SCIENCE 3D

TIGER QUEEN

SCIENCE PERFORMANCE EXPECTATIONS AND DISCIPLINARY CORE IDEAS

In this Elementary School Mission (NGSS Grade 5), 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**, *Tiger Queen*, students will learn about the flow of energy and matter in ecosystems, ecosystem interactions, and how water moves among the atmosphere, biosphere, hydrosphere, and geosphere. They will also learn about how the movement and position of the Earth creates seasons and the phases of the moon. Then, they will explore how this affects animals and ecosystems. Finally, they will learn about how camera traps are used to study wild tiger populations.
- During **Mission Research**, students will explore how energy is used in ecosystems and how it flows through food webs (the rule of 10%). They will use this understanding to make calculations and construct explanations of why top predators are rare. Alternatively, they will model the phases of the moon and how they result from the positions of the Earth, sun, and moon.
- In the **Science Mission**, students will explore living and non-living resources in ecosystems. Then they will match individual tigers to images from camera traps and use this information to investigate how tigers change their movements between seasons. They will also explore how day and night cycles influence tigers and other animals in the forest and then track how tiger populations have changed through time. Students will develop and test hypotheses using data that they analyze and graph.
- In the **STEM Project**, students will use what they have learned to design a new nature preserve for tigers. They will calculate whether the proposed area has enough prey to support a population of tigers, design a monitoring plan for tigers and their prey, and create designs to reduce tiger-human conflict.
- The **Explore Your Backyard** activity has students compare and contrast the flow of matter and energy in a local ecosystem and the tigers' forest in India. An alternate activity has students record local observations about the timing of sunrise and sunset and compare that to other locations around the globe. Then, they relate these observations to the Earth-Sun system.

SCIENCE/ENGINEERING AND DESIGN DISCIPLINARY CORE IDEAS AND PERFORMANCE EXPECTATIONS

MISSION READER

5-LS1-1	Support an argument that plants get the materials they need for growth chiefly from air and water.
LS1.C	Organization for matter and energy flow in organisms.
5-LS2-1	Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment.
LS2.A	Interdependent relationships in ecosystems.
LS2.B	Cycles of matter and energy transfer in ecosystems.
5-ESS1-2	Represent data in graphical displays to reveal the patterns of daily changes in length and direction of shadows, day and night, and the seasonal appearance of some stars in the night sky.
ESS1.B	Earth and the solar system. Only partially covered.
5-ESS2-1	Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and or atmosphere interact.
ESS2.C	The roles of water in Earth's surface processes.
ESS3.C	Human impacts on Earth systems.
5-PS3-1	Use models to describe that energy in animals' food was once energy from the sun.

MISSION RESEARCH

LS1.C	Organization for matter and energy flow in organisms.
5-LS2-1	Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment.
LS2.B	Cycles of matter and energy transfer in ecosystems.
5-PS3-1	Use models to describe that energy in animals' food was once energy from the sun.

SCIENCE MISSION

LS1.C	Organization for matter and energy flow in organisms.
5-LS2-1	Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment.
LS2.A	Interdependent relationships in ecosystems.
LS2.B	Cycles of matter and energy transfer in ecosystems.

*ELA and Math standards to come

STEM PROJECT

LS1.C	Organization for matter and energy flow in organisms.
LS2.B	Cycles of matter and energy transfer in ecosystems.
5-ESS3-1	Obtain and combine information about ways individual communities use science ideas to protect the Earth's Resources and environment.
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.
ETS1.A	Defining and delimiting engineering problems.
ETS1.B	Developing possible solutions: communicating with peers about proposed solutions is important and can improve design.
ETS1.B	Developing possible solutions: tests are often designed to identify failure points to suggest where improvements are needed.
ETS1.C	Optimizing the design solution.

EXPLORE YOUR BACKYARD

LS1.C	Organization for matter and energy flow in organisms.
5-LS2-1	Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment.
LS2.A	Interdependent relationships in ecosystems.
LS2.B	Cycles of matter and energy transfer in ecosystems.
5-ESS1-2	Represent data in graphical displays to reveal the patterns of daily changes in length and direction of shadows, day and night, and the seasonal appearance of some stars in the night sky.
5-ESS2-1	Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and or atmosphere interact.
ESS3.C	Human impacts on earth systems.
5-PS3-1	Use models to describe that energy in animals' food was once energy from the sun.

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, Explore Your Backyard
System and system models: Reader, Mission Research, Science Mission, STEM Project, Explore Your Backyard
Energy and matter: Reader, Mission Research, Science Mission, STEM Project, Explore Your Backyard
Structure and function: Reader, 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, Science Mission, STEM Project
Influence of Science, Engineering and Technology on Society and the Natural World: Reader, STEM Project

CONNECTION TO NATURE OF SCIENCE

Scientific investigations use a variety of methods: Reader, Science Mission, STEM Project
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, Science Mission, STEM Project
Science models, laws, mechanisms and theories explain natural phenomena: Reader, Mission Research, Science Mission, STEM Project, Explore Your Backyard
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, Explore Your Backyard
Science is a human endeavor: Reader, Mission Research, Science Mission, STEM Project, Explore Your Backyard
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, Explore Your Backyard
Planning and carrying out investigations: Science Mission, STEM Project, Explore Your Backyard
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: 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