The Shark

Q: How does a shark greet a fish?
A: Pleased to eat you!

With their streamlined bodies, menacing eyes and rows and rows of sharp, pointy teeth, sharks should help keep your students' attention as they learn that there's more than meets the eye when it comes to sharks. In this unit, students will experiment with buoyancy, compare shark sizes using <, > and =, as well as create their own shark character.

Standards Addressed:

Math

Compare using <,>,=

1.NBT.A.3

2.NBT.A.5

Draw conclusions from graphs

1-2.DS.A

Science

Adaptations

1.LS1.A

Use materials to solve a problem by mimicking an animal

1.LS1.A.1

ELA

Reading comprehension

K-2.R.1.A

Describe characters

K-1.R.2.A.a

2.R.2.A.b

Academic Vocabulary

K.R.1.B

1.R.1.B.e

2.R.1.B.h

ZOOED adventurous learning

The Book

Shark Lady
by Jess Keating
Lexile 730L

Shark Lady tells the story of Eugenie Clark, an important icthyologist and marine conservationist. Eugenie was a fearless researcher and an advocate for compassion towards sharks, and her research contributed greatly to our understanding of sharks. Eugenie's life and work is an inspiring example of what one person can accomplish with passion and drive, even in the face of opposition and skepticism.

In this unit, students will:

- explore the concept of buoyancy by comparing and contrasting using a model.
- describe a main character using character traits.
- create their own shark character.
- identify data by using a graph.
- compare measurements using <,>, and =.

Additional Shark Information

- Using a special electroreceptor organ called the Ampullae of Lorenzini, sharks can sense electromagnetic fields within the ocean. This means they can find fish that might be hidden under the sand by detecting their heartbeat. It's also a good way to help them figure out where to position their head when going in for an attack.
- Scientists can figure out the age of a shark by counting the rings on their vertebrates! While not quite like a tree, scientists use the information about the species, size, and other things to determine the rate those rings would appear before they figure out the actual age.
- Short-tail nurse sharks like to rest on their sides or even upside down for long periods of time. This can sometimes make them appear dead!
- Sand tiger sharks are more dense than water, causing them to sink. To maintain buoyancy they have to swallow air and hold it in their stomachs, allowing them to hover motionless in water.
- Zebra sharks have been found to rest on the ocean floor during the daytime, facing the current so they can pump water over their gills and breathe without having to swim. If the current is strong, they adjust their fins to help remain motionless in the water.
- Sharks have been around since before dinosaurs! Fossil evidence shows sharks have been around for 450 million years. By comparison, the oldest known dinosaur fossils were from 230 million years ago.
- Some sharks need to keep moving in order to breathe. These sharks never stop swimming, but some, like great whites, have been found to swim towards the surface and then "glide" on the way down to the sea floor, taking that time to sleep and rest while still moving.
- Bonnethead sharks, or "shovelhead" sharks have a unique head shape that allows them to make much sharper turns than other shark species. The location of their eyes on their head also increases their field of view. As they swim, they roll their heads side to side, giving them a good look at their surroundings and finding food.

What challenges does this animal face in the wild?

The biggest challenge facing sharks in the wild is overfishing. When commercial fishers catch large amounts of fish, sharks can get caught in the nets and fishing pots while trying to get an easy meal. Additionally, overfishing can greatly reduce the primary food source of sharks, forcing them to travel further to hunt for food.

Be a Planet Protector!

Be a Planet Protector by refusing single use plastic items. By choosing reusable items like water bottles and straws, you can help keep our oceans and waterways healthy. Your choices matter for a happy, healthy planet so choose the reusable option!

Adaptation Exploration

Science- Adaptations: 1.LS1.A

On page 3 of the student guide, students explore shark adaptations. Remind your students what an adaptation is; something physical or behavioral about an animal that helps it to survive.

Gills - Gills help sharks take in oxygen from the water.

Body Shape - The shape of their body helps sharks swim without using too much energy.

Eyes - Sharks have great eyesight. This helps them see in deep water where little light is present.

Teeth - When sharks lose a tooth, a new one grows in to replace it.

Vocabulary

ELA- Academic Vocabulary: K.R.1.B, 1.R.1.B.e, 2.R.1.B.h

apex predator- also known as a top predator, is a predator at the top of a food chain, without natural predators of its own

cartilage- a shark's skeleton is made of cartilage, a flexible but strong connective tissue that's also found throughout the human body, in places like the nose, ears, and in joints between bones

determination - the commitment to achieve your goals, regardless of the challenges you might experience

gills - respiratory organ that many aquatic organisms use to extract dissolved oxygen from water and to excrete carbon dioxide

research- investigation into a subject in order to discover facts

camouflage- concealment by some means that alters or obscures the appearance

prey- an animal hunted for food, especially by a carnivorous animal

Meet Sylvia and Ira

Sylvia is named after Sylvia Earle. Sylvia Earle (b. 1935) is a marine biologist who researched marine ecosystems and developed new ways to research the deep sea. Leading several hundred underwater explorations and spending over 7,000 hours underwater, Sylvia Earle was a pioneer in understanding underwater ecosystems.

Ira is named after Ira Gabrielson (1889-1977). Ira Gabrielson spent his professional life organizing America's wildlife management efforts. He was the first director of the Fish and Wildlife Service where he added millions of acres to the National Wildlife Refuge System, increasing protection for wetlands and waterfowl. After retiring, he was involved in the Wildlife Management Institute, helped found the International Union for Conservation of Nature (IUCN), and was president of the U.S. affiliate of the World Wildlife Fund. He worked tirelessly to help advance America's conservation movement.

Read the Shark Book

ELA- Respond to Read Alouds: K-2.R.1.A

Before Reading the Book:
Is this book fiction or nonfiction? How can you tell?
Have students look at the cover and ask them: How would you feel at that moment if you were the Shark Lady?

While Reading:
How do you think Eugenie felt when she went down to the ocean floor for the first time?
Why do you think Eugenie's mom bought her an aquarium?

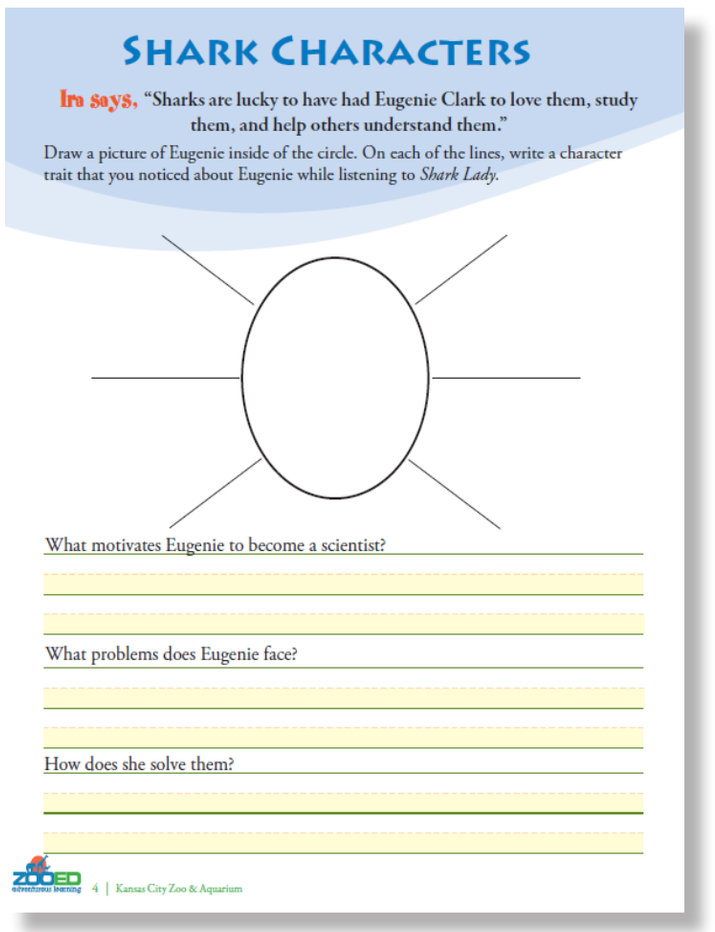
After Reading:
If you could ask Eugenie any question, what would it be?
What is something Eugenie helped people understand about sharks?
Which fact did you find most interesting?
Has your opinion of sharks changed or stayed the same? If your opinion has changed, how has it changed?

Shark Characters

ELA- Describe Characters: K-1.R.2.A.a , 2.R.2.A.b

On page 4 of the student guide, students are asked to draw a picture of Eugenie Clark. Their picture could be Eugenie as a child or as an adult. Students will then add Eugenie's character traits that they learned about her from the book around their picture. Depending on your students, you may want to read the book more than once.

After students have drawn their pictures, they will answer questions about Eugenie's motivation and how she identifies and deals with problems during her career as a scientist.



SHARK CHARACTERS

Ira says, "Sharks are lucky to have had Eugenie Clark to love them, study them, and help others understand them."

Draw a picture of Eugenie inside of the circle. On each of the lines, write a character trait that you noticed about Eugenie while listening to *Shark Lady*.

What motivates Eugenie to become a scientist?

What problems does Eugenie face?

How does she solve them?

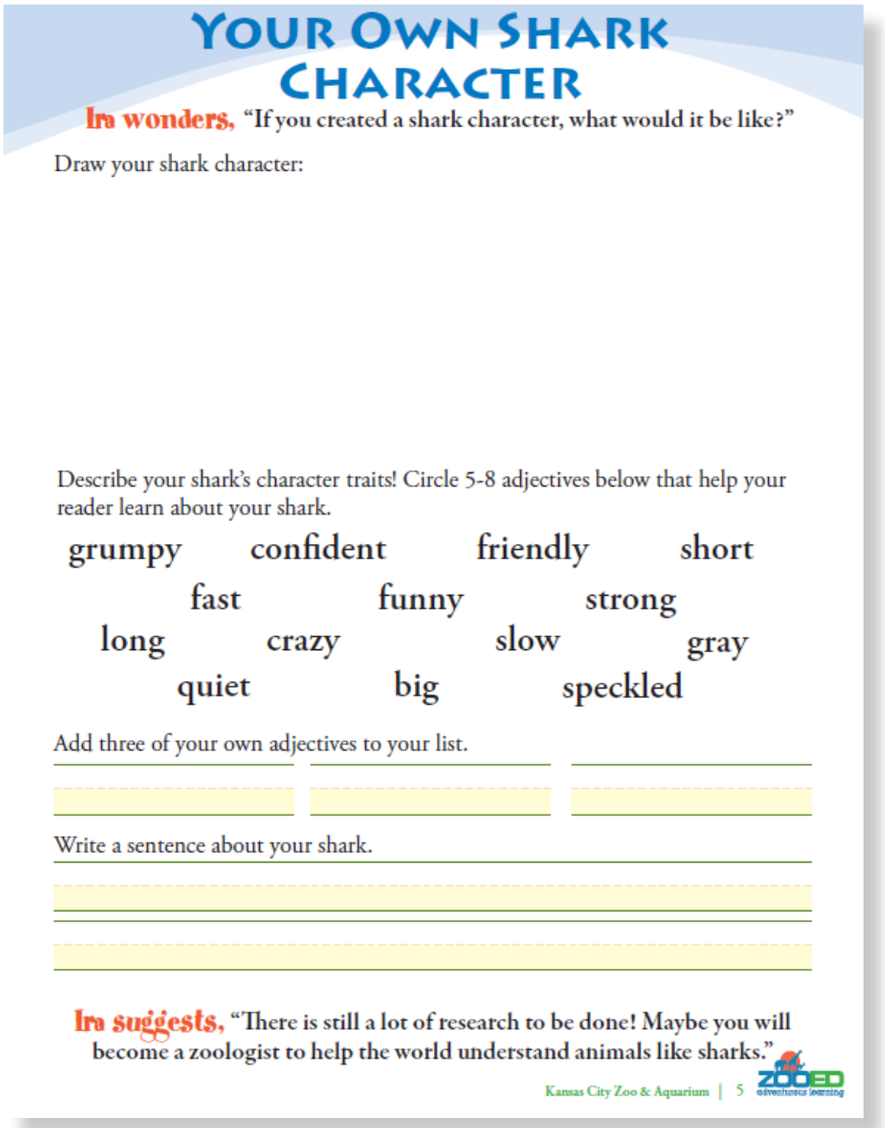
ZOOED adventurous learning 4 | Kansas City Zoo & Aquarium

Your Own Shark Character

ELA- Describe Characters: K-1.R.2.A.a , 2.R.2.A.b

If your students could create their own shark character, what would it look like? On page 5 of the student guide, students are given space to bring their own shark to life! Instruct your students to draw their own shark character, but to think not only about the shape of their shark, but also the shark's personality. By giving them some character traits such as grumpy or short, it will better tie into the next section of this activity.

In the second section, students will circle some of the adjectives provided to help describe their shark. They will write three of their own adjectives that describe their shark. Finally, they are asked to write a sentence about their shark character. As an extension, students can use a separate sheet of paper to write a story about their shark!



YOUR OWN SHARK CHARACTER

Ira wonders, "If you created a shark character, what would it be like?"

Draw your shark character:

Describe your shark's character traits! Circle 5-8 adjectives below that help your reader learn about your shark.

grumpy confident friendly short
fast funny strong
long crazy slow gray
quiet big speckled

Add three of your own adjectives to your list.

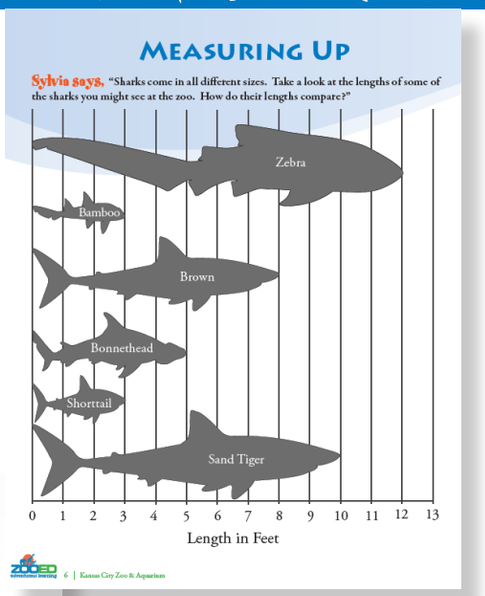
Write a sentence about your shark.

Ira suggests, "There is still a lot of research to be done! Maybe you will become a zoologist to help the world understand animals like sharks."

Kansas City Zoo & Aquarium | 5 ZOOED adventurous learning

Measuring Up

Math- Compare Using <, >, =: 1.NBT.A.3, 2.NBT.A.5



Sharks come in all different sizes, lengths and shapes. The whale shark is the largest species of shark, getting up to 60 feet long while the dwarf lantern shark is the smallest at only 7 inches long. On page 6 of the student guide is a graph showing the lengths sharks that students may see at the Zoo. On the following page, they are asked to first use the graph to determine the length of each shark and then compare those lengths to each other.

Sylvia says, "Find the length of each shark on the graph. Then, write that length in the box below."

Zebra	12	Shorttail	3
Bamboo	3	Bonnethead	5
Brown	8	Sand Tiger	10

Sylvia explains, "Now, use the symbols, <, >, = to compare the lengths of these sharks."

Shorttail ____ feet	<	Bonnethead ____ feet	Brown ____ feet	>	Shorttail ____ feet
Zebra ____ feet	>	Bamboo ____ feet	Sand Tiger ____ feet	>	Bamboo ____ feet
Sand Tiger ____ feet	<	Zebra ____ feet	Shorttail ____ feet	=	Bamboo ____ feet
Zebra ____ feet	>	Bonnethead ____ feet			

Sylvia shares, "The whale shark is the longest species of shark and can be 60 feet in length."

What Floats Your Fish?

Science- Use Materials to Solve a Problem By Mimicking an Animal: 1.LS1.A.1

On page 8 of the student guide, students are asked to think about how fish are able to float in water. How are they able to do that?

Buoyancy is the ability to float in water. Fish, sharks, and stingrays have different characteristics that help them float and change their location in the water column. Let's explore how they do it:

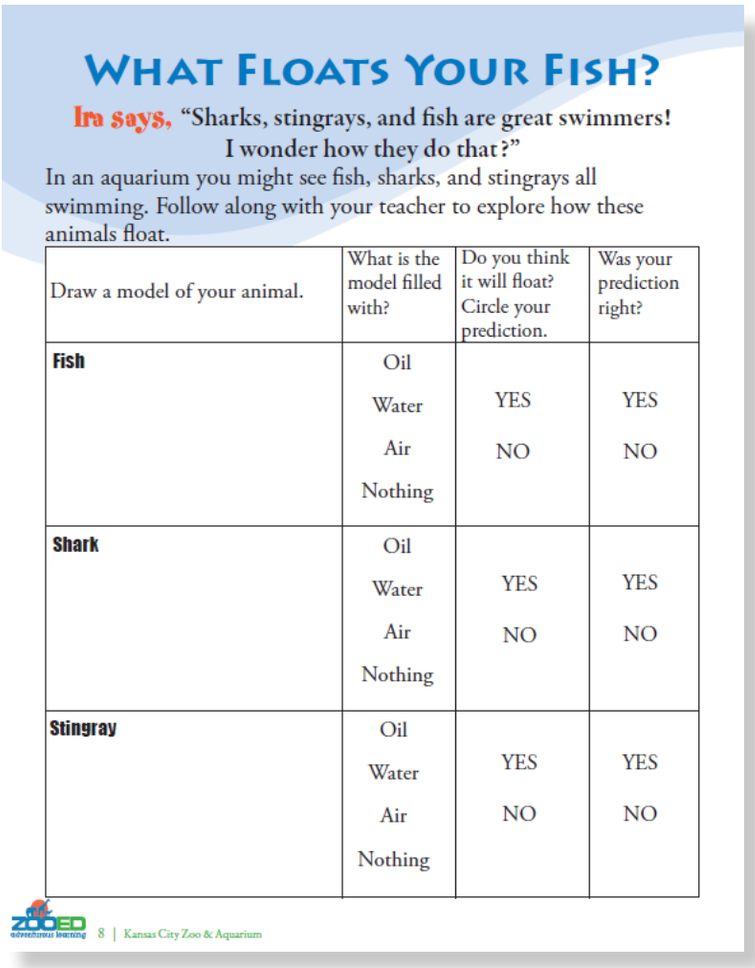
Fish: Most bony fish have a swim bladder. A swim bladder is an internal organ filled with gas that helps the fish float without having to swim all the time. This ability to control their buoyancy, and stay at their current water depth, can occur without having to expend energy in swimming.

Sharks: Sharks do not have a swim bladder to help with buoyancy, but instead they rely on an oily liver. They can rapidly change depth without bursting an air-filled swim bladder. When they stop swimming, they sink.

Stingrays: Unlike most fish, stingrays don't have a swim bladder or an oily liver. When they aren't swimming they start to sink. However, they use the flattened shape of their body and their pectoral fins to glide through the water. The flapping of their pectoral fins act just like wings and helps create the movement needed to keep them floating.

This demonstration on the next page will explore how fish, sharks and stingrays stay afloat.

.



WHAT FLOATS YOUR FISH?

Ira says, "Sharks, stingrays, and fish are great swimmers! I wonder how they do that?"

In an aquarium you might see fish, sharks, and stingrays all swimming. Follow along with your teacher to explore how these animals float.

Draw a model of your animal.	What is the model filled with?	Do you think it will float? Circle your prediction.	Was your prediction right?
Fish	Oil Water Air Nothing	YES NO	YES NO
Shark	Oil Water Air Nothing	YES NO	YES NO
Stingray	Oil Water Air Nothing	YES NO	YES NO

ZOOED adventurous learning 8 | Kansas City Zoo & Aquarium

What Floats Your Fish? Continued...

Show your class the models that will be used to represent fish, sharks, and stingrays. Students should make observations about each model and draw them in their student guide. You might also want to pass around the models so that students can make measurements or notes about how heavy they feel.

Next, students circle what each model is filled with.
Fish - empty water bottle
Shark - water bottle filled with oil
Stingray - flat object (small plastic lid)

At a Glance:
Duration: 20-30 minutes

Setting: classroom; make sure this demonstration can be done somewhere were all students can see

Materials
2 small plastic bottles-(disposable water bottles)
(1 filled with liquid vegetable oil - the other left empty)
Large bowl/container filled with water-(dish tub size)
Small plastic lid-(any flat object that will float)
Optional Extension: objects from around the room that will or will not float

At this point, try not to tell the students if these objects will float or why, allow them to circle their prediction. Will these objects float or not? You may choose to take a tally of students' predictions.

Place the models into a bowl of water. Students make observations and circle what happened, did it float or not? Students should make the conclusion that they all float! Why?

Optional: What Floats Your Fish? Continued...

While you still have a tub of water out, take some time to explain to students what density means. Density is the mass of an object compared to its volume. So why do some things float and others sink? When objects are more dense than water, they sink. When they are less dense, they float. Gather some familiar objects that will either float or not. Make a prediction for each one, will it float or sink? A table like the one below might be helpful to keep track.

Object	Prediction	Result/Outcome