SCIENCE·3D

DESERT BATTLE: NINJA RAT vs RATTLESNAKE

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**, *Desert Battle: Ninja Rat vs Rattlesnake,* students will learn about cells, tissues, body systems, and sensory systems by exploring rattlesnakes and their venom, as well as the amazing adaptations of kangaroo rats and other desert plants and animals. They will also learn about photosynthesis, cellular respiration, levels of organization in ecosystems, and how landscapes and soils are formed through geological processes. Finally, they will explore how scientists have developed innovative solutions to study desert ecology.
- During **Mission Research**, students will use what they learned in the **Mission Reader** to reinforce and expand their understanding of cell structure and function and body systems. They will explore how different types of venom disrupt cells, tissues, and organs.
- In the **Science Mission**, students will use data from field experiments to explore the interaction between rattlesnakes and kangaroo rats. They will describe the body systems involved in each step of an interaction and investigate how reaction times affect the success of snake attacks and kangaroo rat evasion. Finally, students will analyze and synthesize data on each animal's movements to explore how rattlesnakes might help disperse plant seeds by consuming kangaroo rats.
- In the **STEM Project**, students will explore the relationship between surface area and volume and how it is impacted by the shape of objects. They will reinforce math skills and apply their discoveries to understand how natural and engineered structures function. Then, they will apply their understanding to design solutions to several engineering challenges.
- The **Explore Your Backyard** activity has students explore weather and environmental conditions and investigate how plants are adapted to the local environment. They will enhance their writing skills by comparing and contrasting their local habitat to the Sonoran Desert.

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. Should be supplemented with observations of cells.
LS1.A	Structure and function: within cells, special structures are responsible for particular functions.
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: plant and animal reproduction and behavior.
LS1.B	Growth and development of organisms: genetic and local conditions affect growth of plants.
MS-LS2-2	Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems.
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.
LS1.C	Organization for matter and energy flow in organisms: chemistry of photosynthesis.
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.
PS3.D	Energy in chemical processes and everyday life: cellular respiration.
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.
MS-LS2-2	Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems.

*ELA and Math standards to come

DESERT BATTLE NGSS STANDARDS

LS2.A	Interdependent relationships in ecosystems: predation, mutualism, interactions similar across ecosystem types.
MS-LS2-3	Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem.
LS2.B	Cycles of matter and energy transfer: food web models.
LS2.C	Ecosystem dynamics, functioning and resilience: change through time possible.
ETS1.B	Developing possible solutions: process, criteria and constraints.
MS-ESS2-2	Construct an explanation based on evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales. Partial coverage.
ESS2.C	The roles of water in Earth's surface processes: weathering and erosion above and underground. Partial coverage of above ground processes.
MS-ESS2-4	Develop a model to describe the cycling of water through Earth's systems driven by energy from the Sun and the force of gravity. Water cycle covered.

MISSION RESEARCH

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. Partial coverage; needs to be linked to more complete models.
LS1.A	Structure and function: within cells, special structures are responsible for particular functions.
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-LS1-8	Gather and synthesize information that sensory receptors respond to stimuli by sending messages to the brain for immediate behavior or storage as memories.
LS1.D	Information processing. Partial coverage.

SCIENCE MISSION

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. Partial coverage; needs to be linked to more complete models and exploration of physical models and computer animations.
LS1.A	Structure and function: within cells, special structures are responsible for particular functions.
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.
LS1.B	Growth and development of organisms: plant and animal reproduction and behavior. Focus on unexpected mechanisms of plant dispersal.
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.
LS1.D	Information Processing. Partial coverage.
MS-LS2-2	Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems.
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.
LS4.C	Adaptation.

STEM PROJECT

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-ETS2-2	Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constrain.
ETS1.B	Developing possible solutions: process, criteria and constraints.
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.

*ELA and Math standards to come

MIDDLE SCHOOL

DESERT BATTLE NGSS STANDARDS

EXPLORE YOUR BACKYARD

MS-LS1-3	Use argument supported by evidence for how the body is a system of interacting subsystems composed of groups of cells.
MS-LS1-5	Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms.
ESS2.D	Weather and climate: probabilistic predictions of weather.
MS-LS2-3	Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem.
LS2.B	Cycles of matter and energy transfer: food web models.
LS1.B	Growth and development of organisms: genetic and local conditions affect growth of plants.
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. Partial coverage; should be combined with actual data on variation in abundance of organisms once students have explored the hypotheses they generate in this activity.
LS2.A	Interdependent relationships in ecosystems: dependence on environment and may compete; resource limitation on organisms and populations. Partial coverage.
MS-LS2-2	Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems.
LS2.A	Interdependent relationships in ecosystems: predation, mutualism, interactions similar across ecosystems.
LS4.B	Natural selection.
LS4.C	Adaptation.

CROSS CUTTING CONCEPTS

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

CONNECTION TO ENGINEERING, TECHNOLOGY AND APPLICATIONS OF SCIENCE

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

SCIENCE AND ENGINEERING PRACTICES

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