



Grade 7 Science - Unit 4 - Metabolic Reactions

Unit Focus

This unit on metabolic reactions is adapted from OpenSciEd and begins with students investigating a real case study of a middle school girl named M’Kenna, who visits her doctor with symptoms like trouble concentrating, headaches, stomach issues after eating, low energy, and unexplained weight loss—even though she seems to eat a healthy diet. Her case raises questions about what might be going wrong inside her body and why.

To figure this out, students examine evidence from M’Kenna’s case, including doctor’s notes, growth charts, endoscopy results, and microscope images. They also conduct lab experiments and use digital tools to learn how food moves through the body and is broken down, stored, and used. By working to explain M’Kenna’s symptoms, students uncover what happens to food after we eat it and how problems in body systems can lead to health issues.

Stage 1: Desired Results - Key Understandings

Standard(s)	Transfer	
Next Generation Science Standards Performance Expectations: Middle School Life Sciences - Use argument supported by evidence for how the body is a system of interacting subsystems composed of groups of cells. (MS-LS1-3) - Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms. (MS-LS1-5) - 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. (MSLS1-7) Performance Expectations: Middle School Physical Sciences - Develop models to describe the atomic composition of simple molecules and extended structures. (MS-PS1-1) - Analyze and interpret data on the properties of substances before and after the substances interact to determine if a chemical reaction has occurred. (MS-PS1-2)	<i>Students will be able to independently use their learning to...</i> T1 Analyze qualitative and quantitative data to interpret patterns, draw conclusions, and/or make predictions. T2 Make observations and ask questions to define a problem based on prior knowledge and curiosity that stimulates further exploration, analysis, and discovery. T3 Use the scientific process to generate evidence that addresses the original questions.	
	Meaning	
	Understanding(s)	Essential Question(s)
	<i>Students will understand that...</i> U1 In multicellular organisms cells, work together in groups to form tissues and organs with specific functions to ensure survival. U2 Energy, in everyday life, typically refers to the conversion of stored energy into a desired form for practical use. U3 In a chemical reaction, the particles that make up the original substances can be regrouped into different substances. These new substances may have different properties than the original substances. U4 Substances can be identified by their physical and chemical properties. U5 Substances can be identified by their physical and chemical properties. U6 All living things have basic needs in order to survive and grow. U7 Cells have organelles and other structures that help them survive, grow, and meet their needs. U8 In multicellular organisms cells work together in groups to form tissues and organs with specific functions. U9 Within every organism, food is broken down through a series of chemical reactions that release energy. U10 Scientists examine evidence to formulate interesting questions and solve problems.	<i>Students will keep considering...</i> Q1 How do the structures and interactions of cells within the human body work together as a system to support health and function? Q2 What evidence shows that a chemical reaction has occurred when food is broken down and used by the body? Q3 How do atoms and molecules from the food we eat get transformed into energy and matter our bodies can use to grow and function?

Stage 1: Desired Results - Key Understandings

Madison Public Schools Profile of a Graduate

- Analyzing: Examining information/data/evidence from multiple sources to identify possible underlying assumptions, patterns, and relationships in order to make inferences. (POG.1.2)

U11 Conclusions can only be as strong as the quality of the evidence and the relevancy to the original question or problem.
U12 In a chemical reaction atoms can be rearranged and new substances with new properties are created.
U13 Matter is made up of different types of atoms which can combine to form molecules. (In MS discussions are not to include types of bonds or valence electrons.)
U14 All living things have different structures and behaviors that help them survive, grow, and meet their needs.

Acquisition of Knowledge and Skill

Knowledge

Students will know...

K1 Body systems (e.g., circulatory, respiratory, and digestive) work together to deliver molecules (like oxygen and glucose) to cells.
K2 All matter is made of atoms, which combine to form molecules. Molecules can be simple (e.g., glucose) or extended structures (e.g. starch)
K3 Organisms break down food through chemical reactions to release energy or build new molecules.
K4 Within individual organisms, food moves through a series of chemical reactions in which it is broken down and rearranged to form new molecules, to support growth, or to release energy.
K5 The energy released from food is used for body functions, movement, and maintaining internal systems.
K6 The digestive system breaks down food into smaller molecules (e.g., glucose and amino acids) that can be absorbed and transported to cells.
K7 The respiratory system supplies oxygen to the body and removes carbon dioxide as a waste product.
K8 The circulatory system transports molecules like oxygen and glucose to cells and carries away waste products.
K9 Inside cells, a chemical reaction (cellular respiration) rearranges glucose and oxygen molecules into carbon dioxide and water, releasing energy.
K10 The energy released during metabolic reactions is used by cells to perform functions and build new molecules needed for growth and repair.
K11 Symptoms of illness (like fatigue or muscle loss) can be explained by disruptions in the flow of molecules or energy in the body's systems.
K12 Vocabulary: circulatory (cardiovascular system), blood, respiration (respiratory system), excretion, absorption. kidneys, digestion, small and large intestine, carbohydrates, glucose, proteins, amino acids, fatty acids, fats, villi, microvilli, oxygen, carbon dioxide, cellular respiration, esophagus, stomach, glucose, starch, enzyme, cells, tissues, organs, organ system, organism, fiber, complex carbohydrate, simple, saliva, amylase, celiac disease, organelle, energy, chemical energy, ATP

Skill(s)

Students will be skilled at...

S1 Synthesizing and applying information to determine how the body systems (circulatory, respiratory, digestion and excretory) work together to maintain homeostasis
S2 Using arguments supported by evidence for how the body is a system of interacting sub-systems composed of groups of cells.
S3 Using scientific reasoning and data to support claims about how body systems interact and cause health issues.
S4 Connecting how the structure of molecules relates to energy transfer and matter cycling in organisms.