



## **Shark Tank**

Education Resources: 6<sup>th</sup> - 8<sup>th</sup> grade

Students will learn about the important role apex predators play in a food web and how they help maintain biodiversity. Students will research a well-known ocean apex predator, the shark. Acting as animal biologists, students will create a shark exhibit to help the public understand the importance of protecting sharks. Exhibit plans will include a description of the habitat, estimated costs of building and maintaining it, and an explanation of how this exhibit will benefit the public. They will then pitch their proposed plan to the rest of their class, who play the role of potential investors considering to fund the project.

### **Standards Alignment**

#### MLS:

6-8.LS1.C.1 Construct a scientific explanation based on evidence for the role of photosynthesis and cellular respiration in the cycling of matter and flow of energy into and out of organisms.

6-8.LS2.A.1 Analyze and interpret data to provide evidence for the effects of resource availability on individual organisms and populations of organisms in an ecosystem.

6-8.LS2.A.2 Construct an explanation that predicts the patterns of interactions among and between the biotic and abiotic factors in a given ecosystem.

B 6-8.LS2.B.1 Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem.

#### NGSS/ILS:

MS-LS1-6. Construct a scientific explanation based on evidence for the role of photosynthesis in the cycling of matter and flow of energy into and out of organisms.

MS-LS1-7. Develop a model to describe how food is rearranged through chemical reactions forming new molecules that support growth and/or release energy as this matter moves through an organism.

MS-LS2-1. Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem.

MS-LS2-3. Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem.

MS-LS2-4. Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.

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Pre-Visit Lesson

45 minutes



### Objectives:

- Students will learn about the plants and animals involved in an ocean food web
- Students will understand the process by which energy is transferred up a typical ocean food chain, starting with phytoplankton converting energy from the sun into nutrients
- Students will think critically about the importance of apex predators in a food web
- Students will understand the concept of biodiversity and how it benefits human life
- Students will think critically about the educational value of zoos and aquariums

### Materials:

- shark photos
- pencil and paper for students to write letter of intent or computers to type their papers

### Lesson Plan

#### Engage

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On a projector or with printed copies, show students some photos of sharks. In small groups or as a class, ask students to share some things they notice and wonder about sharks.

#### Explore

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We are going to be acting as animal biologists, tasked with designing a shark exhibit at an aquarium to help promote the protection of shark species in the wild. First, we need to do some research so we understand how to communicate the importance of sharks with the exhibit we are designing.

Review the vocabulary words:

- Predator: an animal that eats other animals
- Prey: an animal that is hunted and eaten for food
- Food chain: a series of animals each dependent upon the next as a food source
- Food web: a system of interdependent and intertwining food chains

With pictures if possible, describe a typical ocean food web, beginning with sunlight being absorbed by phytoplankton, phytoplankton being eaten by a small animal, then larger and larger animals as energy is transferred up the food chain. Possible ocean food web: phytoplankton, zooplankton, blue tang fish, grouper, tuna, shark.

#### Explain

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Ask students to hypothesize which animals in the food chains have the highest populations and why (guide students to understanding that predators usually have smaller populations than

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### Pre-Visit Lesson (*continued*)

their prey, and discuss how this helps maintain a balance of both animal populations. Without apex predators like sharks, other animals in the food web would overpopulate and overconsume their food source. Once they ran out of food, their own species would likely die out, unless they are able to adapt, which could take thousands of years. Guiding questions:

- What might happen if there were more sharks than blue fin tuna?
- If blue fin tuna populations decreased, how would this impact tiger grouper populations?
- What might cause a decrease in phytoplankten, and what would this mean for blue tang fish?
- What would happen if there were no sharks?
- Why does it matter if we have biodiversity?
- How do humans benefit from biodiversity?

Guide students to understand that biodiversity helps keep the environment healthy for all, including humans. With climate changes and other factors that change habitats, biodiversity is important because it makes us less vulnerable. If one species' population decreases or they become extinct, biodiverse habitats have other species that can fill similar roles. We also look to nature for medicine, designs, and to better understand the world around us. Maintaining biodiversity gives us a better chance of reaching the potential of future advances in medicine and technology.

### Elaborate

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Ask students to share what they know about sharks, what they've heard about sharks, and what they've seen on tv and in movies about sharks. After a few responses, and once someone says something about being afraid of sharks or hearing bad things about them, inform the class that these stereotypes about sharks have a lot to do with why many shark species are threatened or endangered. The biggest threat to shark populations are fishermen catching sharks intentionally to be sold as food (in countries where that is popular), catching them by accident when they are fishing for other ocean animals, and habitat destruction.

### Evaluate

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Acting as biologists who wish to open a new shark exhibit at an aquarium to teach the public about the importance of sharks, ask students to write a letter of intent to investors who are considering funding this new exhibit. Students should include a plan on how to educate the public about sharks and promote protecting these animals. One helpful resource may be: "Why Zoos and Aquariums Matter Handbook", a study by John Fraser and Jessica Sickler for the Association of Zoos and Aquariums and the Wildlife Conservation Society, found at the link below (especially pages 12-15):

<https://documentcloud.adobe.com/link/track?uri=urn%3Aaaid%3Aascds%3AUS%3Aca8d4054-f71b-49e6-aecd-f289e134cdc4>

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### Pre-Visit Lesson (*continued*)

Letters of intent should address the following questions:

- Why are sharks important?
- What is biodiversity and why does it matter?
- What do you wish every person knew about sharks?
- What ideas do you have that might help people understand (or how would you communicate) the importance of sharks to ocean habitats?
- How will this exhibit help protect sharks in the wild?

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### Field Trip Guide



The following discussion points for each gallery of the St. Louis Aquarium and Conservation & Education Center will help make the most of your field trip by engaging your students and asking them to recall information discussed in the pre-visit lesson.

### Conservation & Education Center

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#### What's your Watershed?

- Discover where your water comes from and where it flows to, while learning facts about your watershed

#### Plastic Bottle Sculpture

- Learn about humanity's excessive use of single use plastics and how this impacts our planet while viewing our massive plastic bottle sculpture

#### Species Discovery

- Explore some local species and research being done to protect them
- View the animals and take note of what items are included in their habitats

#### Digital River Clean-up Game

- This multi-player touch screen game that teaches gamers about conservation topics and our collective responsibility to keep waterways healthy
- Explore the features of a river ecosystem and what can be done to keep these ecosystems healthy

### St. Louis Aquarium at Union Station

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#### Confluence Gallery

- Explain that this is an example of our local ecosystem, and the animals you see here live in our area
- Discuss what animals are included in this exhibit and the role they play in the food web (producers, consumers, predators, apex predators, etc.)

#### Global Rivers

- Rivers all over the world provide fresh water to humans, animals, and plants, making life possible
- Discuss similarities and differences between local river habitats and other river habitats throughout the world

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### Field Trip Guide (continued)

#### Changing Rivers

- Discuss how human actions like farming, cutting down of trees, levees/dams, pollution, or construction projects can change the river ecosystem

#### Ocean Shore

- See and touch some amazing ocean animals!
- Discuss the role these animals play in their food web in the wild (staff members present to help explain)

#### Shark Canyon

- Ask students to take note of their personal reaction to seeing these amazing creatures, and how their beliefs were changed/reinforced by their experience
- Discuss the animals in the habitat – is this a full food web like you would see in the ocean? Why or why not?
- Take note of the features included in this ecosystem – places for animals to hide, space to move around, water type (fresh or salt water) and general temperature

#### The Deep

- View some very unique animals that live in the depths of the ocean
- Do these exhibits mimic the areas these animals would live in the wild? In what ways?
- Discuss what animals you haven't seen at the Aquarium and potential reasons those animals are not here

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Post-Visit Lesson

45 minutes



### Objectives:

- Students will practice presentation and public speaking skills
- Students will think critically about the role of zoos and aquariums and evaluate potential benefits they bring to the community
- Students will use data to form an argument and present their ideas to their class
- Students will practice managing multiple aspects of a project including design, animal research, budgeting, and marketing

### Materials:

- Internet access for research, or pre-printed reference materials about shark habitats
- paper for drawing plans and outlining exhibit proposal

### Engage

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Ask students to recall their field trip to the Aquarium. What were their favorite animals they saw? What do they remember about their habitats? Why did these animals stand out in their memory? How do they feel about the animals they mention?

### Explore

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We are going to be acting as animal biologists, tasked with designing a shark exhibit at an aquarium to help promote the protection of shark species in the wild. Working as a group or independantly, students will create a shark habitat design and present it as a proposal to potential investors.

Remind students the purpose of this habitat is to raise awareness of the need to protect shark species in the wild, and inspire people to care about these animals. Discuss ways this message can be shared with the community. Who would be the target audience, and how would you communicate the importance of sharks to them? With a presentation? Pamphlet? Demonstration?

### Explain

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Students continue to prepare their habitat proposals, by estimating the costs and benefits of building the habitat.

Here is a cost guide (approximation) that you may share with your students:

- Tank: \$35/square foot
- Filtration system: \$5,000 for tanks up to 500 gallons, \$7,500 for tanks larger than 500 gallons

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### Post-Visit Lesson (continued)

- Salt water: \$1/gallon
- Sand: \$1.50/pound
- Animals from reputable sources: \$25/pound of average adult weight of the animal
- Coral or other habitat structures: \$75/square foot

Encourage students to consider the following:

#### Budget

- How much will the exhibit cost to build?
- How will you care for the animals, and what will this cost?
- What daily and long-term care/upkeep is needed?
- Will it be free or will it cost to see?

#### Benefit to the community

- What is the educational value of your proposed exhibit?
- If charging a fee, provide an explanation of why this exhibit is worth the price of admission
- What accompanying educational materials will be available with the exhibit?

#### **Elaborate**

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Students prepare a presentation to potential investors (role played by their classmates), that describes their proposed new exhibit, how it benefits the community, and how much it would cost to build and maintain. They should also include a marketing plan to ensure the exhibit is successful. Students should be prepared to answer the following questions:

#### The Exhibit

- What animal(s) are you featuring in your proposed exhibit?
- What habitat does this animal live in, and how will you recreate that for this exhibit?
- How large will the exhibit be?

#### Benefits to the Community

- Why will this exhibit be interesting to the public?
- What experience or education should guests expect when visiting?
- How else will it benefit the community?
- Why is this exhibit important?

#### Costs

- How much will it cost to build this exhibit?
- What will it cost to maintain the exhibit?



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### Post-Visit Lesson (continued)

#### Marketing Plan

- Who is your target audience for this exhibit, and what can you do to make sure all guests have a meaningful experience?
- How will you advertise to let the community know about this new exhibit?

#### **Evaluate**

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Students present their exhibit proposals to the class. You might choose to have students evaluate each other's presentations.

What great ideas did your students come up with? Teachers are encouraged to share their students' work with the Education Curator of the St. Louis Aquarium by emailing them to: [arodgers@stlaquariumfoundation.org](mailto:arodgers@stlaquariumfoundation.org) with the subject line "Shark Tank Lesson".

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