Grade 6 Science Units:

Chemistry/Chemical Interactions (FOSS)

Chemistry is the systematic unveiling of the nature of matter—its properties, composition, and structure—and the energy dynamics that accompany matter transformations. Chemistry is also the intellectual process of uncovering the nature of matter and energy, which contributes to an ever-expanding body of chemical knowledge. In the Foss **Chemical Interactions** unit, students explore the anchor phenomenon of interactions of matter. The driving question for the course is how does matter interact?

The earliest analysis of the composition of matter was at once simplistic and sophisticated. Twenty-five hundred years ago, the Greek philosophers held that everything was composed of four elements: fire, air, earth, and water. In time this four-element model was pushed aside as more-compelling models gained acceptance. But the idea that basic substances, combined in certain proportions, produce all the forms of matter on Earth was sound.

Today, we understand matter on Earth to comprise 90 elements. We accept that the nature of matter depends on the number and arrangement of atoms of those elements and the particular energy load carried by that association of atoms at a particular time.

- **MS-PS1-1. Develop models to describe the atomic composition of simple molecules and extended structures.**
- **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.**
- **MS-PS1-3. Gather and make sense of information to describe that synthetic materials come from natural resources and impact society.**
- **MS-PS1-4. Develop a model that predicts and describes changes in particle motion, temperature, and state of a pure substance when thermal energy is added or removed.**
- **MS1-PS1-5. Develop and use a model to describe how the total number of atoms does not change in a chemical reaction and thus mass is conserved.**
- **MS-PS1-6. Undertake a design project to construct, test, and modify a device that either releases or absorbs thermal energy by chemical processes.**

Geologic Time/Changing Earth/Earth History (FOSS)

The FOSS **Earth History** unit emphasizes the use of knowledge and evidence to construct explanations about the processes and systems that have operated over geological time. Students investigate sedimentary rocks and fossils from the Grand Canyon to discover clues that reveal Earth's history. They study the processes that create sedimentary, igneous and metamorphic rocks and organize their observations and inferences into the Rock Cycle. Students use the knowledge and data gained from observing rocks to make inferences about organisms, environments, and events that occurred over Earth's history.

- **MS-ESS2-1. Develop a model to describe the cycling of Earth's materials and the flow of energy that drives this process**
- **MS-ESS2-2. Construct an explanation based on evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales.**
- **MS-ESS2-3: Analyze and interpret data on the distribution of fossils and rocks, continental shapes, and seafloor structures to provide evidence of the past plate motions.**
- **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-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.**

Forces in Motion/Physics/Gravity and Kinetic Energy (FOSS)

In the Foss **Gravity and Kinetic Energy** unit, students test motion at various speeds to explore acceleration and to learn about gravity. They use digital video analysis to calculate the acceleration of gravity. They observe patterns of collisions to discern how the variables of mass and speed affect energy, and they develop a model of force and energy transfer within systems based on Newton's three laws of motion.

At the end of this unit, students apply what they've learned to solve an engineering challenge to reduce the force transferred in a collision. Students leave this course with an understanding of force and energy that forms a solid foundation for high school and college physics. The driving question for the course is how can we explain the motion of objects?

- **MS-PS2-1. Apply Newton's Third Law to design a solution to a problem involving the motion of two colliding objects.**
- **MS-PS2-2. Plan an investigation to provide evidence that the change in an object's motion depends on the sum of the force on the object and the mass of the object.**
- **MS-PS2-3. Ask questions about data to determine the factors that affect the strength of electric and magnetic forces.**
- **MS-PS2-4. Develop a model to describe the cycling of water through Earth's systems driven by energy from the sun and the force of gravity.**
- **MS-PS3-1. Construct 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-PS3-2. 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-PS3-3. Apply scientific principles to design, construct, and test a device that either minimizes or maximizes thermal energy transfer.***
- **MS-PS3-4. Plan an investigation to determine the relationship among the energy transferred, the type of matter, the mass, and the change in the average kinetic energy of the particles as measured by the temperature of the sample.**
- **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.**