

# SCIENCE 3D

## SHARKS!

### SCIENCE PERFORMANCE EXPECTATIONS AND DISCIPLINARY CORE IDEAS

In the Elementary School Mission (NGSS Grade 4), students will address the general topics below. For a complete list of NGSS standards covered in each segment of the Mission, continue reading after the general standards. *Note: Be sure to complete the **Mission Reader** and **Mission Research** before viewing the full **Mission Video**. Explore [How to Use Science 3D](#) to get suggestions on how to pace the Mission and options for the order of activities. Math and Language Arts standards will be added shortly.*

- In the **Mission Reader**, *Sharks!*, students will learn about the diversity, history and biology of these amazing fish. They will also learn about external and internal structures, body systems, sensory systems, energy, and how scientists and engineers develop solutions to answer scientific questions, and much more.
- During **Mission Research**, students will use their knowledge of structure and function to match the shapes of shark jaws and teeth to the types of food those sharks eat. Then, they will use this knowledge to support evidence for how fossil organisms might have lived and moved.
- In the **Science Mission**, students will use data to explore how changes in temperature influence the amount of energy and food that sharks need. Then, they will count sharks from drone imagery to determine how shark migrations might be influenced by water temperature and the energy that sharks need. Finally, they will use this understanding to predict how sharks might be influenced by changes in their environment.
- In the **STEM Project**, students will use the engineering design process to define criteria and constraints for putting cameras on shark bodies as well as on drones (to count sharks from the air). Then, they will diagnose places where engineered systems have failed in shark studies and suggest improvements to existing designs.
- Using the **Explore Your Backyard** activity, students will compare and contrast body systems and traits of sharks to organisms in their local environment.

#### SCIENCE/ENGINEERING AND DESIGN DISCIPLINARY CORE IDEAS AND PERFORMANCE EXPECTATIONS

##### MISSION READER

4-LS-1	Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior and reproduction.
LS1.A	Structure and function.
4-LS1-2	Use a model to describe that animals receive different types of information through their senses, process information in their brain, and respond to the information in different ways.
LS1.D	Information processing.
4-PS4-2	Develop a model to describe that light reflecting from objects and entering the eye allows objects to be seen. <i>This is not explicitly in the <b>Mission Reader</b>. However, the reader's focus on shark senses, including vision, could be a good launching point for learning about electromagnetic radiation and how light bounces off objects and enters the eye.</i>
PS4.B	Electromagnetic radiation. <i>This is not explicitly in the reader. However, the reader's focus on shark senses, including vision, could be a good launch point for learning about electromagnetic radiation and how light bounces off objects and enters the eye.</i>

##### MISSION RESEARCH

4-LS-1	Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior and reproduction. <i>Focus is on the function of shark teeth and how structures from different taxa have similar functions by comparing fossils with modern organisms.</i>
LS1.A	Structure and function. <i>Focus is on the function of shark teeth and how structures from different taxa have similar functions by comparing fossils with modern organisms.</i>
ESS1.C	History of planet Earth. <i>Focus is on fossils.</i>
Additional content: Fossils	

##### SCIENCE MISSION

4-LS-1	Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior and reproduction.
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LS1.A Structure and function.

Additional content: Responses to abiotic factors.

Additional content: Physiology.

Possible extension to address 4-LS1-2 would be to have students construct an explanation for what senses blacktip sharks would use to determine when to start migrating and how they would know there is danger from hammerhead sharks. Then, they should explain what body systems sharks are using during the migration.

### **STEM PROJECT**

- 4-ESS3-2 Generate and compare multiple solutions to reduce the impacts of natural Earth processes on humans. [To fully cover this standard, have students compare their solutions for helping hellbenders reproduce to other ideas they have. Be sure to have students think about and explain how they would measure the success of different designs.](#)
- 3-5-ETS1-1 Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.
- 3-5-ETS1-2 Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.
- ETS1.B Developing possible solutions: communicating with peers about proposed solutions is important and can improve design.
- ETS1.A Defining and delimiting engineering problems.
- 3-5 ETS1-3 Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.
- ETS1.C Optimizing the design.

### **EXPLORE YOUR BACKYARD**

- 4-LS-1 Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior and reproduction.
- LS1.A Structure and function.

### **CROSS CUTTING CONCEPTS**

Cause and Effect: Mechanisms and Predictions: [Mission Reader, STEM Project, Science Mission](#)

Patterns: [All](#)

Scale, Proportion and Quantity: [Science Mission](#)

Energy and matter flow: [Mission Reader](#)

System and system models: [Mission Reader, Science Mission, STEM Project](#)

Structure and function: [All](#)

Stability and change: [Mission Reader, Mission Research](#)

### **CONNECTION TO ENGINEERING, TECHNOLOGY AND APPLICATIONS OF SCIENCE**

Interdependence of Science, Engineering and Technology: [STEM Project](#)

Influence of Science, Engineering and Technology on Society and the Natural World: [STEM Project](#)

### **CONNECTION TO NATURE OF SCIENCE**

Scientific investigations use a variety of methods: [Science Mission, STEM Project](#)

Scientific knowledge is based on empirical evidence: [Science Mission, STEM Project](#)

Science models, laws, mechanisms and theories explain natural phenomena: [Mission Research, Science Mission](#)

Science is a way of knowing: [Science Mission](#)

Scientific knowledge assumes an order and consistency in natural systems: [Mission Research](#)

Science addresses questions about the natural and material world: [Mission Reader, Mission Research, Science Mission, STEM Project, Explore Your Backyard](#)

### **SCIENCE AND ENGINEERING PRACTICES**

Asking questions and defining problems: [STEM Project](#)

Developing and using models: [Science Mission, STEM Project](#)

Analyzing and interpreting data: [Science Mission, STEM Project](#)

Constructing explanations and designing solutions: [Science Mission, STEM Project](#)

Engaging in argument from evidence: [Mission Research, Science Mission, STEM Project](#)

Obtaining, evaluating and communicating information: [Science Mission, STEM Project, Explore Your Backyard](#)

Planning and carrying out investigations: [Science Mission](#)

Using mathematics and computational thinking: [Science Mission](#)