SCIENCE·3D

SEA TURTLE 360

SCIENCE PERFORMANCE EXPECTATIONS AND DISCIPLINARY CORE IDEAS

In the Middle School Mission, 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**, *Sea Turtle 360*, middle school students will learn about turtles and tortoises, how fossils are formed, how marine reptiles have changed through time, cycles of the moon, how the moon and sun influence tides, sea turtle ecosystems, the flow of energy and matter in ecosystems, and interactions within ecosystems. They will also explore how nutrients fuel the growth of plants and other producers, and how technology is helping protect these amazing animals.
- During **Mission Research**, students will investigate how to date fossils using both radiometric decay and the concepts of index fossils and superposition. They will practice their skills in interpreting graphs and diagrams of rock layers.
- In the **Science Mission**, students will use data from Abaco, The Bahamas to develop hypotheses and test their predictions to investigate how nutrients affect plant growth and how the amount and quality of food influence where sea turtles are found. They will also explore the diets of sea turtles in different ecosystems and test predictions on how sea turtles might influence seagrass ecosystems. This mission challenges students to develop hypotheses and test their predictions using data.
- In the **STEM Project**, students will explore the concept of density in both life science and as a characteristic of matter. They will gain insights into buoyant force and use this understanding to develop their own designs for scientific tags worn by sea turtles. They will also learn about trade-offs in engineering in the process.
- The **Explore Your Backyard** activity has students explore the distribution of natural disasters across the United States. They will also investigate the natural disasters that might occur in their local area and brainstorm ways to minimize risk from these hazards.

SCIENCE/ENGINEERING AND DESIGN DISCIPLINARY CORE IDEAS AND PERFORMANCE EXPECTATIONS

MISSION READER

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.
LS1.B	Growth and development of organisms: genetic and local conditions affect growth of plants. Most of the focus here is on the growth of plants based on the availability of nutrients but also links to turtle growth; teachers will need to make the links to genetic factors more explicitly.
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.
PS3.D	Energy in chemical processes and everyday life: photosynthesis.
PS4.C	Information technologies and Instrumentation.
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.
LS2.A	Interdependent relationships in ecosystems: dependence on environment and may compete; resource limitation on organisms and populations.
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 and argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.
MS-LS4-1	Analyze and interpret data for patterns in the fossil record that document the existence, diversity, extinction and change of life forms throughout the history of life on Earth under the assumption that natural laws operate today as in the past.
LS4.A	Evidence of common ancestry and diversity: collection of fossils and placement is know from position and dating known as the fossil record; it documents existence, diversity, extinction.
LS4.A	Evidence of common ancestry and diversity: anatomical similarities and differences between fossils and modern taxa allow evolutionary history reconstruction.

*ELA and Math standards to come

MS-LS4-2	Apply scientific ideas to construct an explanation for the anatomical similarities and differences among modern organisms and modern and fossil organisms to infer evolutionary relationships.
LS2.C	Ecosystem dynamics, functioning and resilience: change through time possible.
MS-ESS1-1	Develop and use a model of the Earth-Sun-Moon system to describe the cyclic patterns of lunar phases, eclipses and seasons. Partial – focus on lunar phases and effect on tides.
MS-ESS1-4	Construct a scientific explanation based on evidence from rock strata on how the geologic time scale is used to organize Earth's 4.6 billion-year-old history. Partial – focus on marine predators through geological time.
ESS1.C	History of Earth: geological time scale used to organize history.

MISSION RESEARCH

MS-LS4-1	Analyze and interpret data for patterns in the fossil record that document the existence, diversity, extinction and change of life forms throughout the history of life on Earth under the assumption that natural laws operate today as in the past.
LS4.A	Evidence of common ancestry and diversity: collection of fossils and placement is know from position and dating known as the fossil record; it documents existence, diversity, extinction.
MS-ESS1-4	Construct a scientific explanation based on evidence from rock strata on how the geologic time scale is used to organize Earth's 4.6 billion-year-old history. Partial – focus on how radioisotopes and superposition help understand time and organization of fossil record.
ESS1.C	History of Earth: geological time scale used to organize history.

SCIENCE MISSION

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.
LS1.B	Growth and development of organisms: genetic and local conditions affect growth of plants. Most of the focus here is on the growth of plants based on the availability of nutrients but also links to turtle growth; teachers will need to make the links to genetic factors more explicitly.
MS-LS1-5	Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms.
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.
LS2.A	Interdependent relationships in ecosystems; dependence on environment and may compete; resource limitation on organisms and populations.
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 and argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.
LS2.C	Ecosystem dynamics, functioning and resilience; change through time possible.
PS4.C	Information technologies and Instrumentation.

STEM PROJECT

ETS1.A	Defining and delimiting engineering problems: criteria and constraints.
ETS1.A	Defining and delimiting engineering problems: more precision in constraints and criteria is better.
ETS1.B	Developing possible solutions: solutions need to be tested and modified.
ETS1.B	Developing possible solutions: test and modify.
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.
MS-ETS1-2	Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.
ETS1.C	Optimizing the design solution: what works best under what conditions?
PS4.C	Information technologies and Instrumentation.

EXPLORE YOUR BACKYARD

MS-ESS3-2	Analyze and interpret data on natural hazards to forecast future catastrophic events and inform the development of technologies to mitigate their effects.
ESS3.B	Natural hazards.

*ELA and Math standards to come

MIDDLE SCHOOL

SEA TURTLE 360 NGSS STANDARDS

CROSS CUTTING CONCEPTS

Patterns: Reader, Mission Research, Science Mission, STEM Project, Explore Your Backyard
Cause and Effect: Mechanisms and Predictions: Reader, Mission Research, Science Mission, STEM Project, Explore Your Backyard
Scale, Proportion and Quantity: Reader, Mission Research, Science Mission, STEM Project
System and system models: Reader, Science Mission, Explore Your Backyard
Energy and matter: flows, cycles and conservation: Reader, Science Mission
Structure and function: Reader, Science Mission, STEM Project
Stability and change: Reader, Mission Research, Science Mission, Explore Your Backyard

CONNECTION TO ENGINEERING, TECHNOLOGY AND APPLICATIONS OF SCIENCE

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

CONNECTION TO NATURE OF SCIENCE

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

SCIENCE AND ENGINEERING PRACTICES

Asking questions and defining problems: Reader, Mission Research, Science Mission, STEM Project, Explore Your Backyard
Developing and using models: Reader, Mission Research, Science Mission, STEM Project
Planning and carrying out investigations: Reader, Science Mission
Analyzing and interpreting data: Mission Research, Science Mission, STEM Project, Explore Your Backyard
Using mathematics and computational thinking: Mission Research, Science Mission, STEM Project
Constructing explanations and designing solutions: Reader, 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 Research, Science Mission, STEM Project, Explore Your Backyard

*ELA and Math standards to come