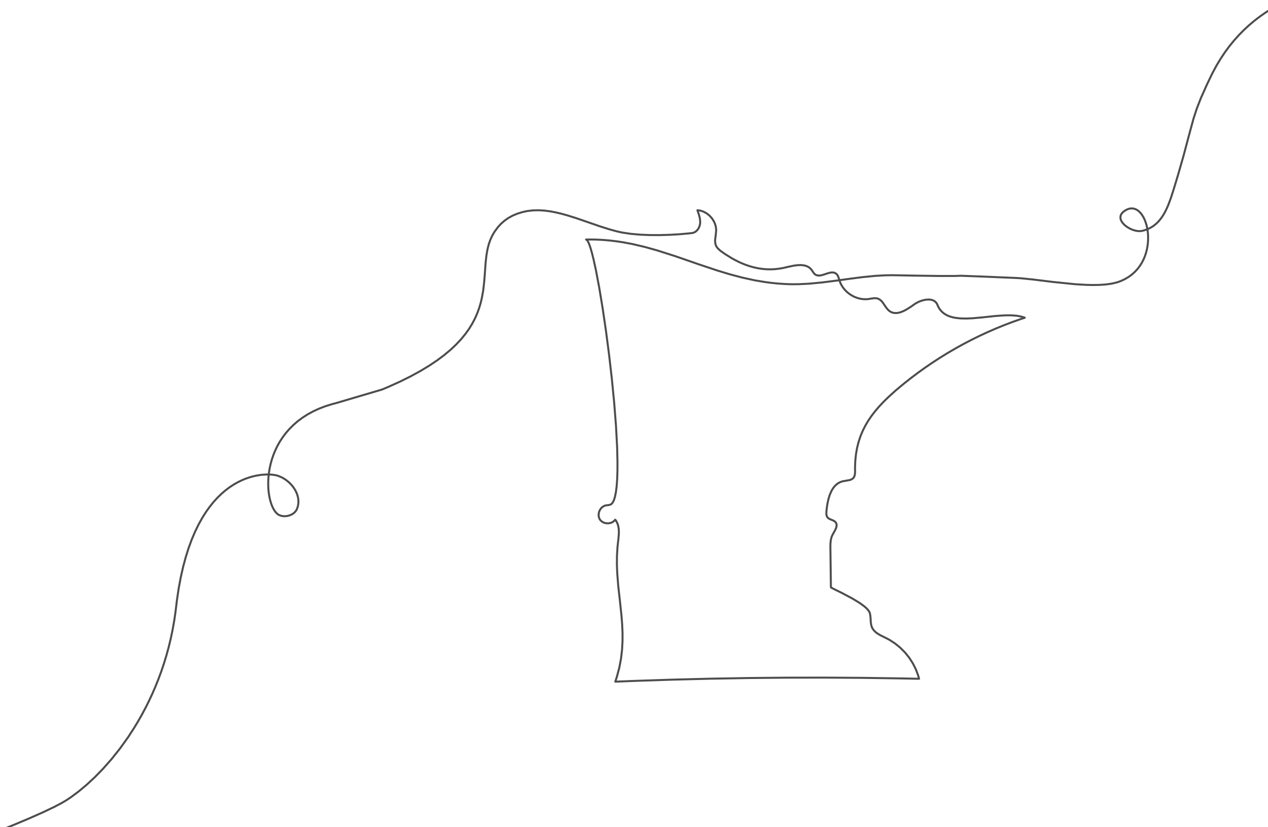
Amplify Science

Grades 6–8

MINNESOTA STATE BENCHMARKS

Performance expectation alignment

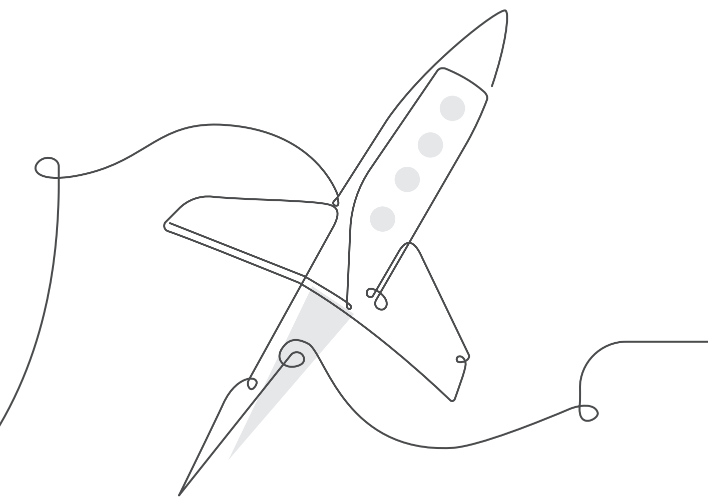


authored by THE LAWRENCE HALL OF SCIENCE
UNIVERSITY OF CALIFORNIA, BERKELEY

Grades 6-8 performance expectation alignment

The Amplify Science curriculum progressively builds students' abilities through an instructional sequence that prepares them for state testing. In the program, learning is centered around anchoring phenomena designed to give students an opportunity to dive deeply into certain core ideas while also drawing from or applying others. In organizing the Amplify Science curriculum, we carefully sequenced these ideas within each grade level to support the development of deep and coherent understanding.

The units in the course are designed and sequenced to build students' expertise with the grade-level core ideas while simultaneously considering the dimensions of grade-level language development, as well as physical and social and emotional development. The following pages provide a sequence of the Minnesota State Science Standards that students will encounter across the Amplify Science curriculum as they build their knowledge.



Amplify.

THE LAWRENCE HALL OF SCIENCE
UNIVERSITY OF CALIFORNIA, BERKELEY

6th grade: Earth Science

Minnesota state benchmark	Summary	Amplify units that focally address performance expectation	Amplify units that additionally address performance expectation
6E.1.1.1.1	Ask questions that arise from observations of patterns in the movement of night sky objects to test the limitations of a solar system model. (P: 1, CC: 1, CI: ESS1) Emphasis is on students questioning the limitations of their own models and questioning the kinds of revisions needed to account for new data. Examples of observations may include the student's own observations or observations made by others. Examples of night sky objects include the moon, constellations, and planets.	Earth, Moon, and Sun	
6E.1.1.1.2	Ask questions to examine an interpretation about the relative ages of different rock layers within a sequence of several rock layers. (P: 1, CC: 1, CI: ESS1) Emphasis is on the interpretation of rock layers using geologic principles like superposition and cross-cutting relationships.	Plate Motion	Earth, Moon, and Sun
6E.1.1.1.3	Ask questions to clarify evidence of the factors that have caused the rise in global temperatures over the past century. (P: 1, CC: 7, CI: ESS3) Emphasis is on the major role that human activities play in causing the rise in global temperatures. Examples of factors include human activities (such as fossil fuel combustion, cement production, and agricultural activity) and natural processes (such as changes in incoming solar radiation or volcanic activity). Examples of evidence can include tables, graphs, and maps of global and regional temperatures, atmospheric levels of gases such as carbon dioxide and methane, and the rates of human activities.	Earth's Changing Climate	
6E.1.2.1.1	Collect data and use digital data analysis tools to identify patterns to provide evidence for how the motions and complex interactions of air masses result in changes in weather conditions.** (P: 3, CC: 2, CI: ESS2) Emphasis is on how weather at a fixed location changes in response to moving air masses and to interactions at frontal boundaries between air masses. Examples of weather data may include temperature, air pressure, precipitation, and wind. Examples of data analysis may include weather maps, diagrams, and visualizations or may be obtained through laboratory experiments (such as with condensation).	Weather Patterns	

Minnesota state benchmark	Summary	Amplify units that focally address performance expectation	Amplify units that additionally address performance expectation
6E.2.1.1.1	Analyze and interpret data to determine similarities and differences among features and processes occurring on solar system objects. (P: 4, CC: 3, CI: ESS1) Examples of objects may include moons, planets, comets or asteroids. Example features may include characteristics of an object's atmosphere, surface or interior. Examples of processes may include erosion, deposition, cratering, or volcanism.	Geology on Mars	Plate Motion Earth's Changing Climate Weather Patterns
6E.2.1.1.2	Analyze and interpret data on the distribution of fossils, rocks, continental shapes, and seafloor structures to provide evidence of past plate motions. (P: 4, CC: 1, CI: ESS2) Examples of data may include similarities of rock and fossil types on different continents, the shapes of the continents (including the continental shelves), and the locations of ocean floor features such as ridges and trenches.	Plate Motion	
6E.2.1.1.3	Analyze and interpret data on natural hazards to forecast future catastrophic events and inform the development of technologies to mitigate their effects.* (P: 4, CC: 1, CI: ESS3, ETS1) Examples of natural hazards may be taken from interior processes (such as earthquakes and volcanic eruptions), surface processes (such as mass wasting and tsunamis), or severe weather events. Examples of data may include the locations, magnitudes, and frequencies of the natural hazards. Examples of technologies may include building tornado shelters or barriers to protect from flooding.	Engineering Internship: Plate Motion	Plate Motion Ocean, Atmosphere, and Climate
6E.3.1.1.1	Develop and use scale models of solar system objects to describe the sizes of objects, the location of objects, and the motion of the objects; and include the role that gravity and inertia play in controlling that motion. (P: 2, CC: 3, CI: ESS1) Emphasis is on the regularity of the motion and accounting for Earth-based visual observations of the motion of these objects in our sky. Emphasis is also on recognizing the limitations of any of the models. Examples may include physical models (such as the analogy of distance along a football field or computer visualizations of orbits) or conceptual models (such as mathematical proportions relative to the size of familiar objects such as students' school or state). Not included are Kepler's Laws and retrograde motion of planets.	Earth, Moon, and Sun	Geology on Mars

Minnesota state benchmark	Summary	Amplify units that focally address performance expectation	Amplify units that additionally address performance expectation
6E.3.1.1.2	Develop a model, based on observational evidence, to describe the cycling and movement of Earth's rock material and the energy that drives these processes. (P: 2, CC: 5, CI: ESS2) Emphasis of the practice is on using observations of processes like weathering and erosion of soil and rock, deposition of sediment, and crystallization of lava to inform model development. Emphasis of the core idea is on how these processes operate over geologic time to form rocks and minerals through the cycling of Earth's materials. Examples of models may be conceptual or physical.	Rock Transformations	Plate Motion Earth's Changing Climate
6E.3.1.1.3	Develop a model, based on observational and experimental evidence, to describe the cycling of water through Earth's systems driven by energy from the sun and the force of gravity. (P: 2, CC: 5, CI: ESS2) Emphasis of the practice is on developing a way to represent the mechanisms of water changing state, the global movements of water and energy, and on how the observational and experimental evidence supports the model. Examples of models may be conceptual or physical.	Weather Patterns	Plate Motion Earth's Changing Climate
6E.3.2.1.1	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. (P: 6, CC: 3, CI: ESS1) Emphasis is on how analyses of rock formations and the fossils they contain are used to establish relative ages of major events in Earth's history. Examples of major events may include the evolution or extinction of particular organisms, the formation of mountain chains, and the formation of ocean basins. Not included is using radioactive decay to age date rocks.	Plate Motion	Earth, Moon, and Sun
6E.3.2.1.2	Construct a scientific explanation based on evidence for how the uneven distribution of Earth's mineral, energy, or groundwater resources is the result of past geological processes. (P: 6, CC: 2, CI: ESS3) Emphasis is on how these resources are limited and typically non-renewable on a human time frame. Examples of uneven distribution of resources may include petroleum (like in the North Dakota Bakken Shale), metal ores (like iron in the rocks of Minnesota's Iron Range), or groundwater in the different regions of Minnesota.	Rock Transformations	Plate Motion Ocean, Atmosphere, and Climate

Minnesota state benchmark	Summary	Amplify units that focally address performance expectation	Amplify units that additionally address performance expectation
6E.3.2.1.3	Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.* (P: 6, CC: 2, CI: ESS3, ETS1) Emphasis of the practice is on applying scientific principles about Earth's natural processes (like how water moves through the ground and air) to designing solutions to problems caused by human activity. Emphasis of the core idea is on how human activity impacts Earth's environments. Examples of parts of the design process may include assessing the kinds of solutions that are feasible, and designing and evaluating solutions that may reduce those impacts. Examples of human activities that impact the environment may include withdrawing too much water from aquifers, altering stream flow by building dams or levees, increasing runoff caused by impermeable surfaces like parking lots, or adding undesirable materials to the air, water, or land.	Engineering Internship: Earth's Changing Climate	Earth's Changing Climate Ocean, Atmosphere, and Climate
6E.4.1.1.1	Construct an argument, supported by evidence, for how geoscience processes have changed Earth's surface at varying time and spatial scales. (P: 7, CC: 3, CI: ESS2) Emphasis is on how processes like erosion, deposition, mountain building, and volcanism affect the surface of Earth. Some processes, like mountain building, take a long time. Other processes, like landslides, happen quickly. Examples may include how weathering, erosion, and glacial activity have shaped the surface of Minnesota.	Rock Transformations	Plate Motion Earth, Moon, and Sun
6E.4.2.2.1	Communicate how a series of models, including those used by Minnesota American Indian Tribes and communities and other cultures, are used to explain how motion in the Earth-Sun-Moon system causes the cyclic patterns of lunar phases, eclipses and seasons. (P: 8, CC: 1, CI: ESS1) Examples of cultures may include those within the local context of the learning community and within the context of Minnesota. Emphasis is on students questioning the limitations of their models and revising them to account for new observations. Models may be physical, graphical or conceptual.	Earth, Moon, and Sun	Earth's Changing Climate Geology on Mars

7th grade: Life Science

Minnesota state benchmark	Summary	Amplify units that focally address performance expectation	Amplify units that additionally address performance expectation
7L.1.1.1.1	Ask questions about the processes and outcomes of various methods of communication between cells of multicellular organisms. (P: 1, CC: 6, CI: LS1) Examples of questions about processes and outcomes may include questions about disruptions to normal communication processes in the human body, such as in cancer, diabetes, paralysis, or other disorders.	Metabolism	Traits and Reproduction
7L.1.1.1.2	Ask questions that arise from careful observations of phenomena or models to clarify and or seek additional information about how changes in genes can affect organisms. (P: 1, CC: 6, CI: LS3) Examples of changes may include neutral, harmful, or beneficial effects to the structure and function of the organism.	Traits and Reproduction	Natural Selection Evolutionary History
7L.1.2.1.1	Conduct an investigation to provide evidence that living things are made of cells; either one cell or many different numbers and types of cells. (P: 3, CC: 3, CI: LS1) Emphasis is on developing evidence that living things are made of cells, distinguishing between living and non-living things, and understanding that living things may be made of one cell or of many and varied cells.	Microbiome	Populations and Resources Traits and Reproductions
7L.2.1.1.1	Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem.** (P: 4, CC: 2, CI: LS2) Emphasis is on cause and effect relationships between resources and growth of individual organisms and the number or organisms in ecosystems during periods of abundant and scarce resources. Examples may include populations of Minnesota deer, moose, wolf, scavengers, or aquatic populations in Lake Superior, or algal blooms in lakes and ponds. Examples of evidence may include the use of flow charts to organize and sequence the algorithm, and to show relationships.	Populations and Resources	Natural Selection
7L.2.1.1.2	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. (P: 4, CC: 1, CI: LS4) Emphasis is on finding patterns of changes in the level of complexity of anatomical structures in organisms and the chronological order of fossil appearance in the rock layers.	Evolutionary History	Natural Selection Matter and Energy in Ecosystems

Minnesota state benchmark	Summary	Amplify units that focally address performance expectation	Amplify units that additionally address performance expectation
7L.2.1.1.3	Analyze visual data to compare patterns of similarities in the embryological development across multiple species to identify relationships not evident in the fully formed anatomy.** (P: 4, CC: 1, CI: LS4) Emphasis is on inferring general patterns of relatedness among embryos of different organisms by comparing their macroscopic appearances on diagrams or pictures.	Evolutionary History	
7L.2.2.1.1	Use an algorithm to explain how natural selection may lead to increases and decreases of specific traits in populations.** (P: 5, CC: 2, CI: LS4) Emphasis is on using proportional reasoning to develop mathematical models, probability statements, or simulations to support explanations of trends in changes to populations over time.	Natural Selection	Engineering Internship: Natural Selection Evolutionary History
7L.3.1.1.1	Develop and use a model to describe the function of a cell as a whole and describe the way cell parts contribute to the cell's function. (P: 2, CC: 6, CI: LS1) Emphasis is on the cell functioning as a whole system and the primary role of identified parts of the cell, specifically the nucleus, chloroplasts, mitochondria, cell membrane, and cell wall.	Microbiome	Metabolism Evolutionary History Populations and Resources
7L.3.1.1.2	Develop and use 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. (P: 2, CC: 5, CI: LS1) Emphasis is on describing that molecules are broken apart and put back together and that in this process, energy is released. Examples may include models of sugar breakdown into molecules of glucose that power our bodies, or protein breakdown into amino acids that are later reassembled to create body structures.	Matter and Energy in Ecosystems	Engineering Internship: Metabolism Metabolism
7L.3.1.1.3	Develop and use a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem. (P: 2, CC: 5, CI: LS2) Emphasis is on describing the conservation of matter and flow of energy into and out of various ecosystems.	Matter and Energy in Ecosystems	Populations and Resources

Minnesota state benchmark	Summary	Amplify units that focally address performance expectation	Amplify units that additionally address performance expectation
7L.3.1.1.4	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. (P: 2, CC: 2, CI: LS3) Emphasis is on using models, such as Punnett squares, diagrams, and simulations to describe the cause and effect relationship of gene transmission from parent(s) to offspring and resulting genetic variations.	Traits and Reproduction	Evolutionary History Populations and Resources Natural Selection
7L.3.2.1.1	Construct an explanation based on evidence for how environmental and genetic factors influence the growth of organisms and/or populations. (P: 6, CC: 2, CI: LS1, ETS2) Examples of environmental factors may include local environmental conditions such as availability of food, light, space, and water. Examples of genetic factors may include large breed cattle and species of grass affecting growth of organisms. Examples of evidence may include drought decreasing plant growth, fertilizer increasing plant growth, different varieties of plant seeds growing at different rates in different conditions, and fish growing larger in large ponds than they do in small ponds. Examples of human activity may include agricultural practices, phosphorus and nitrogen loading in lakes, hybridization and breeding practices.	Traits and Reproduction	Natural Selection
7L.3.2.1.2	Construct an explanation based on evidence for the role of photosynthesis in the cycling of matter and flow of energy into and out of organisms. (P: 6, CC: 2, CI: LS1) Emphasis of the core idea is on plants and algae using energy from light to make sugars (food for themselves and as an energy source for other organisms) from carbon dioxide (air) and water and, in the process, releasing oxygen.	Matter and Energy in Ecosystems	Evolutionary History
7L.3.2.1.3	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. (P: 6, CC: 1, CI: LS4) Emphasis is on explanations of the evolutionary relationships among organisms in terms of similarities or differences in the gross appearance of anatomical structures.	Evolutionary History	Natural Selection

7TH GRADE: LIFE SCIENCE

Minnesota state benchmark	Summary	Amplify units that focally address performance expectation	Amplify units that additionally address performance expectation
7L.3.2.1.4	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. (P: 6, CC: 2, CI: LS4) Emphasis is on using simple probability statements and proportional reasoning to construct explanations.	Natural Selection	Populations and Resources
7L.4.1.1.1	Support or refute an explanation by arguing from evidence for how the body is a system of interacting subsystems composed of groups of cells. (P: 7, CC: 4, CI: LS1) Emphasis is on the conceptual understanding that cells form tissues and tissues form organs specialized for particular body functions. Examples may include arguments that deal with the interaction of subsystems within a system and the normal functioning of those systems.	Metabolism	Traits and Reproduction
7L.4.1.1.2	Support or refute an explanation by arguing from evidence and scientific reasoning for how animal behavior and plant structures affect the probability of successful reproduction. (P: 7, CC: 2, CI: LS1) Examples of behaviors that affect the probability of animal reproduction may include nest building to protect young, herding of animals to protect young from predators, and vocalization and/or colorful plumage to attract mates for breeding. Examples of animal behaviors that affect the probability of plant reproduction may include transferring pollen or seeds, and creating conditions for seed germination and growth. Examples of plant structures may include bright flowers attracting butterflies that transfer pollen, flower nectar and odors that attract insects that transfer pollen, and hard shells on nuts that squirrels bury.	Traits and Reproduction	Populations and Resources Natural Selection
7L.4.1.2.1	Construct an argument supported by empirical evidence that changes in physical or biological components of an ecosystem affect populations.* (P: 7, CC: 7, CI: LS2) Emphasis is on recognizing patterns in data and making warranted inferences about changes in populations, and on evaluating empirical evidence supporting arguments about changes and/or impacts to ecosystems. Examples of physical components may include human-built structures like urban developments, or dams.	Populations and Resources	Matter and Energy in Ecosystems

Minnesota state benchmark	Summary	Amplify units that focally address performance expectation	Amplify units that additionally address performance expectation
7L.4.1.2.2	Evaluate competing design solutions for maintaining biodiversity or ecosystem services.* (P: 7, CC: 2, CI: LS2, ETS2) Emphasis is on evaluating a solution that reduces environmental harm while still benefiting humans. Examples of ecosystem services (natural processes within ecosystems that humans also benefit from) may include water purification as it cycles through Earth's systems, nutrient recycling, climate stabilization, decomposition of wastes, and pollination. Examples of design solution constraints may include scientific, economic, and social considerations.	Populations and Resources	Engineering Internship: Natural Selection Engineering Internship: Metabolism
7L.4.2.2.1	Gather multiple sources of information and communicate how Minnesota American Indian Tribes and communities and other cultures use knowledge to predict or interpret patterns of interactions among organisms across multiple ecosystems. (P: 8, CC: 1, CI: LS2, ETS2) Examples of cultures may include those within the local context of the learning community and within the context of Minnesota. Emphasis is on predicting consistent patterns of interactions in different ecosystems in terms of the relationships among and between organisms and abiotic components of ecosystems. Examples of types of interactions may include competition, predation, and mutualisms.	Populations and Resources	Natural Selection Evolutionary History

8th grade: Physical Science

Minnesota state benchmark	Summary	Amplify units that focally address performance expectation	Amplify units that additionally address performance expectation
8P.1.1.1.1	Ask questions about locations of common elements on the periodic table to note patterns in the properties of similarly grouped elements. (P: 1, CC: 1, CI: PS1) Emphasis is on the similar properties within columns of the periodic table. Examples of questions students may think to ask include how the properties of elements in a column are similar or different.	Chemical Reactions	
8P.1.1.1.2	Ask questions about data to determine the factors that affect the strength of electric and magnetic forces. (P: 1, CC: 2, CI: PS2) Examples of data may include the number of turns of wire in a coil, the strength of magnets, and the current through the wire and their effect on the speed of rotation in a simple motor.	Magnetic Fields	Force and Motion Thermal Energy
8P.1.2.1.1	Plan and conduct an investigation of changes in pure substances when thermal energy is added or removed and relate those changes to particle motion. (P: 3, CC: 2, CI: PS1) Emphasis is on qualitative molecular-level models of solids, liquids, and gases to show that adding or removing thermal energy increases or decreases kinetic energy of the particles until a change of state occurs.	Force and Motion	Phase Change Thermal Energy
8P.1.2.1.2	Plan and conduct 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. (P: 3, CC: 7, CI: PS2) Emphasis is on balanced (Newton's First Law) and unbalanced forces in a system, qualitative comparisons of forces, mass and changes in motion (Newton's Second Law), frame of reference, and specification of units.	Force and Motion	Thermal Energy Phase Change Magnetic Fields
8P.1.2.1.3	Conduct an investigation and evaluate the experimental design to provide evidence that fields exist between objects exerting forces on each other even though the objects are not in contact. (P: 3, CC: 2, CI: PS2) Examples of this phenomenon may include the interactions of magnets, electrically charged strips of tape, and electrically charged pith balls. Examples of investigations may include first-hand experiences or simulations.	Magnetic Fields	Force and Motion Thermal Energy

Minnesota state benchmark	Summary	Amplify units that focally address performance expectation	Amplify units that additionally address performance expectation
8P.1.2.1.4	Plan and conduct an investigation to determine how the temperature of a substance is affected by the transfer of energy, the amount of mass, and the type of matter. (P: 3, CC: 2, CI: PS 3) Emphasis is on conceptualizing temperature as the average kinetic energy of a substance's particles. Examples of investigations may include comparing final water temperatures after different masses of ice melt in equal volumes of water with the same initial temperature, and temperature changes of different materials with the same mass as they heat or cool in the environment.	Thermal Energy	Phase Change Engineering Internship: Phase Change
8P.2.1.1.1	Analyze and interpret data on the properties of substances before and after the substances interact to determine if a chemical reaction has occurred. (P: 4, CC: 1, CI: PS1) Examples of reactions may include burning sugar or steel wool, fat reacting with sodium hydroxide, and mixing zinc with hydrogen chloride. Examples of properties may include density, melting point, boiling point, solubility, flammability, and odor.	Chemical Reactions	Engineering Internship: Force and Motion
8P.2.1.1.2	Construct and interpret graphical displays of data to describe the relationship of kinetic energy to the mass and speed of an object. (P: 4, CC: 3, CI: PS3) Emphasis is on descriptive relationships between kinetic energy and mass separately from kinetic energy and speed. Examples may include riding a bicycle at different speeds, rolling different sizes of rocks downhill, and getting hit by a Wiffle ball versus a tennis ball.	Force and Motion	
8P.2.2.1.1	Use mathematical representations to describe a simple model for waves that includes how the amplitude of a wave is related to the energy in a wave. (P: 5, CC: 1, CI: PS4) Emphasis is on describing waves (standard repeating waves) with both qualitative and quantitative thinking. Not included is electromagnetic waves.	Light Waves	Engineering Internship: Force and Motion Thermal Energy Chemical Reactions

Minnesota state benchmark	Summary	Amplify units that focally address performance expectation	Amplify units that additionally address performance expectation
8P.2.2.1.2	Create a computer program to illustrate the transfer of energy within a system where energy changes form.** (P: 5, CC: 7, CI: PS3) Emphasis of the programming skills is the use of sequences, events and conditionals. Examples of a system may include a roller coaster, a pendulum, an electric water heater, and a solar electric collector.	Engineering Internship: Phase Change	Engineering Internship: Force and Motion Chemical Reactions Light Waves Harnessing Human Energy
8P.3.1.1.1	Develop models to describe the atomic composition of simple molecules and crystals. (P: 2, CC: 3, CI: PS1) Emphasis is on developing models of molecules that vary in complexity. Examples of simple molecules may include ammonia and methane. Examples of crystal structures may include sodium chloride or quartz, pyrite, or diamonds. Does not include valence electrons and bonding energy, discussing the ionic nature of subunits of complex structures, or a complete description of all individual atoms in a complex molecule or crystal structure.	Chemical Reactions	Phase Change
8P.3.1.1.2	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. (P: 2, CC: 5, CI: PS1) Emphasis is on the law of conservation of matter. Examples of models may include physical models, digital formats, or drawings, which represent atoms. Not included are atomic masses, balancing symbolic equations, or intermolecular forces.	Chemical Reactions	Phase Change
8P.3.1.1.3	Develop and revise 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. (P: 2, CC: 5, CI: PS3) Emphasis is on relative amounts of potential energy and not on calculations of potential energy. Examples of objects within systems interacting at varying distances may include: the Earth and either a roller coaster cart at varying positions on a hill or objects at varying heights on shelves, changing the direction/orientation of a magnet, and a balloon with static electrical charge being brought closer to a classmate's hair. Examples of models may include representations, diagrams, pictures, and written descriptions of systems.	Magnetic Fields	Force and Motion

Minnesota state benchmark	Summary	Amplify units that focally address performance expectation	Amplify units that additionally address performance expectation
8P.3.1.1.4	Develop and use a model to qualitatively describe that waves are reflected, absorbed, or transmitted through various materials. (P: 2, CC: 4, CI: PS4) Emphasis is on both light and mechanical waves. Examples of models may include drawings, simulations, a storyboard/diagram and written descriptions.	Light Waves	Magnetic Fields Force and Motion Phase Change Engineering Internship: Force and Motion Engineering Internship: Phase Change
8P.3.2.1.1	Construct an explanation based on evidence and scientific principles of a common phenomenon that can be explained by the motions of molecules. (P: 6, CC: 3, CI: PS1) Emphasis of the core idea is that the movement of small particles (atoms or molecules) can explain the behavior of macroscopic phenomena. Examples of phenomena may include expansion of balloons, diffusion of odors, and pressure changes in gases due to heating and cooling.	Phase Change	
8P.3.2.2.1	Construct, test and modify a device that either releases or absorbs thermal energy by chemical processes.* (P: 6, CC: 5, CI: PS1, ETS1) Emphasis is on the design, controlling the transfer of energy to the environment, and modification of a device using factors such as type and concentration of a substance. Examples of chemical reactions include dissolving ammonium chloride or calcium chloride in water.	Engineering Internship: Phase Change	Engineering Internship: Force and Motion Chemical Reactions Light Waves Harnessing Human Energy
8P.3.2.2.2	Design a solution to a problem involving the motion of two colliding objects using Newton's Third Law.* (P: 6, CC: 4, CI: PS2, ETS1) Examples of practical problems may include the impact of one-dimensional collisions between two cars, between a car and stationary objects, and between a meteor and a space vehicle.	Force and Motion	Engineering Internship: Force and Motion Engineering Internship: Phase Change Magnetic Fields

Minnesota state benchmark	Summary	Amplify units that focally address performance expectation	Amplify units that additionally address performance expectation
8P.3.2.2.3	Design, construct, and test a device that either minimizes or maximizes thermal energy transfer.* (P: 6, CC: 5, CI: PS3, ETS1) Emphasis is on using scientific principles to design the device. Examples of devices may include an insulated box, a solar cooker, and a foam cup.	Thermal Energy	Engineering Internship: Force and Motion Engineering Internship: Phase Change Light Waves Harnessing Human Energy
8P.4.1.1.1	Construct and present arguments using evidence to support the claim that gravitational interactions are attractive and depend on the masses of interacting objects. (P: 7, CC: 3, CI: PS2) Examples of evidence for arguments may include data generated from simulations or digital tools; and charts displaying mass, strength of interaction, distance from the sun, and orbital periods of objects within the solar system. Not included are Newton's Law of Gravitation or Kepler's Laws.	Magnetic Fields	Force and Motion
8P.4.1.1.2	Compare and evaluate evidence to support the claim that when the kinetic energy of an object changes, energy is transferred to or from the object. (P: 7, CC: 5, CI: PS3) Examples of empirical evidence used in the students' arguments may include the temperature or motion of an object before and after an energy transfer.	Harnessing Human Energy	Force and Motion Magnetic Fields Thermal Energy
8P.4.2.1.1	Gather and evaluate information from multiple sources to describe that synthetic materials come from natural resources and impact society. (P: 8, CC: 6, CI: PS1) Emphasis of the practice is to synthesize information from multiple appropriate sources and assess the credibility, accuracy and possible bias of each publication. Emphasis is on natural resources that undergo a chemical process to form the synthetic material. Examples of new materials may include plastic, medicines, foods, and alternative fuels.	Chemical Reactions	Harnessing Human Energy Engineering Internship: Force and Motion Engineering Internship: Phase Change Magnetic Fields

Minnesota state benchmark	Summary	Amplify units that focally address performance expectation	Amplify units that additionally address performance expectation
8P.4.2.1.2	Integrate qualitative scientific and technical information to support the claim that digitized signals are a more reliable way to encode and transmit information than analog signals.** (P: 8, CC: 6, CI: PS4) Emphasis of the practice is on using information to support and clarify claims. Emphasis of the core idea is on understanding that waves (encoded both analog and digitally) can be used for communication purposes. Examples of encoding and transmitting information may include using fiber optic cable to transmit light pulses, radio wave pulses in Wi-Fi devices, and conversion of stored binary patterns to make sound or text on a computer screen.	Light Waves	Chemical Reactions Engineering Internship: Force and Motion

Middle school curriculum course structure

Domain Model

Earth and Space Science

- Launch: Geology on Mars
- Plate Motion
- Engineering Internship: Plate Motion
- Rock Transformations
- Earth, Moon, and Sun
- Ocean, Atmosphere, and Climate
- Weather Patterns
- Earth's Changing Climate
- Engineering Internship: Earth's Changing Climate

Life Science

- Launch: Microbiome
- Metabolism
- Engineering Internship: Metabolism
- Traits and Reproduction
- Populations and Resources
- Matter and Energy in Ecosystems
- Natural Selection
- Engineering Internship: Natural Selection
- Evolutionary History

Physical Science

- Launch: Harnessing Human Energy
- Force and Motion
- Engineering Internship: Force and Motion
- Magnetic Fields
- Thermal Energy
- Phase Change
- Engineering Internship: Phase Change
- Chemical Reactions
- Light Waves

For more information on Amplify Science, visit **amplify.com/science** or contact your Minnesota Account Executive listed below.

Peter Brenner | pbrenner@amplify.com | (608) 224-9331

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