SCIENCE 3D

SHARK WORLD

SCIENCE PERFORMANCE EXPECTATIONS AND DISCIPLINARY CORE IDEAS

In the Middle School Mission, students will address the following general topics. Keep reading below to find the NGSS standards for each component of the Mission. *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 soon.*

- In the **Mission Reader**, *Shark World*, students will explore cells, tissues, body systems, and sensory systems through the biology and behavior of sharks. They will also learn about osmosis and physiology. The ways in which scientists use cameras and sound to study sharks is also covered.
- During **Mission Research**, students will use information from the **Mission Reader** to reinforce and expand their understanding of body systems, sensory systems, and structure and function.
- In the **Science Mission**, students will use data from experiments and the field to explore how bodies use energy and oxygen and how it changes with water temperature. They will use these data to predict how sharks might be affected by changes in oxygen levels, which are occurring around the world. They will also use data to investigate what affects shark migrations and use math skills to predict how far sharks might move over different amounts of time. Finally, they will use the evidence to decide whether or not hammerhead sharks follow a blacktip shark migration.
- In the **STEM Project**, students will explore the different types of energy and apply it to how sharks, scientists, and technology are used to study shark energy consumption. Then, they will use data on power consumption to propose camera tag designs and programs to turn sensors on and off to optimize sampling with shark cameras.
- The **Explore Your Backyard** activity will have students reinforce their understanding of sensory systems by investigating local animals. They will enhance their writing skills by comparing and contrasting sharks and local animals.

SCIENCE/ENGINEERING AND DESIGN DISCIPLINARY CORE IDEAS AND PERFORMANCE EXPECTATIONS

MISSION READER

MS-LS1-1	Conduct an investigation to provide evidence that living things are made of cells.
LS1.A	Structure and function: all living things are made of cells.
MS-LS1-2	Develop and use a model to describe the function of a cell as a whole and ways that parts of cells contribute to function. Given brief overview in figures but needs to be expanded on in class.
LS1.A	Structure and function: within cells, special structures are responsible for particular functions. Given brief overview in figures but needs to be expanded on in class.
MS-LS1-3	Use argument supported by evidence for how the body is a system of interacting subsystems composed of groups of cells.
LS1.A	Structure and function: body is a system of multiple interacting subsystems.
MS-LS1-4	Use argument based on empirical evidence and scientific reasoning to support an explanation for how characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants. Animals only.
LS1.B	Growth and development of organisms: plant and animal reproduction and behavior. Animals only.
MS-LS1-7	Develop a model to describe how food is rearranged through chemical reactions forming new molecules that support growth +/- release energy as this matter moves through an organism.
LS1.C	Organization for matter and energy flow in organisms: food moves through chemical reactions in digestion.
MS-LS1-8	Gather and synthesize information that sensory receptors respond to stimuli by sending messages to the brain for immediate behavior or storage as memories. Focus is on sensory systems, but not explicitly on memory storage.
LS1.D	Information processing.
LS4.C	Adaptation.

MISSION RESEARCH

MS-LS1-3	Use argument supported by evidence for how the body is a system of interacting subsystems composed of groups of cells.

*ELA and Math standards to come

LS1.A	Structure and function: body is a system of multiple interacting subsystems.
MS-LS1-4	Use argument based on empirical evidence and scientific reasoning to support an explanation for how characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants. Animals only.
LS1.D	Information processing.
LS4.C	Adaptation.

SCIENCE MISSION

PS2.A	Forces and motion. Focus is on motion and plotting distance by time to be able to predict future motion.
MS-LS1-3	Use argument supported by evidence for how the body is a system of interacting subsystems composed of groups of cells.
LS1.A	Structure and function: body is a system of multiple interacting subsystems.
MS-LS1-4	Use argument based on empirical evidence and scientific reasoning to support an explanation for how characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants. Animals only.
PS3.D	Energy in chemical processes and everyday life: cellular respiration.
LS2.A	Interdependent relationships in ecosystems: predation, mutualism, interactions similar across ecosystems.
MS-LS2-4	Construct and argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.

STEM PROJECT

ETS1.B	Developing possible solutions: solutions need to be tested and modified.
PS3.A	Definitions of energy: kinetic energy.
PS3.A	Definitions of energy: potential energy.
ETS1.A	Defining and delimiting engineering problems: criteria and constraints.
PS4.C	Information technologies and Instrumentation.
MS-ETS1-1	Define the criteria and constrains of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.
ETS1.A	Defining and delimiting engineering problems: more precision in constraints and criteria is better.
ETS1.B	Developing possible solutions: systematic processes for evaluating solutions to make sure they meet criteria and constraints.
MS-ETS1-4	Develop a model to generate data for iterative testing and modification of proposed object, tool, or process such that an optimal design can be achieved.
ETS1.B	Developing possible solutions: solutions must be tested and models are important.
ETS1.C	Optimizing the design solution: iterative process leads to optimal solutions.

EXPLORE YOUR BACKYARD

LS1.A	Structure and function: body is a system of multiple interacting subsystems.
MS-LS1-4	Use argument based on empirical evidence and scientific reasoning to support an explanation for how characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants. Animals only.
LS1.D	Information processing.
LS4.C	Adaptation.
ESS3.C	Human impacts on Earth systems.

CROSS CUTTING CONCEPTS

Patterns: Mission Reader, Mission Research, Science Mission, Explore Your Backyard
Cause and effect: mechanisms and predictions: Mission Reader, Science Mission, STEM Project, Explore Your Backyard
Scale, proportion and quantity: Science Mission, STEM Project
System and system models: Science Mission, STEM Project, Explore Your Backyard
Energy and matter: Mission Reader, Science Mission
Structure and function: All
Stability and change: Science Mission

CONNECTION TO ENGINEERING, TECHNOLOGY AND APPLICATIONS OF SCIENCE

Interdependence of Science, Engineering and Technology: Mission Reader, Science Mission, STEM Project
Influence of Science, Engineering and Technology on Society and the Natural World: Mission Reader, Science Mission, STEM Project

*ELA and Math standards to come

SHARK WORLD NGSS STANDARDS

CONNECTION TO NATURE OF SCIENCE

Scientific investigations use a variety of methods: Mission Reader, Science Mission, STEM Project
Scientific knowledge is based on empirical evidence: Mission Reader, Mission Research, Science Mission
Science models, laws, mechanisms and theories explain natural phenomena: Science Mission
Science is a way of knowing: Mission Research, Science Mission
Scientific knowledge assumes an order and consistency in natural systems: Mission Reader, Science Mission, Explore Your Backyard
Science is a human endeavor: Science Mission
Science addresses questions about the natural and material world: All

SCIENCE AND ENGINEERING PRACTICES

Asking questions and defining problems: Mission Reader, Science Mission
Developing and using models: Mission Research, Science Mission, STEM Project
Planning and carrying out investigations: Mission Reader, Science Mission
Analyzing and interpreting data: Science Mission
Using mathematics and computational thinking: Science Mission, STEM Project
Constructing explanations and designing solutions: Mission Research, Science Mission, STEM Project, Explore Your Backyard
Engaging in argument from evidence: Mission Research, Science Mission, STEM Project, Explore Your Backyard
Obtaining, evaluating and communicating information: Mission Reader, Mission Research, Science Mission, STEM Project, Explore Your Backyard

*ELA and Math standards to come