Lesson Three
Shark Adaptations: Shark Science
(5th Grade)

Acknowledgement:

This lesson was collaboratively designed by CS Everyone Center for Computer Science Education and UFTeach at the University of Florida. We thank Dr. Meize Guo, Dr. Yongju Jeon, and Dr. Michael Johnson from the CS Everyone Center, as well as Dr. Kristen Apraiz and Dr. Gayle Evans from UFTeach at the University of Florida, for their valuable contributions in designing and reviewing the teaching materials and instructional activities for this project. We also thank Dr. Maya Israel from the CS Everyone Center for Computer Science Education for her expertise and guidance in K-12 AI education.

This project reflects the collective dedication and hard work of all involved, and their contributions to fostering an impactful learning experience for preservice teachers in the UFTeach program and the students from the STEM clubs in Carolyn Beatrice Parker Elementary School and PK Yonge Developmental Research School at Gainesville, Florida are deeply appreciated. Finally, this project was funded by Griffin Catalyst as part of an initiative to increase CS and AI education at preservice and inservice teacher preparation at the University of Florida.

Overview of the Lesson

Name of Lesson	Shark Adaptation
Optional Activities	We prepared multiple materials for various students' backgrounds. **Please consider your students' background knowledge and adjust accordingly.**
Summary of STEM Concepts	**Adaptation** is a characteristic of a living thing that helps it survive in its environment. **Physical adaptations** are special body parts, such as shapes, skin, and color, that help the organisms to survive in their natural habitat. **Camouflage** is a pattern, color, or shape that helps a living thing blend into its environment. It is usually used to help prey avoid predators or for predators not to be seen by prey. A **predator** is an animal that eats other animals. A **prey** is an animal that is eaten by other animals.
Performance Based Learning Objectives	By the end of this section, the students will be able to: 1. Read/memorize/define the grade-level terms in their language. 2. Describe/explain how shark adaptations help sharks survive in the ocean. 3. Design a prototype for their own shark.
Materials Needed	Printing materials were listed in Section 2 **Materials are varied. Customize as you need.**

NGSS / MAFS /CS Standards:

Standard	Description
SC.5.N.2.1	Recognize and explain that science is grounded in observations that are testable, explanation must be linked to evidence
SC.5.L.17.1	Compare and contrast adaptations displayed by animals and plants that enable them to survive in different environments such as life cycles variations, animal behaviors and physical characteristics.

ENGAGE (Time: X minutes)

How will you invite students into the lesson, access prior knowledge, and excite them?

Goal	What will you say/do	Expected student responses/actions
Introduce animal adaptation and present real-world examples of adaptation: camouflage	**Activity: Spot the hidden animals** Place 2-3 students in one group with one iPad. Connect to the Internet and go to the website 27 Animals That Don't Think You Can See Them. Let the students find the animals in each photo. The animal will be revealed after the original image. Make sure the students will check the original images carefully before checking the answers.	Students might have discussions on the photos and find the animals.
	Review or introduce the concepts of camouflage, physical adaptation, and adaptation.	

EXPLORE (Time: X minutes)

How will you organize student activities and thinking as they explore the STEM concepts in this lesson?

Goal	What will you say/do	Expected student responses/actions
Discover the shark adaptations Prepare: Shark teeth and magnifying glasses. Prepare: A bowl of water. A small balloon filled with 40ml vegetable oil and tied up. A small balloon filled with 40ml water and tied up.	**Activity: Shark Teeth Observation** Let the students look at the shark teeth with a magnifying glass. Describe the differences between shark teeth and human teeth. Watch the video of shark tooth loss and regrowth. Introduce the fact that the shark teeth are arranged in rows. When one tooth is damaged or lost, it will be replaced by another. As a front tooth is broken or worn down, it falls out and is replaced by a tooth in the next row. The sets of teeth rotate forward, and a new tooth forms in the rear.	Observe the details of shark teeth and ask questions.

	Optional Website: Shark Jaws and Teeth	
	Activity: Shark Oily Liver Let the students put the balloon with oil and the balloon with water in the big bowl of water. Observe the position of two balloons. Sharks have no swim bladder, but a shark's liver is filled with an oily substance called squalene that helps with floating. Optional video: Shark Buoyancy Why don't sharks sink?	Observe the balloons in the water and ask questions.

EXPLAIN (Time: 10 minutes)

How will you help students make sense of the experiences they had in the exploration?

Goal	What will you say/do	Expected student responses/actions
Link the shark adaptations to the concepts of camouflage, physical adaptation, and adaptation.	Explain the concepts of camouflage, physical adaptation, and adaptation in the shark context. Introduce the concept of predator and prey. Introduce what sharks eat. Sharks eat a range of food types, including plankton, birds, fish, seals, and even man-made objects, but the majority of sharks are carnivores. Some sharks are apex predators, such as the “big three” (tiger sharks, great white sharks, and bull sharks). Link back to Unit Two, shark attack data, emphasizing that sharks do not see humans as prey. Optional Video: Shark Attack Test Optional Reading: Myth Busterd	

Open Discussion	A **predator** is an animal that eats other animals. A **prey** is an animal that is eaten by other animals. The words "predator" and "prey" describe the roles in a relationship between two species. In this relationship, one species eats the other. The predator is the species that does the eating. The prey is the one that gets eaten. **Many animals are both predators and prey. Can you think of an example?** **Discussion: Why is it critical to protect sharks?** Background knowledge for teachers: Ecosystems are built on the balance of relationships between organisms. These relationships play a crucial role in supporting all life on Earth. When certain species in an ecosystem start to disappear, it creates a ripple effect that impacts all the parts of the ecosystem, making it unstable. Sharks are top predators. If all the world's sharks went extinct, the first thing we would notice would be a population explosion in their prey. Fish, seals, seabirds, and other sea creatures would overwhelm our oceans, causing massive biological imbalances. Their overpopulation would deplete resources further down the food chain, creating what is known as a trophic cascade and causing long-term damage to ecosystems.	Participate in the discussion about predators and prey. Participate in the discussion about protecting sharks.

ELABORATE (Time: 12 minutes)

How will you connect this experience with other ideas or real-world applications?

Goal	What will you say/do	Expected student responses/actions

Create your own shark	Pass out a piece of paper and color pencils to each student. Use your knowledge of adaptations to create your own shark. ● Decide the type of ocean habitat your shark will live in. Ideas: Coral Reef, Open Ocean, Shoreline, Deep Sea. ● Choose 3 or more special adaptations that will help the shark to survive. Be creative! ● Draw your shark on your paper. Include some surrounding habitat. ● What kinds of food does your shark eat? ● Does your shark have special-shaped teeth for eating its food? ● How large is your shark when it is fully grown? ● What does your shark like to do every day?	Students design their own shark on paper.

EVALUATE (Time:5 minutes)

How will you assess the extent to which learning goals are met during/by the end of the lesson?

Goal	What will you say/do	Expected student responses/actions
The students can describe the shark adaptations.	By observing the shark teeth and oily balloon floating.	Participant in the discussion about adaptations.
Open-end Discussion	Between humans and sharks, who is the prey, and who is the predator? Why is it important to protect sharks?	Participant in the discussion about why protecting sharks.

Section 2 Reference

Generation Genius. Adaptations Terms.
https://www.generationgenius.com/videolessons/adaptations-video-for-kids/

Baldwin, A. (2015) 27 Animals That Don’t Think You Can See Them. Retrieved March 12, 2025, from https://allthatsinteresting.com/animal-camouflage-pictures

Sharks Jaws and Teeth. https://www.sharks4kids.com/shark-jaws-teeth. Accessed January 30, 2025.

Why don't sharks sink?
https://www.youtube.com/watch?v=pnlGKd9XPWU&ab_channel=OceanFirstInstitute\

Shark Buoyancy
https://www.youtube.com/watch?v=8Puis_8M8SE&ab_channel=BlueWorldTV

Shark Attack Test
https://www.youtube.com/watch?v=vePc5V4h_kg&ab_channel=MarkRober

What would happen if sharks went extinct?
https://planetwild.com/blog/what-would-happen-if-sharks-went-extinct