6 students or the wall hangings from the Grades 2-3 students on a bulletin board. ©



## ADDITIONAL RESOURCES

### Websites

#### Modern Polynesians

<https://newint.org/features/1997/06/05/godzone>

#### Art of Oceania Slideshow

<http://www.slideshare.net/RoxanneFarrar/arts-of-oceania-60831065>

#### Polynesian Bark Cloth Techniques

<http://www.kapahawaii.com/polynesia-tapa-differences.html>

#### Polynesian Tattoo Symbols and Meanings

<http://www.apolynesianattoo.com/polynesian-tattoo-meanings/polynesian-tattoo-symbols-meanings-sun.html>

#### Creation Myths

<http://dept.cs.williams.edu/~lindsey/myths/myths.html>

#### Myths Brainstorming Machine

<http://www.scholastic.com/teachers/activity/myth-brainstorming-machine>

#### The Hero's Journey

<http://www.fiction-writers-mentor.com/heros-journey/>

### Books

Campbell, Joseph. *The Hero with a Thousand Faces*. New World, 2008. ISBN-13: 858-0001046747.

Vogler, Christopher. *The Writer's Journey: Mythic Structure for Writers*. Michael Wiese Productions, 2007. ISBN-13: 978-1932907360

Westervelt, W. D. *Legends of Ma-ui – a Demi God of Polynesia, and of His Mother Hina*. Honolulu: Hawaiian Gazette, 1910. Print. ISBN-13: 978-1125401057

# Disney MOANA

## ACTIVITY 1

# THE HERO'S JOURNEY ANALYSIS



(Title of Maui's Journey Story)

### HERO'S JOURNEY STORY STRUCTURE ELEMENTS

### EXAMPLES FROM MAUI'S JOURNEY STORY

### EXAMPLES OF NATURAL OR SUPERNATURAL OCCURRENCES



What is daily life like for the hero or the people in his land?



What is the problem or call to action?



Who is the hero's mentor before or during the journey?



What are the trials, friends or enemies the hero must deal with?



How does the hero overcome the final trial?



What is the victory or reward?



How has the hero transformed or learned about hidden strengths and new skills?



When the hero returns, what is his new outlook and what are changes to his world?

ACTIVITY 2

PLANNING YOUR HERO'S JOURNEY STORY



1 Describe an ordinary day before the journey began. \_\_\_\_\_  
\_\_\_\_\_

2 What was the problem you needed to solve or the call to action?  
What natural or supernatural events occurred? \_\_\_\_\_  
\_\_\_\_\_

3 Describe how a mentor helped you before or during your journey?  
What natural or supernatural events occurred? \_\_\_\_\_  
\_\_\_\_\_

4 What were the trials you went through?  
What natural or supernatural events occurred? \_\_\_\_\_  
\_\_\_\_\_

5 How did you overcome the final trial?  
What natural or supernatural events occurred? \_\_\_\_\_  
\_\_\_\_\_

6 How were you transformed or what did you learn about yourself? \_\_\_\_\_  
\_\_\_\_\_

7 What changed in your ordinary life after the journey ended? \_\_\_\_\_  
\_\_\_\_\_

# Disney MOANA

## ACTIVITY 3

# PLANNING YOUR HERO'S JOURNEY WALL HANGING

Draw a sketch or use symbols to plan for each step of your hero's journey wall hanging.



Working Title

1 My life before the journey

2 The problem I needed to solve

3 Who helped me get ready to solve my problem

4 My attempts to solve the problem

5 How I solved the problem

6 How I changed (what I learned about myself)

# MUSIC AND RHYTHM OF THE OCEAN

## LESSON 2

The sounds of nature, the ocean and traditional Oceania music are all integral parts of Disney’s “Moana”, and combine in unique ways to express the emotions felt by the characters. Throughout the film, the ocean plays an important role in aiding Moana’s journey. Although not a character in real life, the ocean contains a powerful message that can be heard deep below the surface of the water and through the powerful waves as they crash onto the shore. In listening to these sounds, one can understand how the ocean can be personified with its own voice that inspires musicians both past and present, to create new songs and melodies.

### WARM UP

Disney’s “Moana” has a unique soundtrack filled with fun, entertaining and emotional songs that help tell the background of the characters and aids in establishing Oceania as the setting of the story. Throughout each song, various rhythms can be identified that are unique to the culture of Oceania. Pu’ili sticks, or bamboo percussion instruments, have been used for many years to make music in Oceania, and were also the tools contemporary musicians utilized to provide the rhythm and heartbeat of many of the songs in the film.

### GET STARTED

**STEP 1:** Provide each student with two paper towel cardboard tubes and suggested art supplies. Students will decide which ends of the paper towel tubes will become the fringed area of their Pu’ili sticks. Once decided, each student should measure and draw 5 inch (12.5 cm) lines that are 1/2 inch (1.25 cm) apart from the outer edge towards the middle of the cardboard tubes. Students will then use scissors to carefully cut straight along the lines. After completing the cuts, students should wrap multiple layers of duct tape around the other end of the tubes, forming handles. To complete their Pu’ili sticks, students should write their names on the final product and draw designs to decorate them.

**STEP 2:** Ask students to spend a few minutes getting accustomed to how to play the sticks. Direct them to hold one stick firmly by the handle and gently strike it in the middle with the other stick a few times. They may try holding the sticks above their heads and tapping them lightly and experiment with other techniques. To aid in student understanding of how Pu’ili sticks are played, show the class a video of hula dancers from Hawaii using Pu’ili sticks in a performance <https://www.youtube.com/watch?v=o8RtRGkzUYc>

Point out how the dancers keep a steady beat. Also make note of how the hula dancers make different sounds through a variety of gestures such as tapping their shoulders. After watching the video, ask students to set their sticks aside and inform them that they will be using the sticks after they have learned more about the different sounds of the ocean.

**STEP 3:** In order to understand how the ocean has a unique voice full of various sounds students will listen

**THEME:** Music and Rhythm

**GRADE LEVEL:** 2 - 6

**STUDENTS WILL BE ABLE TO:**

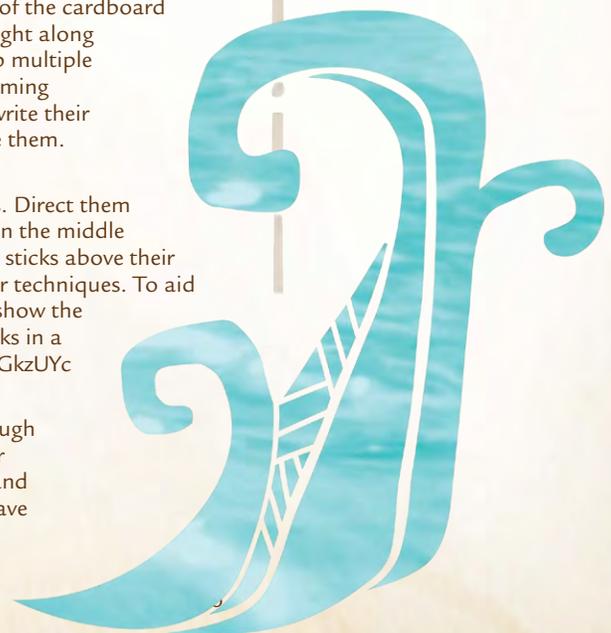
- learn about natural and human-made sounds found underneath the ocean surface
- construct instruments similar to those used in traditional Oceania culture
- compare the patterns found in ocean waves with sound waves
- identify rhythmic patterns found in nature within the songs of Oceania

**VOCABULARY:**

amplitude, crest, frequency, hydrophone, peak, personification, spectrogram, trough, wavelength

**YOU’LL NEED:**

- Suggested Art Supplies: paper towel cardboard tubes, duct tape, pencils, markers, rulers, scissors
- Activity Sheet 1: *Characteristics of Waves of Water*
- Activity Sheet 2: *Characteristics of Sound Waves*



# MUSIC AND RHYTHM OF THE OCEAN

## LESSON 2

underwater recordings from hydrophones provided by the National Oceanic and Atmospheric Administration or NOAA. The development of hydrophones has given scientists a unique way to learn more about unexplored areas of the ocean. Hydrophones are microphones equipped to record underwater sounds. These underwater microphones are used to study the distribution of large whales in open oceans, sounds made by endangered marine animals, sounds related to geological processes and sounds caused or influenced by people. Permanent hydrophone collections help scientists monitor the effects of natural and human-made sounds on the marine environment and the possible impact on marine life communications.

**STEP 4:** Play different natural and human-made underwater recordings on the NOAA sea sounds website. <http://oceanexplorer.noaa.gov/explorations/sound01/background/seasounds/seasounds.html>.

Write different categories for the recordings on the board, and then list specific sound events or phenomena you listen to.

1. Natural Events: earthquakes and volcanic tremors
2. Human-made Sounds: large ships, small ships, geological air guns
3. Marine Life Sounds: blue whales, humpback whales, fin whales and minke whales

4. Unknown Sources: Was there a rhythm to each recorded sound? How would students characterize each sound? How are some sounds the same? How are they different? How might the sounds reflect the mood or emotions of the ocean?

**Hydrophones are microphones equipped to record underwater sounds.**

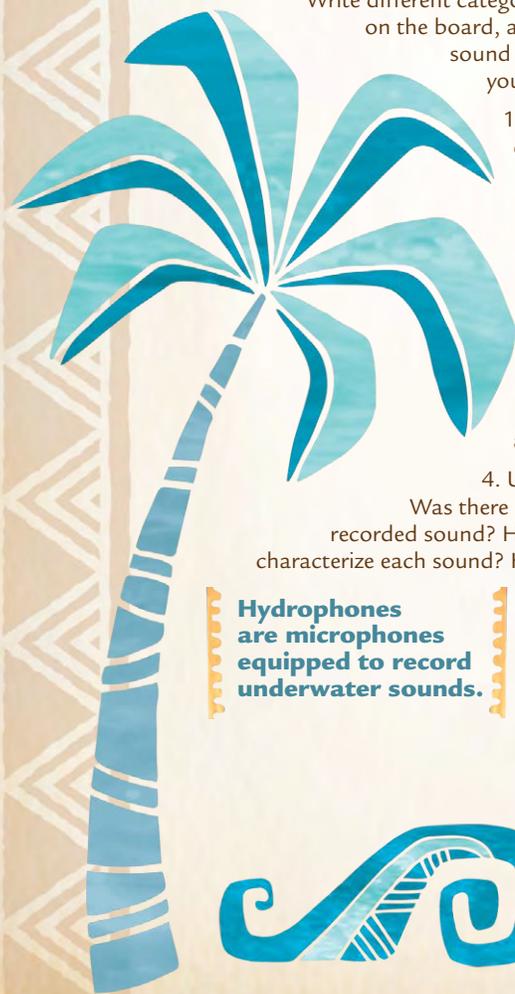
**STEP 5:** Remind students that ocean sounds occur above the surface through waves which Moana and Maui experience while traveling throughout their journey. Some waves they encounter are gentle, some are strong, some occur in the water and some express the mood of the ocean. Waves, whether they are water waves or sound waves, have certain similar features. Understanding waves on water can help students understand how sound waves work. Students will listen to the sounds of ocean surface waves that range from large crashing waves to small waves lapping on the shoreline <http://www.freesound.org/search/?q=ocean+waves>. Students will listen to each sound first and then suggest the type of wave they hear. Read the label that accompanies the wave and discuss specific characteristics. Write the different types of waves students listen to on the board.

**STEP 6:** Show students the spectrogram for each of the sounds you play. The spectrogram is the graphic representation of the frequency, intensity, duration and variation of sounds of an ocean wave. Students should note how the sound bar moves across the different parts of the sound wave, producing distinctive low/high pitches, and louder/softer sounds.

**STEP 7:** Students will use their handmade Pu’ili rhythm sticks to replicate the various patterns of the sounds they heard under the ocean and on the ocean surface. Break the class into small groups of students. Remind them they can refer to the different types of sounds they heard as listed on the board as they complete the activities. Challenge each group to play and practice the distinct rhythms within individual sound patterns. Once each group has mastered their rhythms, combine the class, having each group play at the same time in order to make a classroom ocean soundscape.

### WRAP UP

Play songs from Disney’s “Moana” soundtrack trailer for students <https://www.youtube.com/watch?v=YyyMQS9a6e8>. Ask students to listen to the percussion throughout the song. Did they recognize any of the rhythms they heard throughout the course of the lesson? Could they identify any other percussion sounds that were inspired by nature (i.e. crash of waves,



# MUSIC AND RHYTHM OF THE OCEAN

## LESSON 2

crescendo of a volcano, wind blowing through trees)? Ask students to consider whether or not the song expresses the voice of the ocean. If so, what emotion would the ocean project? What marine animals, human-made objects or natural events under the surface would the ocean use to play this song? How big or small would the waves of the ocean be? How frequently would waves hit the beach? Play the song again and invite students to play their Pu'ili sticks to join in the rhythm of the music.

### EXTENSION GRADES 4-6:

1. Distribute Activity Sheet 1. Ask students to complete a water wave diagram and create diagrams of a small and large wave. Guide a discussion on how students adjusted the wavelength, amplitude and peak to draw both sizes of waves. Remind students that blowing wind causes waves to form on the ocean.
2. Distribute Activity Sheet 2 and ask students to complete a water wave diagram and label diagrams of sound waves that are low pitch, high pitch, louder and softer. Guide a discussion on how students identified the amplitude and frequency to determine where to place the labels. ©

### ADDITIONAL RESOURCES

#### Websites:

##### Longitudinal and Transverse Wave Motion

<http://www.acs.psu.edu/drussell/Demos/waves/wavemotion.html>

##### What is Sound?

<http://www.explainthatstuff.com/sound.html>

##### Polynesian Audio Recordings

<https://www.loc.gov/>

##### Unukupukupu Halau Hula Webcast

[https://www.loc.gov/today/cyberlc/feature\\_wdesc.php?rec=5648](https://www.loc.gov/today/cyberlc/feature_wdesc.php?rec=5648)

##### World and Traditional Music

<http://sounds.bl.uk/World-and-traditional-music>

#### Books

*Experimenting with Sound Science Projects* by Robert Gardner. Enslow Publishers, 2013.

*Cool Science: Experiments with Sound and Hearing* by Chris Woodford. Gareth Stevens Inc, 2010.

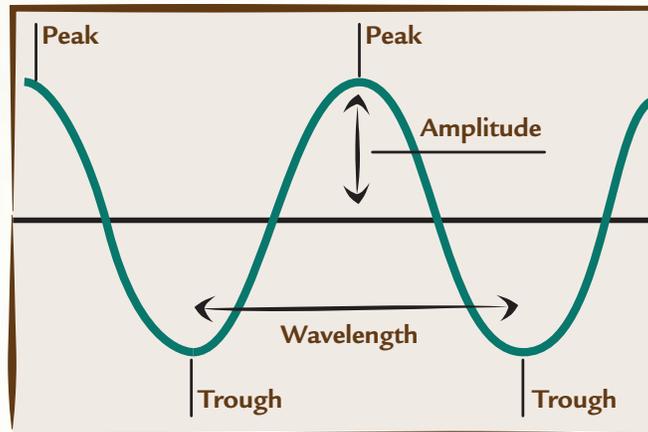
*Light and Sound* by Steve Parker. Raintree Steck-Vaughn, 2000.

*The Science of Noise* by Lynne Wright. Raintree Steck-Vaughn, 2000.



ACTIVITY 1

CHARACTERISTICS OF WAVES OF WATER



**1** Based on the example wave, match each word to the correct definition.

**PEAK**

the highest point of a wave

**TROUGH**

the distance between any two crests/ trough of a wave

**AMPLITUDE**

the number of waves that pass over a particular period of time

**WAVELENGTH**

the lowest point of a wave

**FREQUENCY**

the height of a peak

**2** Experiment with drawing diagrams of waves that are smaller and larger than the example wave. Be prepared to discuss how you adjusted the wavelength, amplitude and peak to draw both sizes of waves.



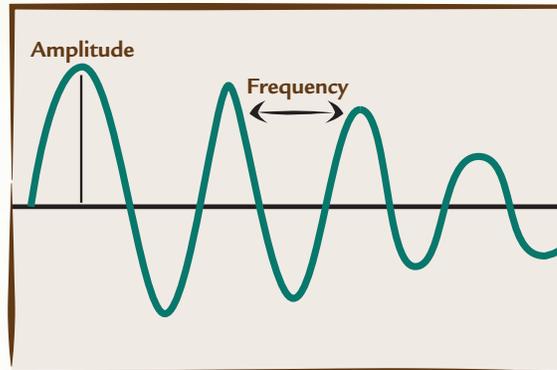
SMALLER WAVES



LARGER WAVES

ACTIVITY 2

CHARACTERISTICS OF SOUND WAVES



1 Based on the example wave on the right, match each word to the correct definition.

**AMPLITUDE**      how loud or soft the sound is

**FREQUENCY**      controls the pitch

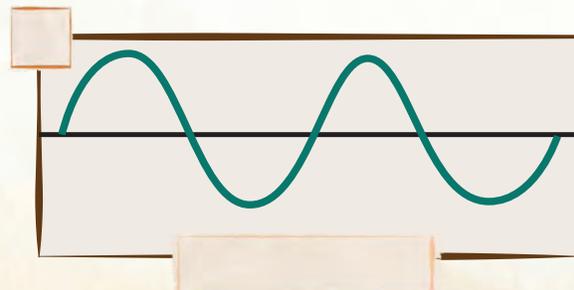
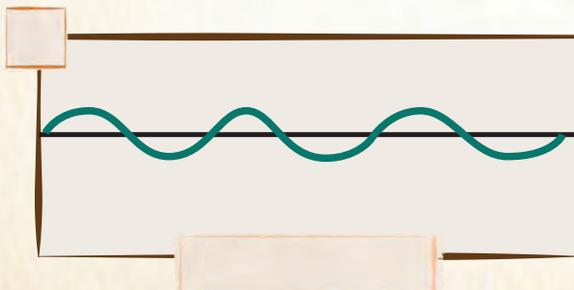
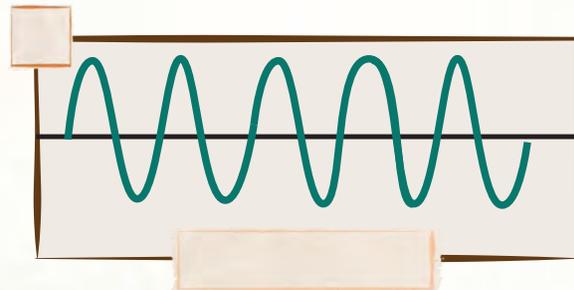
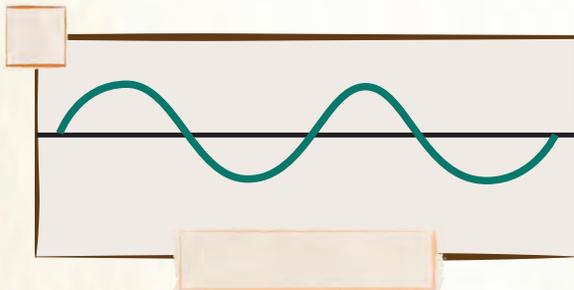
2 Compare the 4 diagrams below with the example wave. Then, in the top left box write a letter from the descriptions below that best match each diagram.

- a) louder      c) lower pitch
- b) softer      d) higher pitch

Be prepared to discuss why you assigned the labels to the different types of sound waves.

3 Below each sound wave, write in the correct label.

- LOW AMPLITUDE
- HIGH AMPLITUDE
- HIGH FREQUENCY
- LOW FREQUENCY



# Disney MOANA

## WAYFINDING USING EARTH'S NATURAL FEATURES

### LESSON 3

**M**oana dreams of exploring the ocean and is inspired to set sail upon learning of her people's heritage as master navigators. Through the use of wayfinding, Moana is able to connect to the natural world through the earth, stars and water in order to accomplish her goals. Similarly, ancient voyagers relied on the natural world to explore their surroundings and provide their people with the needs to sustain life. However, learning the art of navigation takes time, and it is only through the help of Maui as her mentor that Moana learns the skills and techniques necessary to reach her final destination.

### WARM UP

Explain to students that a mentor is someone who is a master in a field of knowledge that is unknown to a person who needs advice or training in that same field. In Disney's "Moana", the character of Maui plays an important role as an effective mentor who uses different techniques to help Moana learn how to navigate the ocean. Inform students that they will become knowledgeable about three techniques to navigate the ocean without the use of modern technology. They will use their experiences and knowledge to mentor visiting students from grades 2-3 similar to Maui's role with Moana.

### GET STARTED

Provide students with guidelines for mentoring younger, less experienced students. Lead a discussion that focuses on the following mentoring guidelines. Students may recall which guidelines Maui used when mentoring Moana. Encourage them to take notes and make a list of the guidelines they think will be most helpful:

1. A mentor is a capable guide, a caring advisor and a companion to a younger person who is on a journey of learning and self-discovery.
2. A mentor reveals new ways of seeing and thinking to the less experienced person.
3. A mentor is a positive role model who helps the younger person accomplish what they are trying to do, but does not do it for them.
4. A mentor asks guiding questions and relates solutions to their own experiences or stories.
5. A mentor steers the younger person in the right direction and gives them the tools they need to accomplish their goals without the mentor.

**THEME:** Navigation

**GRADE LEVEL:** 2 - 3 & 4 - 6

**STUDENTS WILL BE ABLE TO:**

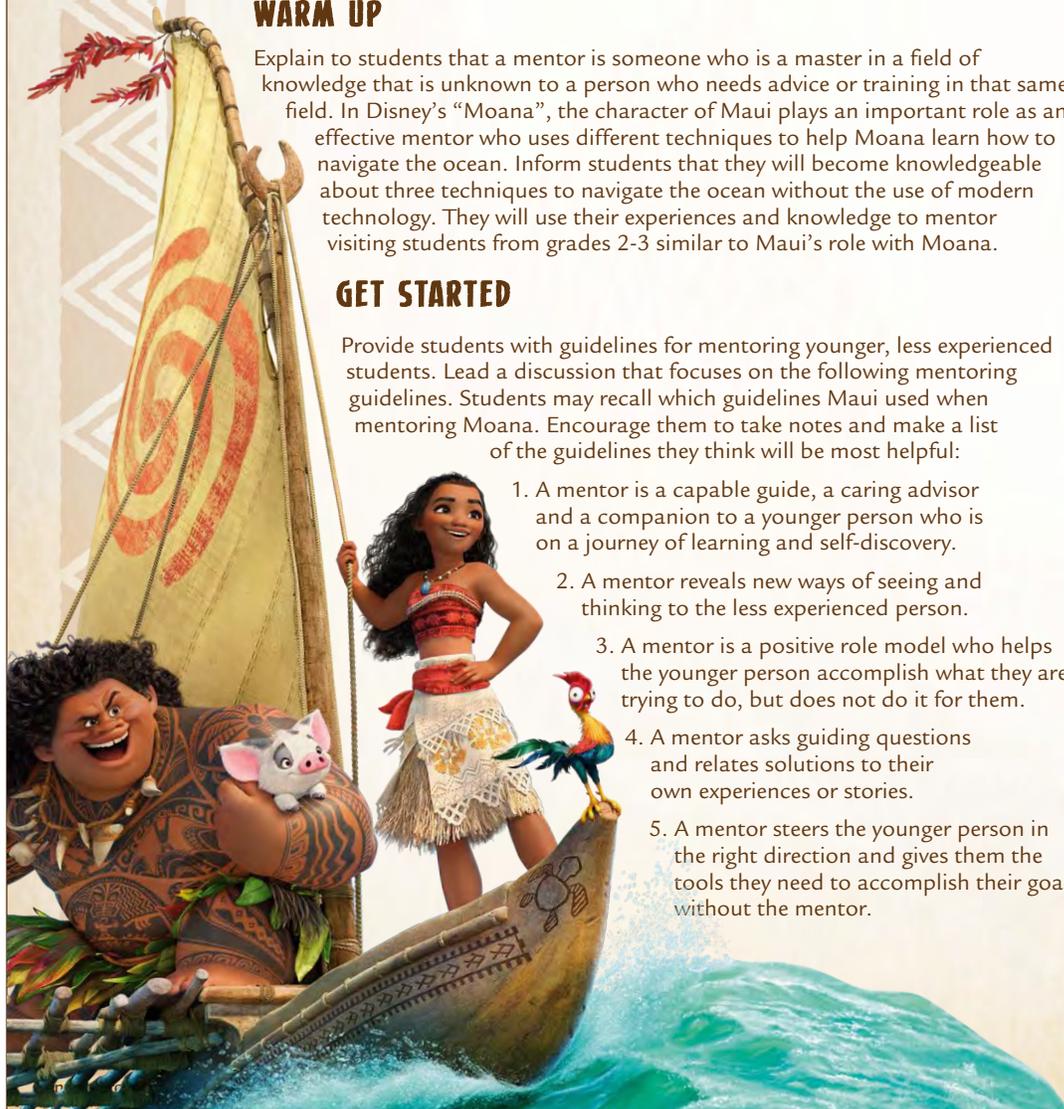
- make a navigation stick chart collage to represent playground pathways
- use a star wheel to locate constellations in different seasons
- mentor students from grades 2-3 in using a playground stick chart and constellation patterns to complete navigation activities

**VOCABULARY:**

cardinal, current, eddies, gyre, island, map, navigation, star wheel, stick chart, swell, voyage, wayfinding

**YOU'LL NEED:**

- Suggested Art Supplies: paper, pencils, clipboards, 8.5x10" card stock or tag board, pretzel sticks, glue, scissors, index cards, markers, peel and stick glow in the dark star kits, rulers, black butcher paper and tacks.
- Activity Sheet 1: *Examples of Navigation Stick Charts and Playground Picture Map*
- Activity Sheet 2: *Constellation Hunt*
- Activity Sheet 3: *Constellation Card Sets*



# WAYFINDING USING EARTH'S NATURAL FEATURES

## LESSON 3

### READING STICK CHARTS

**STEP 1:** Ancient ocean navigators like Moana did not have the materials or technologies required to make sophisticated, mechanical devices such as GPS, radios or compasses to help find their way across short or long distances on the ocean. To help them avoid obstacles and find open paths through ocean waters, voyagers made stick charts that showed the flow and direction of waves, revealing pathways through the ocean. The charts were made from sticks, parts of a coconut and seashells. To teach new navigators how to wayfind across the ocean, family mentors used stick charts to teach another family member how to navigate the ocean waters near their islands.

**STEP 2:** Provide students with Activity Sheet 1. Point out some of the features of the charts such as the way the shells represented islands, straight sticks represented ocean swells and curved lines represented wave patterns. Explain that the charts illustrate the flow of ocean waters.

**STEP 3:** Divide students into peer pairs. For this activity they will be making a picture map and stick chart of the equipment located on the school playground. The stick chart will show possible paths students in grades 2-3 can take to navigate through the playground.

- Making a Playground Picture Map - First, have students take sketching paper and pencils to the playground in order to take notes or make sketches of where the equipment is located. Second, have them draw and color picture maps on card stock or tag board in the classroom and write their names on the back of the map. Third, have students add cardinal directions on each edge of the map.
- Adding Stick Chart Embellishments - First, remind students that the purpose of the stick chart is to show possible pathways to and from playground equipment during recess. Second, ask them to think about where most students enter the playground. Pencil in different pathways. They will use short pieces of pretzel sticks placed in curved or wavy lines to show paths that go around equipment. They will use longer pieces to show straight paths within the playground. Label each path A, B, C, etc. Students will decide how to use sticks to show any areas that are off limits and/or dangerous to children.

**STEP 4:** Invite students from a grade 2-3 classroom to participate with your students. Guide a discussion on how older students can use the playground stick charts to mentor the younger students by presenting them with a series of challenges.

- Mentors show pictures of stick charts on the activity sheet to younger students and explain their purpose for ancient voyagers.
- Mentors tell younger students that, like voyagers in ancient times, they will teach them how to read a stick chart map of the playground. They will then challenge them to plan which routes to take to play on different pieces of equipment.
- Mentors orient the younger students to the stick chart playground map and ask a series of questions. Younger students write their answers on an index card. 1) Which route would they take to the swing? 2) Which route would they take to get from the swing to the slide? 3) What path is the shortest route from the slide to the bench?
- Mentors, younger students and a teacher go to the playground. Younger students look at the list of routes they have selected. Mentors ask students to recall the stick chart and see if they can follow their navigation routes to move among the equipment. Place a check mark by each successful route. Mentors should be prepared to refer younger students to the maps if they get confused.

**STEP 5:** Mentors return to the classroom and discuss benefits and difficulties of using stick maps in sharing knowledge and helping younger students navigate the playground. Direct students who want to learn more about how to navigate with human senses (not modern instruments) to the following video <https://manoa.hawaii.edu/exploringourfluidearth/physical/navigation-and-transportation/wayfinding-and-navigation/voice-sea-traditional-voyaging>.

### READING THE STARS

**STEP 1:** In the film, Moana, with Maui's help, learns to navigate by observing the stars and distances between constellations. In this activity, students will gain insights into the complexities involved in navigating during the nighttime. Begin the discussion by looking at maps and globes and orienting students to north, south, east and west. Note that these directions remain consistent whether you are on land, on water or even in the sky. Most students will already know that the sun (a star) rises in the east and sets in the west. Remind them that this is due to the earth's rotation on its axis, not because the sun itself is changing its position in the universe. Like the sun, stars also appear to travel across the sky from



## WAYFINDING USING EARTH'S NATURAL FEATURES

### LESSON 3

east to west as the earth rotates. This means that you'll see different stars overhead at different times of night. By tracking the position of stars, and their shifts of location in the night sky, Moana could determine which direction she was heading - east, west, north or south.

**STEP 2:** To help students understand that the constellation movements in the night sky show the passage of time throughout the night, instruct pairs of students to assemble a star wheel. They will be learning how to use a star wheel to participate in a night sky constellation hunt. The star wheels will allow them to read times and locations of stars at their directional position. Print a copy of a star wheel from the following website [http://www.skitsap.wednet.edu/cms/lib/WA01000495/Centricity/Domain/1233/starwheel\\_spring09.pdf](http://www.skitsap.wednet.edu/cms/lib/WA01000495/Centricity/Domain/1233/starwheel_spring09.pdf). Note "This Star Wheel is usable for northern latitudes between 30° and 50°, which covers virtually all of the continental US, southern Canada and Europe. It includes the names of the brightest stars and the most prominent constellations." Star wheels for other locations are also available online.



**Like the sun, stars also appear to travel across the sky from east to west as the earth rotates.**

**STEP 3:** After students have assembled their star wheels, provide an orientation by viewing a video on how to use them at <http://www.skyandtelescope.com/astronomy-resources/video-using-star-charts-and-star-wheels/>. Guide students as they turn the circular star map in a counterclockwise position. What seems to be happening in the center? (The sky seems to be turning around Polaris, the North Star.) Give students time to explore and ask questions about the star wheel's outer sleeve. The following instructions can help students locate constellations in the night sky as an optional homework activity.

- Remind students they will begin by rotating the outer sleeve and lining up the desired time of night with the date (month and day).
- Once they decide which constellation they want to locate, they will notice which horizon it is closest to. Students move the holder so the correct horizon is at the bottom. This gives the correct orientation.
- Next students decide if the constellation is closer to the zenith (highest point) or closer to the horizon line.

- After learning the shape of the constellation, students should be able to locate it in the night sky if they are not in a highly lighted area.

**STEP 4:** Distribute Activity Sheet 2 to each student pair. Students will collaborate on answering the questions on the activity sheet and should write additional challenge questions to share with classmates at the bottom of the table.

**STEP 5:** Students will prepare the classroom for mentoring the grade 2-3 students by arranging glow in the dark stars in the shapes of the Big Dipper and 3-4 additional constellations. Students can go to <http://www.dustbunny.com/afk/constellations/> to see close up examples of several constellations. Affix the star shapes to black butcher paper or construction paper. Once the shapes are ready, tack each constellation sheet to the classroom ceiling. Point out the places and spaces on the ceiling that align with the star wheel. Place a large star to serve as the North Star in the middle of the ceiling and place any remaining stars randomly on the ceiling.

**STEP 6:** Divide students into small groups and assign each to become an expert on the myth of one of the selected constellations hung on the ceiling. They may go to a site, such as <http://domeofthesky.com/clicks/constlist.html> and click on the names of constellations to link to the myths. Invite a grade 2-3 classroom to visit your students. Print out copies of Activity Sheet 3 (one for each constellation displayed on the ceiling) and distribute to each visiting grade 2-3 student. Each card in the set shows the name and shape of one of the constellations. Each mentor will take turns guiding one or two grade 2-3 students.

1. Mentors should remind younger students that one of the ways Maui helped Moana learn to navigate was by telling her myth stories of his heroic and epic deeds. Knowing constellation stories can also make the star shapes memorable and help voyagers chart a path through the ocean.
2. Mentors will show the younger students the constellation cards and tell them the myth story that goes with each one.
3. The challenge for the younger students is to chart a course from one corner of a darkened classroom to another by using a set of the constellation cards. The mentor arranges a set of the cards in the order the younger students should follow to navigate across the room. As the younger students start their journey, they seek out and then identify the constellations on each card as they pass under it.
4. The mentor will serve as a guide, helping younger students learn how to notice star patterns; reminding

# Disney MOANA

## WAYFINDING USING EARTH'S NATURAL FEATURES

### LESSON 3

them about how a configuration aligns with a myth story; helping them orient the location of a constellation to the North Star.

5. When younger students arrive at the destination in the opposite corner, their set of constellation cards should be arranged in an order that matches the path they took.

When the activity is completed, mentors should ask the grade 2-3 students if they think following the stars across the ocean on a rocky boat would be easy or difficult? Each of the younger students may keep a set of the star constellation cards. Once the visiting class has left, lead a discussion with students about the experience of mentoring younger students through the constellation star tour. What role did the myth stories play in supporting mentoring? What was the most difficult part of mentoring? What was the most effective part of mentoring? How many of the younger students were able to successfully locate and follow the path laid out by connecting each constellation along the journey?

### WRAP UP

Once you have completed both activities ask students how it felt to be a mentor? Was it difficult to learn and master the different navigation techniques? Did they feel they were experts before they received a younger student to mentor? Similar to Maui in the film, mentorship is not always easy and takes both patience and time to teach others. However, no matter the subject, mentors are always a valuable resource and guide to those who look to learn and complete their own journeys in life. ©

### ADDITIONAL RESOURCES

#### Websites:

**Star Map Image** <http://www.richardbell.net/images/starmap/map.gif>

**Polynesian Navigation Online Simulation**  
<http://www.exploratorium.edu/neverlost/#/voyage/stories>

**Voice of the Sea: Traditional Voyaging**  
<https://manoa.hawaii.edu/exploringourfluidearth/physical/navigation-and-transportation/wayfinding-and-navigation/voice-sea-traditional-voyaging>

**Micronesian Stick Chart**  
<http://nationalgeographic.org/media/micronesian-stick-chart/>

**Wayfinding and Navigation**  
<https://manoa.hawaii.edu/exploringourfluidearth/node/34>

**Traveling the World By A Map of the Stars**  
<http://www.npr.org/sections/codeswitch/2016/05/27/479468130/hokulea-the-hawaiian-canoe-traveling-the-world-by-a-map-of-the-stars>

#### Books

Mitton, Jacqueline, Christina Balit, and Wil Tirion. *Zoo in the Sky: A Book of Animal Constellations*. National Geographic Society, 2006.

Rey, H. A. *The Stars: A New Way to See Them*. Houghton Mifflin, 1980.



ACTIVITY 1

NAVIGATION STICK CHART EXAMPLE

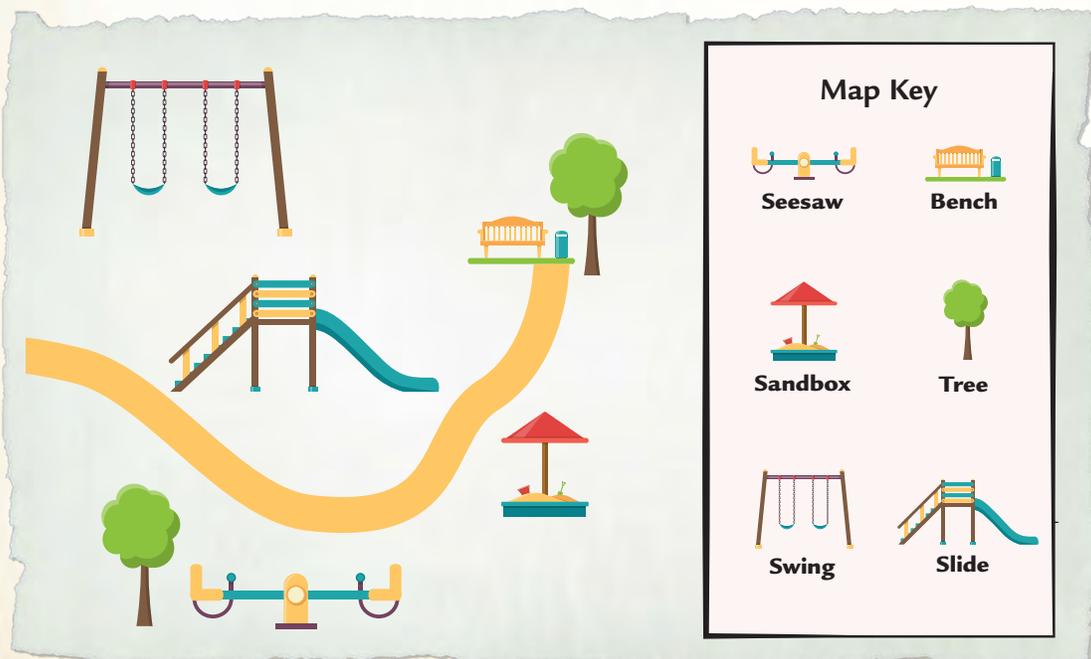
Stick charts for one island show ocean currents and wave patterns that surround each side of an island.



3 WAYFINDING USING EARTH'S NATURAL FEATURES

PLAYGROUND PICTURE MAP EXAMPLE

A picture map shows where items are located in a map of one location. Notice the map key that explains the equipment on the playground.



# Disney MOANA

## ACTIVITY 2

# CONSTELLATION HUNT

**3**  
WAYFINDING  
USING EARTH'S  
NATURAL  
FEATURES

List 3 constellations you can see in winter.

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List 3 constellations you can see in summer.

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Set the dial for 11pm on today's date and adjust the dial to determine which constellations were visible at 9pm but not at 11pm.

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Which constellations will be visible one month from now at 9pm that are not going to be visible at 9pm tonight?

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Add your own questions to challenge others.

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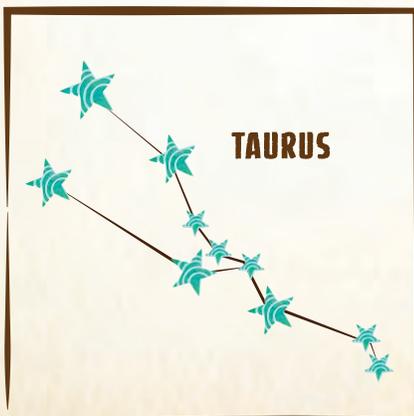
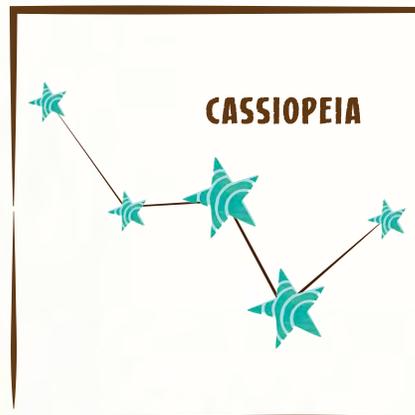
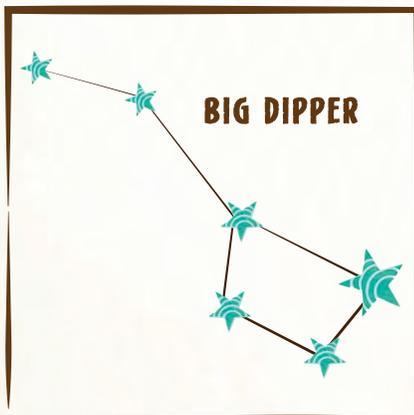
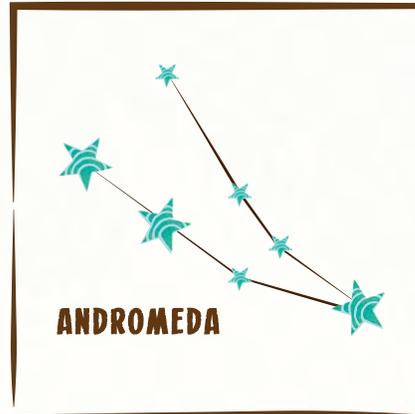
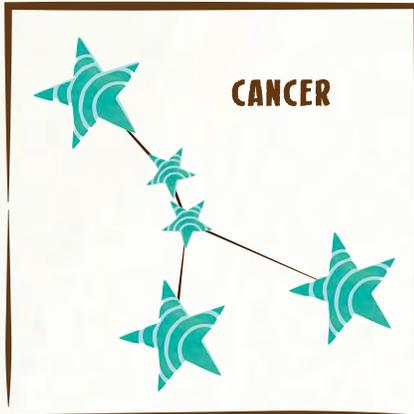
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ACTIVITY 3

CONSTELLATION  
CARD SETS

3  
WAYFINDING  
USING EARTH'S  
NATURAL  
FEATURES



The sky appears to be  
turning around Polaris,  
the North Star.

# CARING FOR SEA TURTLES

## LESSON 4

**A**t a young age Moana is is curious and inquisitive, exploring the natural world around her. Spending time in nature and caring for the species that live in it is a core value towards protecting animals around the world, including sea turtles. The seven species of sea turtles found throughout the world all face threats to their survival and are in need of the same care and empathy shown by Moana throughout her journey. Sea turtles face many threats, with the greatest of these being accidental capture from fisheries, lights and barriers on nesting beaches and loss of feeding habitat such as seagrass beds and coral reefs. By understanding these threats and recognizing the plight of sea turtles in the wild, humans can harness their creativity to find ways to reverse the decline of these magnificent animals.

### WARM UP

On a daily basis, scientists and conservationists work to reverse the decline of endangered species. These wildlife heroes showcase an important quality that is essential in order to care for species, empathy. Students will have the opportunity to examine a marine biologist's field note entries while working in small groups to identify threats to sea turtle hatchlings.

Break students into small groups. Inform the class that their assignment is to step into the shoes of a marine biologist by analyzing a set of field notes. Remind students of the role that field notes and logs play in the study of animals with a quote from the Smithsonian Museum of Natural History: "Field books are important because they are the primary source records of flora, fauna and ecosystem biodiversity research. They hold the first observations, thoughts and reflections of scientific researchers when they venture out to observe, document and collect specimens of the natural world.... Field books or field notes are primary source documents that describe the events leading up to and including the collection of specimens or observations during field research. Field notes can take many forms depending on the information needs of the collector."

### GET STARTED

**STEP 1:** Distribute Activity Sheet 1 that includes marine biologist field notes from the following site, [http://nerdswithoutborders.net/index.php?title=Turtle\\_Sense/\\_/Project\\_logs](http://nerdswithoutborders.net/index.php?title=Turtle_Sense/_/Project_logs). Remind students that taking notes in the field is a tried and true tradition in scientific work that occurs in natural settings. Ask them to predict the type of information they might find in notes related to working with sea

**THEME:** Conservation

**GRADE LEVEL:** 2 - 6

**STUDENTS WILL BE ABLE TO:**

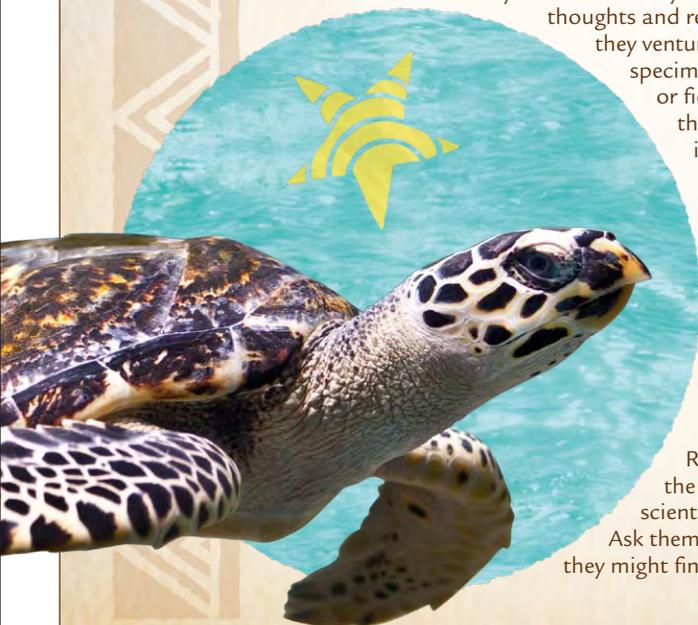
- analyze marine biologist field notes to identify techniques used to study sea turtles, threats posed to sea turtles and facts about sea turtles
- collaboratively write and enact a Poem for Two Voices that offers insights into empathetic points of view about threats to sea turtles
- propose ways to help sea turtles on their nesting beaches
- recommend ways to help sea turtles survive in the water
- conceptualize and draw a diagram of a device designed to automatically overcome a threat to sea turtles in nature

**VOCABULARY:**

bycatch, empathy, field notes, nesting, pollution, reef, seagrass

**YOU'LL NEED:**

- Pens or pencils
- Writing paper
- Activity Sheet 1: *Sea Turtle Field Notes*
- Activity Sheet 2: *Sea Turtle Facts & Conservation Issues Cards*
- Activity Sheet 3: *Writing a Poem for Two Voices*



# CARING FOR SEA TURTLES

## LESSON 4

turtles on beaches. Also, point out that they can take notes in the right-hand columns to identify techniques used to study sea turtles, threats posed to sea turtles and facts about sea turtles.

**STEP 2:** After students have completed the field note analysis, guide a discussion about what they have learned. Ask them to point out any instances they can

**Empathy is the ability to understand the feelings or circumstances of another person, or animal, from their perspective.**

find where scientists recount the importance of their work with sea turtles. While facts about sea

turtle conservation and threats are at the core of a scientist's field notes, it is equally important to see life through the eyes of sea turtles. Thinking deeply about how the facts translate into quality of life can help students develop empathy for the plight of sea turtles. Students who develop empathy are likely to be compassionate, helpful to others and take action to make positive changes in the world.

**STEP 3:** Ask students to divide into pairs. Knowing about the behaviors of sea turtles, as well as the behaviors of people who impact a sea turtle's ability to successfully nest on beaches, will help students further their understanding of the issues. Distribute Activity Sheet 2. Students should cut out each of the cards and sort them into categories of their choosing.

Students read the sets of cards and ask their partners how they think sea turtles are affected by each scenario. How would students feel if they could help with each of the situations?

**STEP 4:** Hand out Activity Sheet 3. Explain to students that they will write a type of poem that deals with an important sea turtle issue that they want to explore from two points of view. Go over the activity sheet, explaining that Voice 1 represents one point of view and Voice 2 represents a different point of view. The middle column represents any points of agreement. For the grades 2-3 students, the poem can be written by the whole class.

**STEP 5:** Students will identify an issue related to threats to sea turtles they learned from analyzing the field notes and reading the issue cards. Then they will each select the voices of those who could express two opposing views and feelings about the issue. For example, the issue might be the dangers of plastic bags along the shoreline and ocean waters. One voice could be a sea turtle that is hungry and thinks the plastic bag is a jellyfish. The other voice could be a marine biologist who is trying to help clean up litter from the ocean and reefs where sea turtles feed. Invite students to suggest different pairs of voices for the poetry. List their suggestions on the board. Students begin peer pair work by brainstorming words related to the issues and emotions involved. What if a sea turtle hatchling could let us know how scared it is of predators, and how worried it is to know that only 1 in 1,000 grow to maturity? Poems may be blank verse or they may rhyme.

**STEP 6:** Go over the "reminders for performing the poem" at the bottom of Activity Sheet 3. Remind students that the purpose is not only to present different points of view, but to also reflect emotions that students might feel if they were sea turtles in light of different threats. At the end of each poem students should be prepared to highlight specific actions they hope will be taken to protect sea turtles.



# CARING FOR SEA TURTLES

## LESSON 4

### WRAP UP

Identify some tangible actions that students anywhere can take to do their part to help sea turtles, such as campaigns to collect and recycle plastic bags, eliminating plastic straws, neighborhood litter cleanups, shielding lights to reduce light pollution near beaches, filling in holes that may entrap hatchlings, avoiding fireworks during nesting periods and promoting safe boating to avoid striking sea turtles. No matter where students live, they can make a difference for sea turtles and other threatened species. Passing along knowledge to friends and family is a great conservation action. This shared knowledge can foster passion and empathy toward animals to help save wildlife around the world.

### EXTENSION GRADES 4-6:

#### Design a Conservation Device to Address a Threat

Challenge students to conceptualize the design of devices that are intended to provide practical solutions to conservation challenges. For this activity, students will draw a diagram of a device designed to overcome a threat to sea turtles in nature.

You'll Need: graph paper, markers, pencils and poster board

Share a diagram of a Turtle Excluder Device also known as a TED, <http://www.fao.org/fishery/equipment/ted/en>. A TED is designed to ensure sea turtles do not get entangled in a trawl fishing net. When sea turtles are ensnared in a net they are not able to swim to the surface for air, and as a result many drown. By studying how sea turtles move and react when in a net, scientists, fishers and designers were able to create a device that allows a sea turtle to escape.

Remind students of sea turtle threats they can address: human interference with nesting on beaches, lights that draw hatchling sea turtles on beaches away from the ocean, predators that dig into nests to eat eggs or plastic litter in the sea that is mistaken for food.

Students can put together what they learned as a class to draw and diagram an innovative new device to protect the species. ©

### ADDITIONAL RESOURCES

#### Websites

##### Sea Turtle Species Profile

<https://disneyworld.disney.go.com/attractions/epcot/disney-animals-sea-turtles>

##### Archie Carr Center for Sea Turtle Research – University of Florida

<https://accstr.ufl.edu>

##### Sea Turtle Conservancy

<http://www.conserveturtles.org>

##### Sea Turtle Tracker

<http://www.tourdeturtles.org>

#### Books

Davies, Nicola. *One Tiny Turtle: Read and Wonder*. Illustrated by Jane Chapman. New York: Candlewick Press, 2005.

Marsh, Laura. *National Geographic Readers: Sea Turtles*. Washington, D.C.: National Geographic Society, 2011.

Monroe, Mary Alice, and Barbara J. Bergwert. *Turtle Summer: A Journal for My Daughter*. Mt. Pleasant, S.C.: Sylvan Dell Publishing, 2007.

Pirotta, Saviour, and Nilesh Mistry. *Turtle Bay*. New York: Farrar, Straus and Giroux, 1997.

Rhodes, Mary Jo. *Sea Turtles (Undersea Encounters)*. Photographs by David Hall. Danbury, Conn.: Children's Press, 2005.

Stevenson, Andrew. *The Turtle Who Ate a Balloon*. Flatts, Bermuda: Bermuda Zoological Society, 2007.

Swinburne, Stephen R. *Turtle Tide: The Ways of Sea Turtles*. Illustrated by Bruce Hiscock. Honesdale, Pa.: Boyds Mills Press, 2005.

Tara, Stephanie Lisa. *I'll Follow the Moon*. Illustrated by Lee Edward Fodi. Dallas, Tex.: Brown Books Publishing Group, 2005.

Yee, Tannmy. *Baby Hanu's Incredible Journey*. Waipahu, Hawaii: Island Heritage Press, 1997.



ACTIVITY 1A

SEA TURTLE FIELD NOTES



SUMMER 2015 FIELD NOTES ENTRY



1

RESULTS FROM THE FIRST NEST

We had our first nest hatching yesterday, August 10th, or what we call a boil. I'm happy to report that the day before the boil, I sent an e-mail to the National Park Service saying that I thought something might be happening in the nest. ... it might actually be possible to predict when a nest will hatch! [The trick seems to be in the way we have hidden the sensing data in a container that looks like a turtle egg. It can stay in the nest undisturbed. "Nest monitor devices with a microcontroller, accelerometer, thermometer and communications system inside a ping-pong ball (which, conveniently, looks a lot like a turtle egg".]\* After the boil, I spent a few hours looking at all the data to see what I could find, and the results were not quite what I had expected. In fact, I have a new hypothesis about how to predict when a boil is about to occur.

Previously, I had heard that the activity from the turtles moving around in their eggs and then from hatching stimulated the other turtles to hatch ... From looking at the data, I think what might be happening is that the motion ramps up gradually until they start hatching. ... After they all have hatched and are waiting for the boil, everything quiets down. ... [The nest collapses]. The quieting down ... might be the clue to the turtles that all their siblings have hatched and it is time for a boil. It makes sense, as each turtle hatches there is no need for it to move any more. All it needs to do is wait for everyone else to finish their wiggling. If there is no wiggling, all the eggs have hatched, and it is time to go.

It will be interesting to see what the data looks like from some more hatching nests and whether they all look similar. Who knows? Another nest might be boiling as I write this.

2

HATCHING OR GHOST CRABS?

We've completed the monitoring of five nests so far. One sensor failed in a nest (due to a bad connection). Eight nests are being monitored currently, and another four are awaiting a spare communications unit to become available. So, we should have data from about 17 nests to evaluate.

Using our theory about hatching, which we are now calling the "popcorn" theory, we were able to predict several boils. The popcorn theory is that the turtle eggs are like popping corn in boiling oil. When the kernels heat up, they start to jiggle a little, and then they all start to pop at once. When you hear the popping quiet down, you know it is time to pour everything out of the pot.

So, we theorize that the turtles are all programmed to listen for things to quiet down after hatching, and that way they know that it is time to leave the nest. ... Popping (hatching) shows up in our data a few days (3-5) before the turtles pour (boil) out of the nest.

The sensors are sending 240 records in each report, and each report is phoned in every 4 hours. So each record is a profile of what happened each minute of the day. To graph the data, we integrate all the readings during each minute's report to get a single numerical value. This value corresponds roughly to the energy from the motions recorded. We can graph the data versus time to see what is happening.

Field notes from: [http://nerdswithoutborders.net/index.php?title=Turtle\\_Sense/\\_Project\\_logs](http://nerdswithoutborders.net/index.php?title=Turtle_Sense/_Project_logs)

| Techniques | Facts | Threats |
|------------|-------|---------|
|            |       |         |
|            |       |         |
|            |       |         |
|            |       |         |
|            |       |         |

ACTIVITY 1B

SEA TURTLE FIELD NOTES



Fall 2015 Update

1

A VISIT TO OUR SITES

I just returned from nine days visiting our two test sites in North Carolina. While there, I got a chance to see baby sea turtles making their way to the ocean and to talk with wildlife managers and biologists. I learned quite a bit from the trip.

We went out for several nights to visit a nest where I had predicted a boil using the data from our sensor. The turtles emerged two days later than expected, but that was not surprising considering that the temperature had been cooling down in the prior two weeks, and the previous nests had hatched during warmer periods.

The boils often occur between sundown and about 10:00 PM, which is when we usually gave up and went home. This nest ended up boiling a little after midnight.

Nest sitters must wait for the boil in total darkness because lights can confuse any baby turtles that emerge. So there's nothing much to do except talk and enjoy watching and listening to the phosphorescent waves. This gave all of us many hours to talk about our progress so far and to discuss how the data correlates to what is happening underground.

A VISIT TO OUR SITES

I got a chance to meet staff from a Conservancy at the southeast tip of North Carolina. I was very surprised to learn that there was little data about the timing of events in sea turtle nests before a boil. Part of the reason for this is that it is so difficult to study what is happening. ... So our [sensory] apparatus is a welcome addition to tools that biologists can use to understand what is happening inside the nests.

[The] biologists [I met] are also responsible for managing wildlife, and it was here that our discussions led to several ideas about how we can use our technology for the benefit of sea turtles ... [by] monitoring the nests for events that could harm the turtles and managing volunteers

Predators often attack the nests, and high tides and storms can cause over-washes that suffocate the nest. These harmful events are often discovered too long after the fact for wildlife managers to be able to intervene in any effective way.... It is likely that we can create an automated system to recognize these changes in the data and send out e-mail or text alerts to wildlife managers so that immediate action can be taken.

For example, one of our nests was washed away by high tides a day or two before a boil was expected. We knew that the

eggs had hatched ... What I learned was that turtles still have their yolk sacks attached after they hatch, and it takes a few days for them to fully absorb the remaining nutrients so they have enough energy to make the journey to the ocean and find their first meal. Wildlife managers, knowing that threatening high surf could drown the hatchlings, could have rescued them beforehand and released them later when they were ready. Because boil times have been so difficult to predict, volunteer nest sitters could spend two weeks or more monitoring a nest waiting for it to boil. With our technology, we can probably reduce that time to one-to-three days. This means that a single volunteer would be able to monitor several nests during the same time they currently spend monitoring just one nest.

The most gratifying part of our journey was discovering so many ways that we might also be improving the survival rate of the baby sea turtles. Nests continue to hatch and boil at Cape Hatteras. ... One boil was obscured by very frequent predation by ghost crabs. ... There was also a recent nest that started hatching not very long after we started monitoring it, and we missed predicting the hatching until about the same time that the nest boiled. This nest was the first that was up in the dunes, and we may need more data and a different approach before we can make predictions about nests like this.

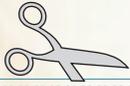
2

Field notes from: [http://nerdswithoutborders.net/index.php?title=Turtle\\_Sense/\\_Project\\_logs](http://nerdswithoutborders.net/index.php?title=Turtle_Sense/_Project_logs)

| Techniques | Facts | Threats |
|------------|-------|---------|
| _____      | _____ | _____   |
| _____      | _____ | _____   |
| _____      | _____ | _____   |
| _____      | _____ | _____   |
| _____      | _____ | _____   |

ACTIVITY 2

**SEA TURTLE FACTS & CONSERVATION ISSUES CARDS**



**CONSERVATION TIP**

When done for the day, **bring in beach tents, toys, chairs, tables, umbrellas and ice chests** that could prevent female sea turtles from reaching the upper beach.



**CRAWLING**

After **two months** hatchlings emerge from their nest at night and must crawl to the ocean, avoiding dehydration and predators such as birds and crabs.



**CONSERVATION TIP**

Knock down sand castles, fill in holes and pick up beach toys that could **trap hatchlings**.



**FISHING**

Each year, many thousands of sea turtles are accidentally caught as "bycatch," in **fishing nets and lines**. Because sea turtles need to reach the surface to breathe, many drown after being caught or tangled.



**HATCHLINGS**

Hatchlings are only 2 inches long when they emerge and only **one in a thousand** will make it to adulthood.



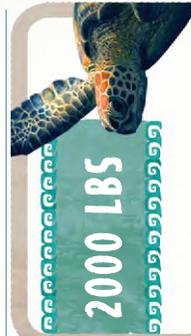
**BEACHGOERS**

Beachgoers may accidentally leave behind trash, toys and beach chairs that **interfere** with nesting and foraging areas.



**2000 LBS**

Leatherback sea turtles can weigh up to **2000 pounds** and their shells can grow up to **5 feet**.



**NESTING**

About 90% of all sea turtle nesting in the United States takes place on Florida's beaches. **The nesting and hatching season is March through November.**



**KEEPING WARM**

Although sea turtles spend most of their lives in the ocean, they can warm themselves by swimming close to the surface and **basking in the sun**.



**CONSERVATION TIP**

Choose sustainable seafood. Visit [seafoodwatch.org](http://seafoodwatch.org) for great tips on seafood choices.



**LIGHTS**

Lights visible from beaches **interfere with nesting** by female sea turtles and mislead hatchlings trying to make their way to the ocean.



**LAYING EGGS**

After mating on their way to their nesting beach, sea turtles crawl onto beaches to lay **120 eggs or more** at a time in one sand nest.



**POACHERS**

In some countries, sea turtles are threatened because their eggs and meat are harvested and **eaten by poachers**.



**CONSERVATION TIP**

Keep lights from harming turtles on beaches by hiding lights with shields and by **using only sea turtle-friendly lights** that seem dim to the sea turtles.





**NEW FACTS:**  
Create your own card with facts from your research

**CONSERVATION TIP**

To **avoid attracting pests** to sea turtle nests, take any picnic or snack leftovers with you when you leave the beach.



**CONSERVATION TIP**

**Dispose of litter** in secured recycle or trash bins.



**MIGRATION**

Female sea turtles migrate from feeding grounds to nesting beaches where they hatched to **lay their eggs every 2 to 4 years.**



**SAND MOUNDS**

Female sea turtles prepare their nest site by digging a pit. Then **they lay their eggs, covering them with sand** creating a mound over them. This hour-long task ends with the turtle re-entering the sea.



**BUILDINGS**

Building too close to the beach and installing seawalls can keep sea turtles from nesting and **lower the survival of their eggs.**



**OXYGEN**

Sea turtles can hold their breath underwater more than 5 hours, but a **sea turtle struggling in a net can drown in minutes.**



**INJURIES**

Cuts from **boat propellers** are the most common identifiable cause of injury to sea turtles in many areas.



**VEHICLES**

Beachgoers on dune buggies or other beach vehicles **have disturbed sea turtle nesting beaches** around the world.



**CONSERVATION TIP**

Close curtains and blinds of beachside windows and **turn off other lights that can be seen from the beach.**



**JELLYFISH**

Young sea turtles feed on tiny jelly animals in the open sea and adults feed on items that differ between species. **All sea turtles eat jellyfish** and often mistake plastic bags for this food.



**SEAGRASS**

Seagrass is **healthier when fed on by green turtles**, who nibble the leaves and stimulate new growth.



**SHORTER LIVES**

Although sea turtles can live **over 100 years in the wild**, the lives of many are shortened by capture in fisheries, boat strikes and entanglement in plastic debris



**SWIMMING**

Sea turtles can **swim up to 35 mph (56 km/h)** and they can move quickly and gracefully through the ocean waters. Leatherback sea turtles can travel more than **10,000 miles every year.**



**CONSERVATION TIP**

**Spread the word** on what you've learned about sea turtles and their conservation by talking to friends, family and classmates.



ACTIVITY 3A

WRITING A POEM FOR TWO VOICES



THE ISSUE

VOICE 1: \_\_\_\_\_

VOICE 2: \_\_\_\_\_

PLAYED BY: \_\_\_\_\_

PLAYED BY: \_\_\_\_\_

Focus or POV:

Focus or POV:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Brainstorm words about the issue & emotions

Large empty rectangular box for brainstorming words.



ACTIVITY 3B

WRITING A POEM FOR TWO VOICES



POEM TITLE

VOICE 1

VOICE 2

Three sets of horizontal lines for writing the first three lines of the poem, alternating between Voice 1 and Voice 2.

BOTH VOICES  
(shared perspective)

A single horizontal line for writing the shared perspective line.

VOICE 1

VOICE 2

Three sets of horizontal lines for writing the next three lines of the poem, alternating between Voice 1 and Voice 2.

BOTH VOICES  
(shared perspective)

A single horizontal line for writing the final shared perspective line.



REMINDERS FOR PERFORMING THE POEM

- Begin by reading the title.
- Decide which voice will read the first line for Voice 1. Voice 2 will then read their first line.
- Continue alternating reading the lines until you come to a line in the middle.
- The line in the middle conveys a shared perspective and should be read by both voices.
- At the end of the performance, be prepared to answer questions about the poem and the issues and emotions you wrote about.



## **GLOSSARY**

**Bycatch** Ocean animals caught unintentionally during commercial fishing.

**Current** A swift movement of water in a certain direction.

**Demigod** In mythology, a person who is part human and part god.

**Eddie(s)** A small, temporary current of water moving in a circle against the main current.

**Empathy** The sharing and understanding of another person's feelings and experiences.

**Field Notes** Notes recorded during or after observations.

**Gyre** A large, long-term circular ocean current.

**Hero's journey** A cycle of events that commonly make up stories about heroes.

**Island** A stretch of land surrounded by water.

**Map** A chart that displays the layout and features of a given area.

**Myth** A fictional, traditional story that is meaningful to a culture.

**Narrative** A written or spoken story.

**Navigation** The process of finding the way to a certain place.

**Nesting** Having to do with the time, place and behavior in which animals build and tend to their nests.

**Onomatopoeia** When the form of a word is an imitation of a sound.

**Pacing** The speed at which a story is told.

**Pollution** Human-made trash and chemicals that harm the earth.

**Seagrass** Grass-like plants that grow in water.

**Star wheel** A circular map of the stars.

**Stick chart** An ancient Polynesian chart that was made of natural materials and traditionally used to show how ocean currents interact with nearby islands.

**Swell** A series of ocean waves that are created by far off weather systems.

**Voyage** A long journey, typically over water.

**Wayfinding** The ancient Polynesian art of using natural cues to reach a destination.

[www.merriam-webster.com/dictionary](http://www.merriam-webster.com/dictionary)