Cody Outdoor Classroom

Where Learning Comes Naturally

Overviews of Physical Science Lessons

Below are overviews of Cody Outdoor Classroom's physical 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.

Racing Around
An Investigation and Comparison of Materials Used to Push Objects
Grade: Kindergarten

Students explore the effects of different strengths and different directions of pushes on the motion of an object. They test the impact of various "pushing tools" and graphically record the relative strength of each tool. They will apply this knowledge to collaboratively solve a design problem focused on getting a small car to complete its journey along a set path.

Light It Up!
Exploring Light Energy
Grade: 1st
Light, both natural and artificial, impacts our daily lives. Students explore this by conducting experiments to determine the effects of placing various materials in the path of a beam of light. Are there times when we need more light and times when we want to keep light out? They evaluate when each material might be useful in our daily lives. Students apply their knowledge of light to solve an instructor-presented design problem.

Build it Up, Break it Down
Exploring Properties of Materials and Classification
Grades: 2nd
A drive around the block reveals many different materials used to build houses, and a glance around the cafeteria reveals different materials used in water bottles. In this lesson, students classify different, yet similar, materials using their observation skills and scientific tools such as scales, balances, and rulers. They work collaboratively to determine which materials are best suited to solve a problem and then evaluate differences or challenges of completing the same task using the same materials, this time in smaller pieces.

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Magnetized
Exploring Properties and Uses of Magnets
Grade: 3rd
Observe two batches of slime. When a magnet is held near batch A, nothing happens. When a magnet is held near batch B, the slime rises into the air toward the magnet. Why? In this lesson, students engage in hands-on activities to explore the properties of magnets and the different impacts magnets have on the objects around them. Students then create their own magnets and apply these scientific ideas to solve a design problem.

Feeling Energized!
An Investigation and Comparison of Energy Sources and Transfers
Grade: 4th
Why do we hear sound differently when it travels through a solid, liquid and gas? How can you prevent a balloon from popping when it is held to a flame? It's all about energy and energy transfers! Students will participate in science experiments and make observations to conclude that there are a variety of energy sources and means of energy transfer. For example, they will collect, interpret and analyze data to determine if various materials found around the classroom are conductors or insulators.

Mad Scientist
Scientific Investigations of Materials and Reactions
Grades: 5th, 6th
Students will participate in several instructor-led and student-led science experiments. Using scientific inquiry, students determine the outcomes of an experiment and practice making effective scientific observations. They will collect, interpret, and analyze data to determine if the experiment resulted in a chemical or physical change. Scientific principles covered may include: density, pressure, solubility, states of matter, electricity, and convection.

Keep it Moving
Experimenting with Forces and Motion
Grades: 6th, 7th, 8th
Students will use models to understand two scientific principles: forces and motion. They first explore both principles independently, then determine how they interact to affect an object. Students calculate the velocity (by themselves and by using a motion sensor detector) of a car as it races down a slope. They then determine the effects on a system when one variable is changed, such as the mass of the car or the material on the slope. Students will be able to explain how inputs and outputs affect a system and how this is used to make scientific advances.

See next page for Appendix: Science Standards.

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Appendix: Science Standards

Racing Around
An Investigation and Comparison of Materials Used to Push Objects

NGSS: K-PS2-1. Plan and conduct an investigation to compare the effects of different strengths or different directions of pushes and pulls on the motion of an object.
NGSS: KPS2-2. Analyze data to determine if a design solution works as intended to change the speed or direction of an object with a push or a pull.

MA: K-PS2-1. Compare the effects of different strengths of different directions of pushes and pulls on the motion of an object.

NH: S:PS3:2:2.2 Describe and demonstrate how the position and motion of an object can be changed by applying force, such as pushing and pulling; and explain that the greater the force, the greater the change.
NH: S:SPS1:2:1.2 Record observations using language, concrete objects, and symbolic representations.
NH: S:SPS1:1:2:1.4 Ask questions that lead to exploration and investigation as a result of working with materials or objects.
NH: S:SPS1:2:2.3 Predict how changing one part of an exploration will affect the outcome.
NH: S:SPS1:2:3.2 Follow a simple step-by-step procedure.
NH: S:SPS1:2.4.2 Identify and describe patterns and relationships in observed objects and events.

Light It Up!
Exploring Light Energy

NGSS: 1-PS4-3. Plan and conduct an investigation to determine the effects of placing objects made with different materials in the path of a beam of light.

MA: 1-PS4-3. Conduct an investigation to determine the effect of placing materials that allow light to pass through them, allow only some light through them, block all the light, or redirect light when put in the path of a beam of light.

NH: S:SPS1:2:1.2 Record observations using language, concrete objects, and symbolic representations.
NH: S:SPS1:1:2:1.4 Ask questions that lead to exploration and investigation as a result of working with materials or objects.
NH: S:SPS1:2:2.3 Predict how changing one part of an exploration will affect the outcome.
NH: S:SPS1:2:3.2 Follow a simple step-by-step procedure.
NH: S:SPS1:2.4.2 Identify and describe patterns and relationships in observed objects and events.
NH: S:SPS3:2:1.1 Work with a partner to accomplish a specific task.
NH: S:SPS3:2:1.2 Take turns.

Build it Up, Break it Down
Exploring Properties of Materials and Classification

NGSS: 2-PS1-1. Plan and conduct an investigation to describe and classify different kinds of materials based on their observable properties
NGSS: 2-PS1-2. Analyze data obtained from testing different materials to determine which materials have the properties that are best suited for an intended purpose.
NGSS: 2-PS1-3. Make observations to construct an evidence-based account of how an object made of a small set of pieces can be disassembled and made into a new object.

MA: 2-PS1-1. Describe and classify different kinds of materials by observable properties of color, flexibility, hardness, texture, and absorbency.
MA: 2-PS1-2. Test different materials and analyze the data obtained to determine which materials have the properties that are best suited for the intended purpose.
MA: 2-PS1-3. Analyze a variety of evidence to conclude that when a chunk of material is cut or broken into pieces, each piece is still the same material and, however small each piece is, has weight. Show that the material properties of a small set of pieces do not change when the pieces are used to build larger objects.

NH: S:PS1:4:1.2 Use measures of weight (data) to demonstrate that the whole equals the sum of the parts.
NH: S:PS1:4:2.5 Collect and organize data about physical properties in order to classify objects or draw conclusions about objects and their characteristic properties (e.g., temperature, color, size, shape, weight, texture, flexibility).
NH: S:PS4:4:2.1 Demonstrate how to use tools, such as magnifiers, scales, balances, rulers, and thermometers to gather data and extend the senses.
NH: S:SPS1:4:1.5 Classify according to several attributes and describe or show the method for classification.

NH: S:SPS1:4:3.3 Identify and test appropriate tools.
NH: S:SPS2:4:5.1 Discover the relationship between shape and use.
NH: S:SPS3:4:1.2 Communicate ideas to others.
NH: S:SPS4:4:4.3 Use evidence to construct explanations.

Magnetized
Exploring Properties and Uses of Magnets
NGSS: 3-PS2-3. Ask questions to determine cause and effect relationships of electric or magnetic interactions between two objects not in contact with each other.
NGSS: 3-PS2-4. Define a simple design problem that can be solved by applying scientific ideas about magnets.

MA: 3-PS2-3. Conduct an investigation to determine the nature of the forces between two magnets based on their orientations and distance relative to each other.
MA: 3-PS2-4. Define a simple design problem that can be solved by using interactions between magnets.

NH: S:PS3:4:1.1 Recognize that magnets attract certain kinds of other materials; and classify objects by those magnets will attract and those they will not.
NH: S:PS3:4:1.2 Recognize that magnets attract and repel each other.
NH: S:PS3:4:1.3 Explain that electrically charged material pulls on all other materials and can attract or repel other charged materials.
NH: S:PS3:4:1.5 Use observations or magnets in relation to other objects to describe the properties of magnetism (i.e., attracts or repel certain objects or has no effect).
NH: S:SPS1:4:3.2 Plan and test ideas through guided experiments.
NH: S:SPS1:4:5.3 Draw a conclusion to answer an initial question, based on the evidence collected.
NH: S:SPS3:4:1.2 Communicate ideas to others.
NH: S:SPS4:4:4.3 Use evidence to construct explanations.

Feeling Energized!
An Investigation and Comparison of Energy Sources and Transfers

NGSS: 4-PS3-2. Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric current.

MA: 4-PS3–2. Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric current.

NH: S:PS2:4:1.1 Recognize that energy has the ability to create change.
NH: S:PS2:4:3.1 Identify various forms of energy, such as electrical, light, and heat, and sound.
NH: S:PS2:4:3.6 Given a specific illustration (e.g., simple closed circuit, rubbing hands together) predict the observable effects of energy (i.e., the bulbs lights, the bell rings, hands warm up).
NH: S:PS2:4:3.8 Experiment, observe, or predict how heat might move from one object to another.
NH: S:SPS1:4:3.2 Plan and test ideas through guided experiments.
NH: S:SPS1:4:5.3 Draw a conclusion to answer an initial question, based on the evidence collected.
NH: S:SPS2:4:4.2 Demonstrate that if something consists of many parts, the parts usually influence one another.
NH: S:SPS4:4:4.3 Use evidence to construct explanations.

Mad Scientist
Scientific Investigations of Materials and Reactions

NGSS: 5-PS1-3. Make observations and measurements to identify materials based on their properties.
NGSS: 5-PS1-4. Conduct an investigation to determine whether the mixing of two or more substances results in new substances.
NGSS: MS-PS1-2 Analyze and interpret data on the properties of substances before and after the substances interact to determine if a chemical reaction has occurred.

MA: 5-PS1-3. Make observations and measurements of substances to describe the characteristic properties of each, including color, reflectivity, electrical conductivity, thermal conductivity, response to magnetic forces, solubility.
MA: 5-PS1-4. Conduct an experiment to determine whether the mixing of two or more substances results in new substances with new properties (a chemical reaction) or not (a mixture).
MA: MS-PS1-8(MA). Conduct an experiment to show that many materials are mixtures of purse substances that can be separated by physical means into their pure substances.

NH: S:PS1:6:2.2 Identify substances by their physical and chemical properties, such as magnetism, conductivity, density, solubility, boiling and melting points.

NH: S:PS2:6:1.1 Differentiate between a physical change, such as melting, and a chemical change, such as rusting.
NH: S:SPS1:6:1.9 Determine which observations will be helpful to a given investigation.
NH: S:SPS1:6:2.3 Incorporate components of good experimental design, such as controls and multiple trials, into investigations.
NH: S:SPS1:6.3.1 Carry out simple student or teacher-developed procedures or experiments.
NH: S:SPS1:6:4.5 Draw appropriate conclusions based on data collected.
NH: S:SPS1:6:5.1 Determine if the results of an experiment support or fail to support the scientific idea being tested.
NH: S:SPS2:6:1.4. Realize that if one or more variable changes at the same time in an experiment, the outcome of the experiment may not be clearly attributable to any one of the variables.
NH: S:SPS3:6:1.2 Work collectively within a group toward a common goal.
NH: S:SPS4:8:3.1 Execute steps of scientific inquiry to engage in problem-solving and decision making processes.

Keep it Moving
Experimenting with Forces and Motion

NGSS: 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.

MA: 8.MS-PS2-2. Provide evidence that the change in an object's speed depends on the sum of the forces on the object (net force) and the mass of the object.

NH: S:PS3:6:1.3 Describe the relationship between the strength of a force on an object and the resulting effect, such as the greater the force, the greater the change in motion
NH: S:PS3:8:1.3 Use data to determine or predict the overall (net) effect of multiple forces (e.g., friction, gravitational, magnetic) on the position, speed, and direction of motion of objects.
NH: S:SPS1:8:1.3 Investigate similarities and differences noted when making observations.
NH: SPS1:8:1.7 Ask questions about relationships between and among observable variables.
NH: SPS1:8:4.3 Draw appropriate conclusions regarding the scientific question under investigation, based on the data collected.
NH: SPS3:8:1.2 Work collectively within a group toward a common goal.