Cody Outdoor Classroom

Where Learning Comes Naturally

Overviews of Earth and Space Science Lessons

Below are overviews of Cody Outdoor Classroom's earth and space science lessons. Please note each lesson specifies the grades it is designed for. Some lessons can be tailored to include additional grades; please contact us for more information regarding this.

NGSS, MA, and NH science standards for the lessons are listed in an Appendix below the overviews.

Changing with the Seasons
Exploring the Relationship between the Sun, the Earth, and Seasons
Grades: Kindergarten, 1st
As the Earth orbits the sun, the seasons change. Shorter days mean colder temperatures and more snow. Longer days mean warmer temperatures and abundant sunshine. This lesson explores predictable patterns that accompany seasons. Students will record seasonal observations, interpret daylight and temperature graphs, and create arguments based on evidence to predict the weather during specific times of the year.

Moving Mountains
Investigating how Wind, Water, and Humans Can Change a Landscape
Grade: 2nd
Over time, water has the power to drastically change the landscape, carving mountains and transporting sediment. Humans have long sought to harness and use this power for their own needs and survival. To explore the power of water, students get their hands dirty in a stream table (a table full of sand and water) which demonstrates the ability of water to change landforms. Students apply their new knowledge to design and build dams and culverts to prevent unwanted erosion. They also learn that, though we can see the changes occur quickly in the stream table, many geologic changes happen over long periods of time that are difficult to observe in a human lifetime.

It's Cloudy!
Collecting Cloud and Weather Data
Grade: 3rd
Most of us start our day by looking outside and taking a peek at the weather. It's raining, it's snowing, it's a bright sunshiny day. But how often do you look up – way up – to see how the clouds look during these different types of weather? Students collect simple, qualitative data, such as the shape and size of different types of clouds. Organizing this data graphically, they

analyze it to determine the relationship between cloud type and weather patterns. They apply this knowledge to report the local weather, describing how weather and clouds change over time.

Glaciers and Rivers
Exploring Forces that Change Landscapes
Grade: 4th
Water has the power to carve both mountains and valleys into and out of existence. However, water can take many forms, and therefore can have different types of effects. Students explore erosion, deposition, and weathering, and how glaciers and rivers accomplish those processes in very different ways. The stream table (a model that demonstrates how moving water affects sand) allows students to gather data and make observations on the effects of a river on a landscape. Through a hands-on group activity called the "Glacier Shuffle," students discover the impacts of glaciers on mountains and valleys. They develop an understanding of the power of the forces that affect the Earth's landscape and conceptualize the longevity of the geologic time scale.

Planet H2O
The Water Cycle and Value of Fresh Water
Grade: 5th
Freshwater is essential for life on planet Earth. And yet, freshwater on Earth is limited in both quantity and where it is found. To understand where freshwater is found and how water is distributed on the planet, students use models and pie-charts to represent the distribution of water on the planet. They analyze graphical data regarding scarceness of freshwater and discuss what humans might do to access and conserve the available freshwater.

The Tilted Earth
Understanding Earth's Seasons through Modeling and Data Analysis
Grades: 6th, 7th, 8th
The cycling of seasons on Earth is a direct result of the position of the Earth in orbit around the sun. The tilt of the Earth and its position in orbit determine the amount of sun energy that filters through the atmosphere and strikes the Earth. During this lesson, students use models of the Earth-Sun system to understand their relative positions and movements. Students will experiment with the models and laser thermometers to collect data and explore the causes of the seasons and investigate natural phenomena such as axial tilt, shifting daylight hours, and the angles at which sunlight strikes the surface of the planet.

Appendix: Science Standards

Cody Outdoor Classroom

Where Learning Comes Naturally

Changing with the Seasons
Exploring the Relationship between the Sun, the Earth, and Seasons

NGSS: K-ESS2-1. Use and share observations of local weather conditions to describe patterns over time.
NGSS: 1-ESS1-2. Make observations at different times of year to relate the amount of daylight to the time of year.

MA: K-ESS2-1. Use and share quantitative observations of local weather conditions to describe patterns over time.
MA: 1-ESS1-2. Analyze provided data to identify relationships among seasonal patterns of change, including relative sunrise and sunset time changes, seasonal temperature and rainfall or snowfall patterns, and seasonal changes to the environment.

NH: S:ESS1:2:1.1 Recognize that weather conditions change frequently, and that weather patterns change over the seasons.
NH: S:ESS1:2:1.2 Describe and compare weather using observations and measurements of local weather conditions.
NH: S:ESS2:2:1.1 Recognize the basic patterns of the Sun, including its appearance during the daytime, and how its position in the sky changes through the seasons.

Moving Mountains
Investigating how Wind and Water Change a Landscape

NGSS: 2-ESS2-1. Compare multiple solutions designed to slow or prevent wind or water from changing the shape of the land.
NGSS: K-2-ETS1-3. Analyze data from tests of two objects designed to solve the same problem to compare the strengths and weaknesses of how each performs.

MA: 2-ESS2-1. Investigate and compare the effectiveness of multiple solutions designed to slow or prevent wind or water from changing the shape of the land.
MA: 2-ESS2-4 Observe how blowing wind and flowing water can move Earth materials from one place to another and change the shape of a landform.
MA: 2.K-2-ETS1-3. Analyze data from tests of two objects designed to solve the same design problem to compare the strengths and weaknesses of how each object performs.

NH: S:ESS1:2:5.1 Recognize that some changes are too slow or too fast to be easily observed.

NH: S:ESS4:2:3.2 Identify environments that are natural, such as a forest, meadow, or mountains and those that have been built or modified by people, including cities, roads, farms, and houses.
NH: S:SPS1:2:1.2 Record observations using language, concrete objects, and symbolic representations.
NH: S:SPS1:2:1.4 Ask questions that lead to exploration and investigation as a result of working with materials and objects.
NH: S:SPS1:2:2.3 Predict how changing one part of an exploration will affect the outcome.
NH: S:SPS1:2:3.1 Follow their own plan for conducting an investigation.
NH: S:SPS2:2:1.3 Explain that sometimes people aren't sure what will happen because they don't know all the factors that may have an effect on the outcome.
NH: S:SPS2:2:3.1 Describe how a model of something is different from the real thing but can be used to learn something about the real thing.
NH: S:SPS4:2:6.1 Plan and carry out simple activities with a group.

It's Cloudy!
Collecting Cloud and Weather Data

NGSS: 3-ESS2-1. Represent data in tables and graphical displays to describe typical weather conditions expected during a particular season.

MA: 3-ESS2-1. Use graphs and tables of local weather data to describe and predict typical weather during a particular season in an area.

NH: S:ESS1:4:1.3 Based on data collected from daily weather observations, describe weather changes or weather patterns.
NH: S:ESS4:4:1.1 Recognize that man uses various mechanical devices to record changes in the weather and the Earth.
NH: S:ESS4:4:2.1 Demonstrate the use of simple instruments to collect weather data, including thermometers, windsocks, meter sticks, and rain gauges.
NH: S:SPS1:4:1.2 Make and record observations for a given purpose.
NH: S:SPS1:4:4.1 Compile and display data in a variety of formats.
NH: S:SPS1:4:5.1 Cite evidence or data to support conclusions.
NH: S:SPS2:4:1.4 Explain that scientific investigations may take many different forms, including observing what things are like or what is happening somewhere, collecting specimens for analysis, and doing experiments; and that investigations can focus on physical, biological, and social questions.
NH: S:SPS3:4:1.2 Communicate ideas to others.

NH: S:SPS4:4:3.3 Organize observations and data into tables, charts and graphs.

Glaciers and Rivers
Exploring Forces that Change Landscapes

NGSS: 4-ESS2-1. Make observations and/or measurements to provide evidence of the effects of weathering or the rate of erosion by water, ice, wind, or vegetation.

MA: 4-ESS1-1. Use evidence from a given landscape that includes simple landforms and rock layers to support a claim about the role of erosion or deposition in the formation of the landscape over long periods of time.

NH: S:ESS1:4:5.1 Identify and describe processes that affect the features of the Earth's surface, including weathering, erosion, deposition of sediment.
NH: S:ESS1:4:5.2 Explain how wind, water, or ice shape and reshape the Earth's surface.
NH: S:ESS1:4:6.4 Use results from an experiment to draw conclusions about how water interacts with earth materials (e.g., percolation, erosion, frost heaves).
NH: S:SPS1:4:1.2 Make and record observations for a given purpose.
NH: S:SPS1:4:2.1 Plan a step-by-step process to solve a practical problem or to carry out a "fair test" of a simple scientific question.
NH: S:SPS1:4:3.2 Plan and test ideas through guided experiments.
NH: S:SPS2:4:2.2 Provide examples that demonstrate that something may not work well (or at all) if a part of it is missing, broken, worn out, mismatched, or misconnected.
NH: S:SPS2:4:3.1 Know that seeing how a model works after changes are made to it may suggest how the real thing would work if the same changes were done to it.
NH: S:SPS2:4:4.2 Understand that some changes are so slow or so fast that they are hard to see.
NH: S:SPS2:4:5.2 Explore methods, designs and problems of transporting liquids.
NH: S:SPS2:6:5.3 Investigate the relationship between various landforms and wind currents.

Planet H2O
The Water Cycle and Value of Fresh Water

NGSS: 5-ESS2-2. Describe and graph the amounts and percentages of water and fresh water in various reservoirs to provide evidence about the distribution of water on Earth.
NGSS: 5-ESS3-1. Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment.

MA: 5-ESS2-1. Use a model to describe the cycling of water through a watershed through evaporation, precipitation, absorption, surface runoff, and condensation.
MA: 5-ESS2-2. Describe and graph the relative amounts of salt water in the ocean; fresh water in lakes, rivers, and groundwater; and fresh water frozen in glaciers and polar ice caps to provide evidence about the availability of fresh water in Earth's biosphere.

NH: S:ESS1:6:7.1 Explain the properties that make water an essential component of the Earth's system, including solvency and its ability to maintain a liquid state at most temperatures.
NH: S:ESS1:6:7.2 Explain that water quality has a direct effect on Earth's life forms.
NH: S:ESS4:6:3.1 Provide examples of products that man has developed which allow humans to do things that they could not do otherwise; and identify the natural materials used to produce these products.
NH: S:SPS2:6:2.1 Recognize that thinking about things as systems means looking for how every part relates to others.
NH: S:SPS2:6:3.1 Understand that models are often used to think about processes that happen too slowly, too quickly, or on too small a scale to observe directly; or that are too vast to be changed deliberately; or that are potentially dangerous.
NH: S:SPS3:6:1.1 Work effectively within a cooperative group setting, accepting and executing assigned roles and responsibilities.
NH: S:SPS3:6:2.2 Design environmental investigations to answer particular questions.
NH: S:SPS3:6:3.1 Identify problems/issues that can be addressed by design technology.

Earth, Moon, and Sun
Understanding Earth's Phenomena through Modeling

NGSS: 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.

MA: 6.MS-ESS1-1a. Develop and use a model of the Earth-Sun-Moon system to explain the

causes of lunar phases and eclipses of the Sun and Moon.

MA: 8.MS-ESS1-1b. Develop and use a model of the Earth-Sun system to explain the cyclical pattern of seasons, which includes Earth's tilt and differential intensity of sunlight on different areas of Earth across the year.
MA: 8.MS-ESS1-2. Explain the role of gravity in ocean tides, the orbital motions of planets, their moons, and asteroids in the solar system.

NH: S:ESS2:6:1.1 Recognize and describe how the regular and predictable motions of the Earth and Moon explain certain Earth phenomena, such as day and night, the seasons, the year, shadows and the tides.
NH: S:ESS2:6:2.1 Recognize how the tilt of the Earth's axis and the Earth's revolution around the Sun affect seasons and weather patterns.
NH: S:ESS2:8:1.2 Recognize and describe how the regular and predictable motions of the Earth and Moon account for phenomena, such as the phases of the Moon and eclipses.
NH: S:ESS2:8:1.4 Explain the temporal or positional relationships between or among the Earth, Sun and Moon (e.g., night/day, seasons, year, tide).
NH: S:SPS1:8:4.2 Identify sources of error in experiments.
NH: S:SPS1:8:4.3 Draw appropriate conclusions regarding the scientific question under investigation, based on the data collected.
NH: S:SPS2:8:2.1 Understand that any system is usually connected to other systems, both internally and externally; thus a system may be thought of as containing subsystems and as being a subsystem of a larger system.
NH: S:SPS2:8:3.2 Know that different models can be used to represent the same thing; what kind of model is used and how complex it should be depends on its purpose; and the usefulness of a model is one of the instances in which intuition and creativity come into play in science, mathematics and engineering.
NH: S:SPS3:8:1.1 Work effectively within a cooperative group setting, accepting and executing assigned roles and responsibilities.
NH: S:SPS3:8:2.3 Explore the uses and limitations of models.