Jurassic Park

Unit Overview

Students engage in a critical look at an excerpt from Jurassic Park. They decide which parts of the movie they consider fact or fiction and which topics they need to find out more about in order to determine how organisms have changed over time.

Students look at the fossil record and determine that fossils are formed when organisms die and are preserved, that older fossils are found in the lower (older) layers of sedimentary rocks, and that sedimentary rocks are layered over time (with the oldest at the bottom). They explore how radiometric dating helps determine the age of a fossil. Students investigate how organisms have changed over time and that some organisms have gone extinct. They explore natural selection and genetic engineering.

Students explore DNA, how the sequencing of it affects the characteristics of organisms and examine evolutionary relationships among modern organisms and dinosaurs. Students investigate how changes to genes on chromosomes will affect the function of the protein, and how mutations can affect individuals as well as populations.

Students observe similarities and differences that can be seen in organisms in varying stages of embryological development and examine the characteristics of common ancestors in varying evolutionary timelines.

Performance Expectations

- MS-LS3-1 Develop and use a model to describe why structural changes to genes (mutations) located on chromosomes may affect proteins and may result in harmful, beneficial, or neutral effects to the structure and function of the organism.

- 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.

- MS-LS4-2 Apply scientific ideas to construct an explanation for the anatomical similarities and differences among modern organisms and between modern and fossil organisms to infer evolutionary relationships.

- MS-LS4-3 Analyze displays of pictorial data to compare patterns of similarities in the embryological development across multiple species to identify relationships not evident in the fully formed anatomy.

- MS-LS4-4 Construct an explanation based on evidence that describes how genetic variations of traits in a population increase some individuals' probability of surviving and reproducing in a specific environment.

- MS-LS4-5 Gather and synthesize information about the technologies that have changed the way humans influence the inheritance of desired traits in organisms.

- MS-LS4-6.Use mathematical representations to support explanations of how natural selection may lead to increases and decreases of specific traits in populations over time.

Sound Waves

Unit Overview

In this unit, students develop ideas related to how sounds are produced, how they travel through media, and how they affect objects at a distance. Their investigations are motivated by trying to account for a perplexing anchoring phenomenon — a truck is playing loud music in a parking lot and the windows of a building across the parking lot visibly shake in response to the music.

They make observations of sound sources to revisit the K–5 idea that objects vibrate when they make sounds. They figure out that patterns of differences in those vibrations are tied to differences in characteristics of the sounds being made. They gather data on how objects vibrate when making different sounds to characterize how a vibrating object's motion is tied to the loudness and pitch of the sounds they make. Students also conduct experiments to support the idea that sound needs matter to travel through, and they will use models and simulations to explain how sound travels through matter at the particle level.

Performance Expectations

- MS-PS4-1 Use mathematical representations to describe a simple model for waves that includes how the amplitude of a wave is related to the energy in a wave.

- MS-PS4-2 Develop and use a model to describe that waves are reflected, absorbed, or transmitted through various materials.Forces at a Distance

Adventure to Mars

Unit Overview

Students are presented with the anchoring phenomenon of living on Mars. They explore the formation of the solar system and Earth and how they have changed over time, including the progression of life.

Students engage in activities involving the scale properties of objects within our solar system, observing patterns in size, distance, and movement, and the role of gravity in the universe. The movement of the planet Mars within our solar system is then examined.The rotation and revolution of the Moon and Earth causing moon phases and eclipses, and the axial tilt of Earth resulting in seasons are investigated. Students explore, model, and explain the causes of these phenomena, and the predictability of their patterns. Observations of patterns of moon phases and seasons on Earth are compared to Mars phases and seasons.

Students study the formation of rock and fossil records by building and analyzing a model rock profile. Students create and analyze the geologic timeline. Students read information on the geology and history of Mars comparing it to Earth.

Acting as future archeologists, students examine a penny as an artifact of today's society. Students learn about the Cambrian Explosion and perform a Dubia Roach Lab activity. Students analyze and compare the characteristics of fossilized and living organisms and complete a jig-saw activity reading articles about possible fossil evidence on Mars comparing it to Earth fossil evidence.Students explore how humans obtain and use Earth's natural resources, and how a change in population size can affect the use and availability of the natural resources. Students propose engineering changes to the production and/or use of consumer products to mitigate the related impact on the environment.

Performance Expectations

- 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.

- MS-LS4-2 Apply scientific ideas to construct an explanation for the anatomical similarities and differences among modern organisms and between modern and fossil organisms to infer evolutionary relationships.

- MS-ESS1-1 Develop and use a model of the Earth-sun-Moon system to describe the cyclic patterns of lunar phases, eclipses of the Sun and Moon, and seasons.

- MS-ESS1-2 Develop and use a model to describe the role of gravity in the motions within galaxies and the solar system.

- MS-ESS1-3 Analyze and interpret data to determine scale properties of objects in the solar system.

- MS-ESS1-4 Construct a scientific explanation based on evidence from rock strata for how the geologic time scale is used to organize Earth's 4.6-billion-year old history.

- MS-ESS3-4 Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems.

- MS-ETS1-3 Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success

Forces at a Distance

Unit Overview

This unit launches with a slow-motion video of a speaker as it plays music. In the previous unit, students developed a model of sound. This unit allows students to investigate the cause of a speaker's vibration in addition to the effect.
Students dissect speakers to explore the inner workings, and engineer homemade cup speakers to manipulate the parts of the speaker. They identify that most speakers have the same parts–a magnet, a coil of wire, and a membrane. Students investigate each of these parts to figure out how they work together in the speaker system. Along the way, students manipulate the components (e.g. changing the strength of the magnet, number of coils, direction of current) to see how this technology can be modified and applied to a variety of contexts, like MagLev trains, junkyard magnets, and electric motors.

Performance Expectations

- MS-PS2-3 Ask questions about data to determine the factors that affect the strength of electric and magnetic forces.

- MS-PS2-5 Conduct an investigation and evaluate the experimental design to provide evidence that fields exist between objects exerting forces on each other even though the objects are not in contact.

- MS-PS3-2 Develop a model to describe that when the arrangement of objects interacting at a distance changes, different amounts of potential energy are stored in the system.

- MS-PS2-2 Plan an investigation to provide evidence that the change in an object's motion depends on the sum of the forces on the object and the mass of the object.

- MS-PS3-1 Construct and interpret graphical displays of data to describe the relationships of kinetic energy to the mass of an object and to the speed of an object.

- MS-PS3-5 Construct, use, and present arguments to support the claim that when the kinetic energy of an object changes, energy is transferred to or from the object

Contact Forces

Unit Overview

Oh, no! I've dropped my phone! Most of us have experienced the panic of watching our phones slip out of our hands and fall to the floor. We've experienced the relief of picking up an undamaged phone and the frustration of the shattered screen. This common experience anchors learning in the Contact Forces unit as students explore a variety of phenomena to figure out, "Why do things sometimes get damaged when they hit each other?"

Student questions about the factors that result in a shattered cell phone screen lead them to investigate what is really happening to any object during a collision. They make their thinking visible with free-body diagrams, mathematical models, and system models to explain the effects of relative forces, mass, speed, and energy in collisions. Students then use what they have learned about collisions to engineer something that will protect a fragile object from damage in a collision. They investigate which materials to use, gather design input from stakeholders to refine the criteria and constraints, develop micro and macro models of how their solution is working, and optimize their solution based on data from investigations. Finally, students apply what they have learned from the investigation and design to a related design problem.

Performance Expectation

- MS-PS2-1 Apply Newton's Third Law to design a solution to a problem involving the motion of two colliding objects.

- MS-PS-2-2 Plan an investigation to provide evidence that the change in an object's motion depends on the sum of the forces on the object and the mass of the object.

- MS-PS3-1 Construct and interpret graphical displays of data to describe the relationships of kinetic energy to the mass of an object and to the speed of an object.

- MS-ETS1-2 Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.

- MS-ETS1-3 Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.

- 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