NOBLESVILLE SCHOOLS CURRICULUM

Science

8th Grade Units of Study

The Indiana Academic Standards for Grades K-12 Science are based on A Framework for K-12 Science Education (NRC, 2012) and Next Generation Science Standards (NGSS Lead States, 2013). The following conceptual shifts reflect what is new about these science standards. The K-12 Science Indiana Academic Standards:

- Reflect science as it is practiced and experienced in the real world;
- Build logically from kindergarten through grade 12;
- Focus on deeper understanding as well as application of content; and
- Integrate practices, crosscutting concepts, and core ideas.
  (Indiana Dept of Education)

These shifts in the K-12 Science Indiana Academic Standards means students are not just learning science facts—they are learning to think, talk, and act like scientists.

What Science Looks Like in Middle School

In Noblesville, students in grades 6-8 use high-quality, hands-on units from OpenSciEd, a nationally recognized science program designed to actively engage students in the process of doing science. Our units are centered around big, real-world questions that spark curiosity. In each unit, students investigate real phenomena, collect and analyze data, and use models to explain their ideas. Instruction is active, collaborative, and grounded in evidence-based thinking.

Why the Units Are Taught in This Order

The Indiana standards provide a clear list of science concepts to be mastered by 8th grade. In Noblesville, we intentionally follow the instructional sequence developed by OpenSciEd, with some careful rearranging in order to maintain each grade level's standards as much as possible. This sequence is based on how students best build their understanding over time. In 8th grade science, students begin by learning how particles interact in chemical reactions, then apply that knowledge to understand how our bodies use food and oxygen for energy. They explore how traits are inherited through genes and how those traits vary within populations. Finally, they investigate how variation leads to natural selection and how scientists use evidence to understand common ancestry. *This progression helps students make deeper connections between concepts and supports stronger long-term understanding.*

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Unit Description	**Indiana 2023 Academic Standards** *Note: Standards with gray shading and an "E" are identified by the Indiana Department of Education as essential for mastery by the end of the grade level.*
Unit 1: Chemical Reactions and Matter **Essential Question:** *How can we make something new that was not there before?* Students start with an experience of observing and analyzing a bath bomb as it fizzes and eventually disappears in the water. Their observations and questions about what is going on drive learning that digs into a series of related phenomena as students draw models depicting what happens during chemical reactions. By the end of the unit, students have a firm grasp on how to model simple molecules, know what to look for to determine if chemical reactions have occurred, and apply their knowledge to chemical reactions to show how mass is conserved when atoms are rearranged. *This introductory unit also guides students through the classroom routines they will continue all year: Using a Driving Question Board to practice asking strong scientific questions, discussing concepts in a scientist circle, and drawing models to explain a scientific phenomenon.*	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-PS1-5: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-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.

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Unit Description	**Indiana 2023 Academic Standards** *Note: Standards with gray shading and an "E" are identified by the Indiana Department of Education as essential for mastery by the end of the grade level.*
Unit 2: Metabolic Reactions **Essential Question:** *How do things inside our bodies work together to make us feel the way they do?* This unit focuses on understanding how the human body processes food and uses its energy. It uses a case study of a girl named M'Kenna, who experiences symptoms like stomach pain and weight loss, to drive student investigations. Through this case, students explore metabolic reactions, how the body systems interact, and how food is transformed and used for energy and growth.	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-LS1-5:Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms. MS-LS1-3:Use arguments supported by evidence for how the body is a system of interacting subsystems composed of groups of cells. MS-LS1-7:Develop a model to describe how food is rearranged through chemical reactions forming new molecules that support growth and/or release energy as this matter moves through an organism.

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Unit 3: Matter Cycling and Photosynthesis **Essential Question:** *Where does food come from and where does it go next?* This unit focuses on how plants use photosynthesis to create food and how this matter is cycled through ecosystems. The unit explores the interconnectedness of living and non-living components, tracing the origin and destination of food within an ecosystem. Students investigate how plants convert carbon dioxide and water into glucose and oxygen using sunlight, and how this process is linked to the food we eat.	MS-LS1-2:Develop and use a model to describe the function of a cell as a whole and ways parts of cells contribute to the function. MS-LS1-6:Construct a scientific explanation based on evidence for the role of photosynthesis in the cycling of matter and flow of energy into and out of organisms. MS-PS1-3:Gather and make sense of information to describe that synthetic materials come from natural resources and impact society. MS-LS2-3: Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem.
Unit 4: Genetics **Essential Question:** *Why are living things different from one another?* This unit explores the topic of genetics, focusing on how traits are passed down and how genes and the environment influence the characteristics of living things. The unit uses the phenomenon of different sized muscles in cattle to engage students in investigating genetic and environmental factors that cause trait variations.	MS-LS1-2:Develop and use a model to describe the function of a cell as a whole and ways parts of cells contribute to the function. MS-LS1-5:Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms. MS-LS3-2:Develop and use a model to describe why asexual reproduction results in offspring with identical genetic information and sexual reproduction results in offspring with genetic variation.

Unit 5: Natural Selection and Common Ancestry **Essential Question:** *How could living things today be connected to the things that lived long ago?* At the beginning of this unit, students hear about the surprising fossil of an ancient penguin (nicknamed “Pedro”) in a podcast from the researchers who found and identified the fossil. Students analyze data about modern penguins and Pedro to develop initial explanations for how these penguins could be connected. They brainstorm about 1) Where did all the ancient penguins go? 2) Where did all the different species of modern penguins come from? and 3) What other organisms alive today might also be connected to organisms that lived long ago? After exploring variations in body structures and behaviors in modern penguins and ancient penguins, they also analyze data from ancient and modern species of horses, whales, and horseshoe crabs to see whether these organisms have similar patterns. Then, to figure out the cause of the changes they have observed in populations, students explore more recent cases of changing heritable trait distribution in populations and explain them by developing a model for natural selection.	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-LS1-4:Use argument based on empirical evidence and scientific reasoning to support an explanation for how characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants respectively. 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-LS4-6:Use mathematical representations to support explanations of how natural selection may lead to increases and decreases of specific traits in populations over time.

Please note: These 5 units are used across both schools. However, grade-level teacher teams at both middle schools in Noblesville have flexibility to add additional lessons, activities, and projects as time allows.