Unit 1 - Physical Science - Atoms, Elements, The Periodic Table and Simple Molecules

Content Area: **Science**
Course(s):
Time Period: **1st Marking Period**
Length: **7-9 weeks**
Status: **Not Published**

Summary of the Unit

How is it that everything is made of stardust? Students build understandings of what occurs at the atomic and molecular scale. Students apply their understanding that pure substances have characteristic properties and are made from a single type of atom or molecule. The crosscutting concepts of cause and effect, scale, proportion and quantity, structure and function, interdependence of science, engineering, and technology, and the influence of science, engineering and technology on society and the natural world provide a framework for understanding the disciplinary core ideas. Students demonstrate grade appropriate proficiency in developing and using models, and obtaining, evaluating, and communicating information. Students are also expected to use the scientific and engineering practices to demonstrate understanding of the core ideas.

Enduring Understandings

- Substances are made from different types of atoms. Atoms are the basic units of matter.
- Substances combine with one another in various ways.
- Molecules are two or more atoms joined together.
- Atoms form molecules that range in size from two to thousands of atoms.
- Molecules can be simple or very complex.
- Solids may be formed from molecules, or they may be extended structures with repeating subunits (e.g., crystals).
- Each pure substance has characteristic physical and chemical properties (for any bulk quantity under given conditions) that can be used to identify it. Substances are made from different types of atoms.
- Atoms are the basic units of matter.
- Substances react chemically in characteristic ways.
- All matter is made of particles called atoms that are too small to be seen without special magnification. For example, a gold ring can be broken * into smaller and smaller pieces until the pieces are no longer visible All matter is made of different combinations of about 100 pure substances called elements.
- The smallest particle of an element is an atom. Iron is an example of an element that is made up of only iron atoms. Each element has distinct characteristic properties. The Periodic Table of Elements is used to organize elements based on properties such as their reactivity, state of matter, conductivity or density.
- Element names are represented by letter symbols on the Periodic Table.
- Some elements, such as iron (Fe) and aluminum (Al), are classified as metals because they have similar properties. Individual metallic elements have distinct characteristic properties (for example, sodium (Na) is a light, soft metal that is nonmagnetic, while iron is a magnetic metal that is denser than sodium and aluminum). Some elements, such as carbon (C), hydrogen (H), oxygen (O) and chlorine (Cl), are classified as nonmetals. Carbon is a nonmetal that occurs in several different forms (graphite,

diamond, and coal), each of which has distinct properties. Hydrogen and oxygen are nonmetals that are similar in that they are both gases; however, each gas has distinct characteristic properties such as color and odor.

- Atoms can combine chemically to make a molecule of a new substance with new properties called a compound.
- A molecule is the smallest part of a compound and is made of atoms of different elements in specific amounts. Unlike mixtures, compounds cannot be separated using the physical properties of the component elements.
- Compounds have different properties than the individual elements of which they are made. For example, table salt (NaCl) is a compound with different characteristic properties than the elements sodium and chlorine from which it is made; water (H20) is a compound with different characteristic properties than the elements hydrogen and oxygen from which it is made.
- Different amounts of the same elements can produce compounds with different properties (e.g., water (H20) and hydrogen peroxide (H202) In a chemical reaction, atoms can rearrange to form different molecules of new compounds.
- During photosynthesis, carbon dioxide (CO2) is taken in by green plants and combined with water (H2O). The carbon, hydrogen and oxygen atoms rearrange to make two new compounds: glucose (made of atoms of carbon, oxygen, and hydrogen) and oxygen gas (made of atoms of oxygen).

Essential Questions

- What is the universe made of?
- How can particles combine to produce a substance with different properties?
- What happens when new materials are formed? What stays the same and what changes? How do properties provide evidence of the identity of materials?
- How do changes affect the properties, identities, and interactions of matter?
- Is it possible to tell if two substances mixed or if they reacted with each other?
- How does the arrangement of the Periodic Table describe the properties of an element?
- How are the properties of elements different from the properties of compounds?
- How have chemical reactions impacted human society?
- How does the structure of matter affect the properties and uses of materials?

Summative Assessment and/or Summative Criteria

- Observable features of the student performance by the end of the course:
- Components of the model - a Students develop models of atomic composition of simple molecules and extended structures that vary in complexity. In the models, students identify the relevant components, including:i. Individual atoms. ii. Molecules. iii. Extended structures with repeating subunits. iv. Substances (e.g., solids, liquids, and gases at the macro level).
- Relationships - a In the model, students describe relationships between components, including: i. Individual atoms, from two to thousands, combine to form molecules, which can be made up of the same type or different types of atom. ii. Some molecules can connect to each other iii. In some molecules, the same atoms of different elements repeat; in other molecules, the same atom of a single element repeats.
- Connections - a Students use models to describe that:i. Pure substances are made up of a bulk quantity of individual atoms or molecules. Each pure substance is made up of one of the following:

- 1. Individual atoms of the same type that are connected to form extended structures.
- 2. Individual atoms of different types that repeat to form extended structures (e.g., sodium chloride).
- 3. Individual atoms that are not attracted to each other (e.g., helium).
- 4. Molecules of different types of atoms that are not attracted to each other (e.g., carbon dioxide).
- 5. Molecules of different types of atoms that are attracted to each other to form extended structures (e.g., sugar, nylon).
- 6. Molecules of the same type of atom that are not attracted to each other (e.g., oxygen). ii. Students use the models to describe how the behavior of bulk substances depends on their structures at atomic and molecular levels, which are too small to see.

Resources

- Mosa Mack Unit: Atoms & Molecules
- Better Lesson: Adopt and Element Project
- Build an Atom Online Simulator
- Kessler Stations: Atoms
- All about Me: Periodic Table Scavenger Hunt
- Periodic Table Battleship
- Elements Matching Game
- Design an Element Superhero
- Mystery Element Cards
- Build a Molecule: Phet Simulation

Resources for Implementing Three-Dimensional Science Assessments

As educators, districts, and states implement new science standards, they are faced with creating and implementing new three-dimensional assessments to help monitor student progress and provide feedback to students, parents, and teachers. Achieve has worked with teachers, states, and researchers to develop a variety of tools and resources to help design and implement assessments that are worth students' and teachers' time.

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Unit Plan w/ Associated Standards (Chart)

Topics/Timelines	Objectives	Activitie
		Kessler
	Identify atoms at the basic building block of all matter.	Mosa M
Atoms & Atomic Structure/2-3 weeks	Define electrons, protons, and neutrons.	Build an
	Review that all matter has basic properties such as mass, volume and density.	BrainPO Measuri
		Discover Atomic Mosa M
	Define an element as a substance whose atoms all have the same struture.	Better L Project
Periodic Table of Elements/2-3 weeks	Identify parts of the period table and explain how elements are systematically arranged and orgniazed.	All abou Scaveng
		Periodic
		BrainPO

	Define a molecule as a combination of elements in a specific arrangement.	Discover Labs: Pe Mosa M
Molecules & Formulas/2-3 weeks	Explain how certain atoms are attracted to one another and form different bonds based on the number of protons and electrons in their atomic structure.	BrainPO Equation
	Write simple formulas and illustrate the atomic arrangement.	Discove Labs: M

MS-PS1-1. Develop models to describe the atomic composition of simple molecules and extended structures. [Clarification Statement: Emphasis is on developing models of molecules that vary in complexity. Examples of simple molecules could include ammonia and methanol. Examples of extended structures could include sodium chloride or diamonds. Examples of molecular-level models could include drawings, 3D ball and stick structures, or computer representations showing different molecules with different types of atoms.] [Assessment Boundary: Assessment does not include valence electrons and bonding energy, discussing the ionic nature of subunits of complex structures, or a complete depiction of all individual atoms in a complex molecule or extended structure.]

MS-PS1-3. Gather and make sense of information to describe that synthetic materials come from natural resources and impact society. [Clarification Statement: Emphasis is on natural resources that undergo a chemical process to form the synthetic material. Examples of new materials could include new medicine, foods, and alternative fuels.] [Assessment Boundary: Assessment is limited to qualitative information.]

PS1.A: Structure and Properties of Matter Substances are made from different types of atoms, which combine with one another in various ways. Atoms form molecules that range in size from two to thousands of atoms. (MS-PS1-1)

Each pure substance has characteristic physical and chemical properties (for any bulk quantity under given conditions) that can be used to identify it. (MS-PS1-2),(MS-PS1-3)

PS1.B: Chemical Reactions Substances react chemically in characteristic ways. In a chemical

process, the atoms that make up the original substances are regrouped into different molecules, and these new substances have different properties from those of the reactants. (MS-PS1-2),(MS-PS1-3),(MS-PS1-5)

Developing and Using Models Modeling in 6–8 builds on K–5 and progresses to developing, using and revising models to describe, test, and predict more abstract phenomena and design systems. Develop a model to predict and/or describe phenomena. (MS-PS1-1),(MS-PS1-4)

Obtaining, Evaluating, and Communicating Information Obtaining, evaluating, and communicating information in 6–8 builds on K–5 and progresses to evaluating the merit and validity of ideas and methods. Gather, read, and synthesize information from multiple appropriate sources and assess the credibility, accuracy, and possible bias of each publication and methods used, and describe how they are supported or not supported by evidence. (MS-PS1-3)

Scale, Proportion, and Quantity Time, space, and energy phenomena can be observed at various scales using models to study systems that are too large or too small. (MS-PS1-1)

Structure and Function Structures can be designed to serve particular functions by taking into account properties of different materials, and how materials can be shaped and used. (MS-PS1-3)

Connections to Engineering, Technology, and Applications of Science Interdependence of Science, Engineering, and Technology Engineering advances have led to important discoveries in virtually every field of science, and scientific discoveries have led to the development of entire industries and engineered systems. (MS-PS1-3)

Influence of Science, Engineering and Technology on Society and the Natural World The uses of technologies and any limitations on their use are driven by individual or societal needs, desires, and values; by the findings of scientific research; and bydifferences in such factors as climate, natural resources, and economic conditions. Thus technology use varies from region to region and over time. (MS-PS1-3)

TECH.8.1.8.F.CS1	Identify and define authentic problems and significant questions for investigation.
MA.6.G.A	Solve real-world and mathematical problems involving area, surface area, and volume.
TECH.8.1.8.A.3	Use and/or develop a simulation that provides an environment to solve a real world problem or theory.
TECH.8.2.8.D.2	Identify the design constraints and trade-offs involved in designing a prototype (e.g., how the prototype might fail and how it might be improved) by completing a design problem and reporting results in a multimedia presentation, design portfolio or engineering notebook.
TECH.8.1.8.F.CS2	Plan and manage activities to develop a solution or complete a project.

TECH.8.1.8.C.CS4	Contribute to project teams to produce original works or solve problems.
TECH.8.1.8	Educational Technology: All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and to create and communicate knowledge.
TECH.8.1.8.A	Technology Operations and Concepts: Students demonstrate a sound understanding of technology concepts, systems and operations.
TECH.8.1.8.B	Creativity and Innovation: Students demonstrate creative thinking, construct knowledge and develop innovative products and process using technology.
SCI.MS-PS1-3	Gather and make sense of information to describe that synthetic materials come from natural resources and impact society.
MA.6.EE.C	Represent and analyze quantitative relationships between dependent and independent variables.
TECH.8.2.8.A.4	Redesign an existing product that impacts the environment to lessen its impact(s) on the environment.
TECH.8.2.8.C.5b	Create a technical sketch of a product with materials and measurements labeled.
TECH.8.1.8.B.CS1	Apply existing knowledge to generate new ideas, products, or processes.
TECH.8.2.8.D.5	Explain the impact of resource selection and the production process in the development of a common or technological product or system.
LA.W.6.3.E	Provide a conclusion that follows from the narrated experiences or events.
LA.W.6.1	Write arguments to support claims with clear reasons and relevant evidence. For example, in a problem involving motion at constant speed, list and graph ordered pairs of distances and times, and write the equation d = 65t to represent the relationship between distance and time.
LA.W.6.1.A	Introduce claim(s) and organize the reasons and evidence clearly.
TECH.8.2.8.A.5	Describe how resources such as material, energy, information, time, tools, people, and capital contribute to a technological product or system.
TECH.8.1.8.F.CS3	Collect and analyze data to identify solutions and/or make informed decisions.
LA.W.6.1.B	Support claim(s) with clear reasons and relevant evidence, using credible sources and demonstrating an understanding of the topic or text.
LA.W.6.5	With some guidance and support from peers and adults, develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach.
TECH.8.2.8.C.8	Develop a proposal for a chosen solution that include models (physical, graphical or mathematical) to communicate the solution to peers.
TECH.8.2.8.D.4	Research and publish the steps for using and maintaining a product or system and incorporate diagrams or images throughout to enhance user comprehension.
TECH.8.2.8.C.5a	Explain the interdependence of a subsystem that operates as part of a system.
LA.RL.6.7	Compare and contrast the experience of reading a story, drama, or poem to listening to or viewing an audio, video, or live version of the text, including contrasting what they “see” and “hear” when reading the text to what they perceive when they listen or watch.
TECH.8.2.8.D.CS1	Apply the design process.
TECH.8.2.8.D.1	Design and create a product that addresses a real world problem using a design process under specific constraints.
LA.W.6.2.A	Introduce a topic and organize ideas, concepts, and information, using text structures (e.g., definition, classification, comparison/contrast, cause/effect, etc.) and text features (e.g., headings, graphics, and multimedia) when useful to aiding

	comprehension.
TECH.8.2.8.B.3	Research and analyze the ethical issues of a product or system on the environment and report findings for review by peers and /or experts.
LA.W.6.2.B	Develop the topic with relevant facts, definitions, concrete details, quotations, or other information and examples.
LA.W.6.2.D	Use precise language and domain-specific vocabulary to inform about or explain the topic.
LA.RI.6.1	Cite textual evidence and make relevant connections to support analysis of what the text says explicitly as well as inferences drawn from the text.
LA.RI.6.2	Determine a central idea of a text and how it is conveyed through particular details; provide a summary of the text distinct from personal opinions or judgments.
LA.RI.6.3	Analyze in detail how a key individual, event, or idea is introduced, illustrated, and elaborated in a text (e.g., through examples or anecdotes).
LA.SL.6.1	Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 6 topics, texts, and issues, building on others' ideas and expressing their own clearly.
LA.RI.6.4	Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings.
LA.SL.6.2	Interpret information presented in diverse media and formats (e.g., visually, quantitatively, orally) and explain how it contributes to a topic, text, or issue under study.
LA.RI.6.7	Integrate information presented in different media or formats (e.g., visually, quantitatively) as well as in words to develop a coherent understanding of a topic or issue.
LA.SL.6.3	Deconstruct a speaker's argument and specific claims, distinguishing claims that are supported by reasons and evidence from claims that are not.
LA.RI.6.8	Trace and evaluate the argument and specific claims in a text, distinguishing claims that are supported by reasons and evidence from claims that are not.
LA.SL.6.4	Present claims and findings, sequencing ideas logically and using pertinent descriptions, facts, and details to accentuate main ideas or themes; use appropriate speaking behaviors (e.g., eye contact, adequate volume, and clear pronunciation).
LA.SL.6.5	Include multimedia components (e.g., graphics, images, music, sound) and visual displays in presentations to clarify information.
TECH.8.1.8.A.1	Demonstrate knowledge of a real world problem using digital tools.
TECH.8.2.8.B.4	Research examples of how humans can devise technologies to reduce the negative consequences of other technologies and present your findings.
TECH.8.2.8.E.1	Identify ways computers are used that have had an impact across the range of human activity and within different careers where they are used.
TECH.8.2.8.D.CS3	Assess the impact of products and systems.
TECH.8.2.8.C.7	Collaborate with peers and experts in the field to research and develop a product using the design process, data analysis and trends, and maintain a design log with annotated sketches to record the developmental cycle.
6-8.MS-PS1-1	Develop models to describe the atomic composition of simple molecules and extended structures.
TECH.8.2.8.D.6	Identify and explain how the resources and processes used in the production of a current technological product can be modified to have a more positive impact on

	the environment.
TECH.8.1.8.C.CS2	Communicate information and ideas to multiple audiences using a variety of media and formats.
6-8.MS-ETS1-1	Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.
6-8.MS-ETS1-1.1.1	Define a design problem that can be solved through the development of an object, tool, process or system and includes multiple criteria and constraints, including scientific knowledge that may limit possible solutions.
6-8.MS-ETS1-1.ETS1.A.1	The more precisely a design task's criteria and constraints can be defined, the more likely it is that the designed solution will be successful. Specification of constraints includes consideration of scientific principles and other relevant knowledge that are likely to limit possible solutions.
6-8.MS-ETS1-2	Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.
6-8.MS-ETS1-2.7	Engaging in argument from evidence in 6–8 builds on K–5 experiences and progresses to constructing a convincing argument that supports or refutes claims for either explanations or solutions about the natural and designed world.
6-8.MS-ETS1-2.7.1	Evaluate competing design solutions based on jointly developed and agreed-upon design criteria.
TECH.8.1.8.A.CS1	Understand and use technology systems.

Suggested Modifications for SPED, ESL & Gifted Students

- Small group instruction/individual instruction as warranted
- directions to be read out loud
- information presented in multiple learning modalities (multi- sensory)
- use of technology and games to teach and model scientific concepts
- skeletal notes/cloze notes provided
- students provided additional time on a topic in accordance with individual IEP/504
- ticketing/prize reward system utilized for behavioral management
- formative assessments to indicate student groupings into heterogeneous and homogeneous groupings
- curriculum content level-adjusted to meet student's needs based on assessments
- frequent classroom breaks
- redirection
- repetition of direction
- break down large tasks into smaller tasks
- front-loading vocabulary
- providing leading questions
- reduced essay requirements
- leveled questioning techniques/scaffolding
- use project-based learning to connect science with observable phenomena
- structure learning around explaining or solving a social or community-based issue
- provide ELL students with multiple literacy strategies
- collaborate with after school programs or clubs to extend learning opportunities

*Continually assess and adjust lesson content to meet students' needs.

Cross-Curricular/21st Century Connections

21st Century Connections

- **CRP4. Communicate clearly and effectively and with reason.**
- **CRP5. Consider the environmental, social and economic impacts of decisions.**
- **CRP6. Demonstrate creativity and innovation.**
- **CRP7. Employ valid and reliable research strategies.**
- **CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.**
- **CRP9. Model integrity, ethical leadership and effective management.**
- **CRP10. Plan education and career paths aligned to personal goals.**
- **CRP11. Use technology to enhance productivity.**
- **CRP12. Work productively in teams while using cultural global competence.**

Connections to other DCIs in this grade-band:

- MS.ESS2.C

Articulation of DCIs across grade-bands:

5.PS1.A ; HS.PS1.A ; HS.ESS1.A

Common Core State Standards Connections

ELA/Literacy

- RST.6-8.7 Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table). (MS-PS1-1)

Mathematics

- MP.3 Reason abstractly and quantitatively. (MS-PS1-1)
- MP.4 Model with mathematics. (MS-PS1-1)
- 6.RP.A.3 Use ratio and rate reasoning to solve real-world and mathematical problems. (MS-PS1-1)
- 8.EE.A.3 Use numbers expressed in the form of a single digit times an integer power of 10 to estimate very large or very small quantities, and to express how many times as much one is than the other. (MS-PS1-1)

Technological Innovations

Mosa Mack Science https://mosamack.com/

Discovery Science http://www.discoveryeducation.com/

Brainpop https://www.brainpop.com/

Achieve 3000 http://www.achieve3000.com/

Better Lesson https://betterlesson.com/

NGSS https://www.nextgenscience.org/

STEM Learning https://www.stem.org.uk/

Khan Academy - Math and Science https://www.khanacademy.org/

Science News https://student.societyforscience.org/sciencenews-students

Nature http://www.nature.com/

National Geographic http://ngm.nationalgeographic.com/

The Smithsonian http://www.smithsonianmag.com/

Science Daily http://ngm.nationalgeographic.com/

Popular Science http://www.popsci.com/

NASA http://www.nasa.gov/

Science for Kids http://www.sciencekids.co.nz/

How Stuff Works http://www.howstuffworks.com/

Aurum Science http://www.aurumscience.com/

Phet interactive simulations https://phet.colorado.edu/

HHMI Biointeractive https://www.hhmi.org/biointeractive

Molecular Workbench http://mw.concord.org/modeler/index.html

Google sky https://www.google.com/sky/

Unit 2 - Earth Science - Earth's Structure & Changing Surface

Content Area: **Science**
Course(s):
Time Period: **2nd Marking Period**
Length: **7-9 Weeks**
Status: **Not Published**

Summary of the Unit

Students examine geoscience data in order to understand processes and events that shape Earth. Important crosscutting concepts in this unit are scale, proportion, and quantity, stability and change, and patterns in relation to the different ways geologic processes operate over time. Students will be able to identify gravity as the force that shaped the Earth and affected its structure. Students will identify and describe the composition of the layers of the Earth. Students will differentiate between minerals and rocks as they explore the rock cycle and discover how materials flow in and out of the Earth. They will also identify processes such as weathering, erosion and deposition as forces that have shaped the Earth's surface over time.

Enduring Understandings

Students will understand the following:

- Rocks help tell the story of what has happened to the Earth
- Things change when they go through cycles and they tend to be essential and important to life, i.e. rocks, water, carbon
- Changes in the Earth, via the Rock Cycle, take millions of years
- Rocks are made of minerals
- Minerals can be described and named by their properties of luster, streak, hardness, breakage pattern, and crystal shape
- Rocks can be identified by looking at clues to their formation such as texture, color, presence of banding and mineral content
- Rocks are classified as igneous, metamorphic or sedimentary
- Matter is not created or destroyed, but rather changes as it cycles through earth processes.
- Energy drives the process that results in the cycling of Earth’s materials.
- The processes of melting, crystallization, weathering, deformation, and sedimentation act together to form minerals and rocks through the cycling of Earth’s materials.
- All Earth processes are the result of energy flowing and matter cycling within and among the planet’s systems.
- Energy flowing and matter cycling within and among the planet’s systems derive from the sun and Earth’s hot interior.
- Energy that flows and matter that cycles produce chemical and physical changes in Earth’s materials and living organisms.
- Explanations of stability and change in Earth’s natural systems can be constructed by examining the changes over time and processes at different scales, including the atomic scale.

Essential Questions

- How is Earth structured?
- What evidence indicates that Earth has a solid inner core and a liquid outer core?
- What are common rock-forming minerals?
- What is the rock cycle?
- How do chemical and physical processes change rocks?
- How do the properties and movements of water shape Earth's surface and affect its systems?

Summative Assessment and/or Summative Criteria

Observable features of the student performance by the end of the course:

- Demostrate knowledge of the Earth's structure, rock cycle, and geoprocesses by completing a department created quarterly assessment.
- Develop a model to describe the cycling of Earth's materials and the flow of energy that drives this process.

Resources

- Mosa Mack Unit: Mosa Mack: Rock Cycle and Earth's history
- The Rock Cycle Game
- CER: House on a Hill
- Discovery Education Techbook: Stucture of the earth Unit, Rocks and Minerals Unit, Change over time Unit
- Brainpop: Earth's Structure, Erosion, Mineral Identification, Rock Cycle, Soil, Types of Rocks
- Textbook A Materials: Earth's Changing Surface
- Kessler Stations: The Rock Cycle

Resources for Implementing Three-Dimensional Science Assessments

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Unit Plan with associated standards

Topics / Timelines	Objectives	Activities
		Illustrate the Earth
		Discovery E explorations
	Explain how gravity formed the Earth's spherical shape.	
Earth's formation and structure/2-3 weeks		Videos
	Differentiate layers of the Earth.	
		Brainpop: Ea structure
		Textbook ma Book A
	Model phases of the rock cycle.	Mosa Mack: Earth's Histo
Minerals, Rocks and the Rock Cycle/2-3 weeks	Explain that different combinations of minerals make rocks.	Mineral & R stations
	Identify and descrive different types of rocks: igneous, sedementary and	

	metamorphic.	Discovery Ed explorations
	Make connections between the law of the conservation of matter and how materials cycle between Earth's interior and surface.	Rock Cycle C
		Rock Cycle C
		Brainpop: Rock cycl Identification,
		Textbook ma Book A CER: House
	Define weathering, erosion and deposition as processes that change rocky materials.	Mechanical a weathering la
Weathering, Erosion and Deposition/2-3 weeks		Brainpop: Er
	Explain the difference between mechanical and chemical weathering.	
		Textbook ma Book A
		Discovery Ed Techbook: R

SCI.MS-ESS2-1	Develop a model to describe the cycling of Earth's materials and the flow of energy that drives this process.
LA.RL.7.1	Cite several pieces of textual evidence and make relevant connections to support analysis of what the text says explicitly as well as inferences drawn from the text.
LA.RI.7.2	Determine two or more central ideas in a text and analyze their development over the course of the text; provide an objective summary of the text.
LA.WHST.6-8.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes.
LA.RH.6-8.7	Integrate visual information (e.g., in charts, graphs, photographs, videos, or maps) with other information in print and digital texts.
SCI.MS-ESS2-2	Construct an explanation based on evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales.

LA.W.7.6	Use technology, including the Internet, to produce and publish writing and link to and cite sources as well as to interact and collaborate with others, including linking to and citing sources.
LA.RST.6-8.7	Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).
LA.W.7.8	Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation.
LA.RST.6-8.9	Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic.
MA.7.EE.B.4	Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities.
6-8.MS-ESS2-1.ESS2.A.1	All Earth processes are the result of energy flowing and matter cycling within and among the planet's systems. This energy is derived from the sun and Earth's hot interior. The energy that flows and matter that cycles produce chemical and physical changes in Earth's materials and living organisms.
6-8.MS-ESS2-1.7.1	Explanations of stability and change in natural or designed systems can be constructed by examining the changes over time and processes at different scales, including the atomic scale.
6-8.MS-ESS2-2	Construct an explanation based on evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales.
6-8.MS-ESS2-2.6.1	Construct a scientific explanation based on valid and reliable evidence obtained from sources (including the students' own experiments) and the assumption that theories and laws that describe nature operate today as they did in the past and will continue to do so in the future.
6-8.MS-ESS2-2.ESS2.A.1	The planet's systems interact over scales that range from microscopic to global in size, and they operate over fractions of a second to billions of years. These interactions have shaped Earth's history and will determine its future.
6-8.MS-ESS2-2.ESS2.C.1	Water's movements—both on the land and underground—cause weathering and erosion, which change the land's surface features and create underground formations.
6-8.MS-ESS2-2.3.1	Time, space, and energy phenomena can be observed at various scales using models to study systems that are too large or too small.
6-8.MS-ESS2-3.4	Analyzing data in 6–8 builds on K–5 experiences and progresses to extending quantitative analysis to investigations, distinguishing between correlation and causation, and basic statistical techniques of data and error analysis.

Suggested Modifications for SPED, ESL & Gifted Students

- Small group instruction/individual instruction as warranted
- directions to be read out loud
- information presented in multiple learning modalities (multi- sensory)
- use of technology and games to teach and model scientific concepts
- skeletal notes/cloze notes provided
- students provided additional time on a topic in accordance with individual IEP/504
- ticketing/prize reward system utilized for behavioral management

- formative assessments to indicate student groupings into heterogeneous and homogeneous groupings
- curriculum content level-adjusted to meet student's needs based on assessments
- frequent classroom breaks
- eveled questioning techniques
- redirection
- repetition of direction
- break down large tasks into smaller tasks
- front-loading vocabulary
- providing leading questions
- reduced essay requirements
- leveled questioning techniques/scaffolding

*Continually assess and adjust lesson content to meet students' needs.

Cross-Curricular/21st Century Connections

English Language Arts

- Cite specific textual evidence based on evidence from rock strata for how the geologic time scale is used to organize Earth's 4.6-billion-year-old history to support analysis of science and technical texts.
- Write informative/explanatory texts to examine evidence from rock strata for how the geologic time scale is used to organize Earth's 4.6 billion-year-old history and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content.
- Cite specific textual evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales to support analysis of science and technical texts.
- Use informative/explanatory texts to examine evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content.
- Include multimedia components and visual displays in presentations about evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales to clarify claims and findings and emphasize salient points.
- Cite specific textual evidence of past plate motion to support analysis of science texts.
- Integrate quantitative or technical information about evidence of past plate motions expressed in words in a text with a version of that information expressed in a flowchart, diagram, model, graph, or table.
- Compare and contrast the information gained from experiments, simulations, video, or multimedia sources showing evidence of past plate motion with that gained from reading a text on the same topic.

Mathematics

- Use variables to represent numbers and write expressions when solving problems while constructing explanations from evidence from rock strata for how the geologic time scale is used to organize Earth's 4.6-billion-year-old history; understand that a variable can represent an unknown number or, depending on the purpose at hand, any number in a specific set.

- Use variables to represent quantities in a real-world or mathematical problem when solving problems while constructing explanations from evidence from rock strata for how the geologic time scale is used to organize Earth's 4.6-billion-year-old history, and construct simple equations and inequalities to solve problems by reasoning about the quantities.
- Reason abstractly and quantitatively when analyzing evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales.
- Use variables to represent numbers and write expressions when solving a real-world or mathematical problem involving evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales. Understand that a variable can represent an unknown number or, depending on the purpose at hand, any number in a specified set.
- Use variables to represent quantities in a real-world or mathematical problem involving evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales, and construct simple equations and inequalities to solve problems by reasoning about the quantities.
- Use numbers, symbols, and words while analyzing and interpreting data on the distribution of fossils and rocks, continental shapes, and sea floor structures to provide evidence of past plate motions.
- Use variables to represent numerical data and write expressions when solving a problems involved in the analysis of data about past plate motions. Understand that a variable can represent an unknown number or, depending on the purpose at hand, any number in a specified set.
- Use variables to represent quantities when analyzing data about past plate motions and construct simple equations and inequalities to solve problems by reasoning about the quantities.

Connections to other DCIs in this grade-band:

MS.ESS2.C

Articulation of DCIs across grade-bands:

5.PS1.A ; HS.PS1.A ; HS.ESS1.A

Common Core State Standards Connections

ELA/Literacy

RST.6-8.7 Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table). (MS-PS1-1)

Mathematics

MP.3 Reason abstractly and quantitatively. (MS-PS1-1)

MP.4 Model with mathematics. (MS-PS1-1)

6.RP.A.3 Use ratio and rate reasoning to solve real-world and mathematical problems. (MS-PS1-1)

8.EE.A.3 Use numbers expressed in the form of a single digit times an integer power of 10 to estimate very large or very small

quantities, and to express how many times as much one is than the other. (MS-PS1-1)

Technological Innovations

Mosa Mack Science https://mosamack.com/

Discovery Science http://www.discoveryeducation.com/

Brainpop https://www.brainpop.com/

Achieve 3000 http://www.achieve3000.com/

Better Lesson https://betterlesson.com/

NGSS https://www.nextgenscience.org/

STEM Learning https://www.stem.org.uk/

Khan Academy - Math and Science https://www.khanacademy.org/

Science News https://student.societyforscience.org/sciencenews-students

Nature http://www.nature.com/

National Geographic http://ngm.nationalgeographic.com/

The Smithsonian http://www.smithsonianmag.com/

Science Daily http://ngm.nationalgeographic.com/

Popular Science http://www.popsci.com/

NASA http://www.nasa.gov/

Science for Kids http://www.sciencekids.co.nz/

How Stuff Works http://www.howstuffworks.com/

Aurum Science http://www.aurumscience.com/

Phet interactive simulations https://phet.colorado.edu/

HHMI Biointeractive https://www.hhmi.org/biointeractive

Unit 3 - Earth Science - Plate Tectonics

Content Area: **Science**
Course(s):
Time Period: **3rd Marking Period**
Length: **5-6 weeks**
Status: **Not Published**

Summary of the Unit

Students examine geoscience data in order to understand processes and events in Earth's history. Important crosscutting concepts in this unit are scale, proportion, and quantity, stability and change, and patterns in relation to the different ways geologic processes operate over geologic time. An important aspect of the history of Earth is that geologic events and conditions have affected the evolution of life, but different life forms have also played important roles in altering Earth's systems. Students understand how Earth's geosystems operate by modeling the flow of energy and cycling of matter within and among different systems. Students investigate the controlling properties of important materials and construct explanations based on the analysis of real geoscience data. Students are expected to demonstrate proficiency in analyzing and interpreting data and constructing explanations. They are also expected to use these practices to demonstrate understanding of the core ideas.

(Based on NJ Model Curriculum Summary)

Enduring Understandings

- Tectonic processes continually generate new seafloor at ridges and destroy old sea floor at trenches.
- Maps of ancient land and water patterns, based on investigations of rocks and fossils, make clear how Earth's plates have moved great distances, collided, and spread apart.
- Patterns in rates of change and other numerical relationships can provide information about past plate motions.
- The distribution of fossils and rocks, continental shapes, and seafloor structures to provide evidence of past plate motions.
- Similarities of rock and fossil types on different continents, the shapes of the continents (including continental shelves), and the locations of ocean structures (such as ridges, fracture zones, and trenches) provide evidence of past plate motions.

Essential Questions

- How and why is Earth constantly changing?
- How do Earth's major systems interact?
- Why do the continents move, and what causes earthquakes and volcanoes?
- How do people reconstruct and date events in Earth's planetary history?
- How do humans depend on Earth's resources?
- How are resources limited?
- How are the distribution of Earth's resources the result of past or current processes?

Summative Assessment and/or Summative Criteria

Observable features of the student performance by the end of the course:

- Quarterly Assessments

Resources

- Mosa Mack Unit: Plate Tectonics, Volcanoes & Earthquakes
- Plate Tectonics Student Contract Assignment
- Discovery Education Techbook: Plate Tectonics Unit, Volcanoes Unit, Earthquakes Unit
- BrainPOP: Earthquakes, Mountains, Plate Tectonics, Tsunamis, Volcanoes
- Textbook B Materials: Geologic Changes

Resources for Implementing Three-Dimensional Science Assessments

As educators, districts, and states implement new science standards, they are faced with creating and implementing new three-dimensional assessments to help monitor student progress and provide feedback to students, parents, and teachers. Achieve has worked with teachers, states, and researchers to develop a variety of tools and resources to help design and implement assessments that are worth students' and teachers' time.

Task Annotation Project in Science: The Task Annotation Project in Science (TAPS) was launched to provide an answer to the questions "what does it look like to ask students to demonstrate progress toward three-dimensional standards?" and "what are the most important features of high-quality science tasks?" This suite of resources includes annotated examples of assessment tasks for elementary, middle, and high school as well as a series of short resources that highlight the major takeaways across the whole project.

Science Assesesment Criteria: This document describes the most important features of statewide summative assessments designed for three-dimensional standards based on *A Framework for K-12 Science Education*, such as the NGSS.

Science Assessment Task Screening Tools: These two tools are intended to assist educators in evaluating science assessment tasks to determine whether they are designed for three-dimensional science standards based on the *Framework for K–12 Science Education*, such as the Next Generation Science Standards.

Transforming Science Assessment: Challenges and Recommendations for States: This brief describes some key challenges associated with developing assessments for new three-dimensional science standards and recommendations for states to consider.

Transforming Science Assessment: Systems for Innovation: This series of resources is designed to provide state education leaders with 1) information about how states are currently pursuing statewide assessment systems in science; 2) analyses of what features influence different approaches, with an eye to supporting state

leaders as they make their own decisions regarding science assessment systems; 3) detailed state profiles that highlight how and why some states have made decisions regarding designing and enacting different examples of systems of assessment; and 4) a how-to guide for policymakers looking to enact systems of assessment in science.

Unit Summary with associated standards

Topics / Timeframe	Objectives	Activties	Assessments	Standards
Plate tectonics / 2-3 Weeks	Describe tectonic plates and how they move. Explain what the movement of tectonic plates causes. Identify three types of plate boundaries and the landforms they cause. Explain how the rock cycle and tectonic processes are related.	Modeling Pangaea / Seafloor spreading Analyzing and Interpreting Evidence of Continental Drift to help support the Theory of Plate Tectonics Model Plate Tectonics features and processes Mosa Mack: Plate tectonics	Mosa Mack "make" and "engineer" investigations and rubrics Plate tectonics contract rubric Department created unit tests Department created unit quizzes Mosa Mack "make" and "engineer" investigations and rubrics	ESS2-1 ESS2-2 ESS2-3 ESS3-2 ESS3-3 ESS2-1
Volcanoes & earthquakes / 2-3 Weeks	Describe how understanding the history of natural hazards help forecast the locations and likelihoods of future events. Identify and explain the ring of fire.	Mosa Mack: Earthquakes and volcanoes Plate tectonics contract project	Plate tectonics contract rubric Department created unit tests Department created unit quizzes	ESS2-2 ESS2-3 ESS3-2 ESS3-3

SCI.MS-ESS2-1	Develop a model to describe the cycling of Earth's materials and the flow of energy that drives this process.
MA.K-12.2	Reason abstractly and quantitatively.
LA.WHST.6-8.8	Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation.
MA.6.EE.B.6	Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set.
LA.WHST.6-8.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes.
LA.RH.6-8.7	Integrate visual information (e.g., in charts, graphs, photographs, videos, or maps) with other information in print and digital texts.
LA.RST.6-8.1	Cite specific textual evidence to support analysis of science and technical texts.
MA.6.NS.C.5	Understand that positive and negative numbers are used together to describe quantities having opposite directions or values (e.g., temperature above/below zero, elevation above/below sea level, credits/debits, positive/negative electric charge); use positive and negative numbers to represent quantities in real-world contexts, explaining the meaning of 0 in each situation.
SCI.MS-ESS2-2	Construct an explanation based on evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales.
LA.RST.6-8.7	Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).
LA.RST.6-8.9	Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic.
MA.7.EE.B.4	Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities.
SCI.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.
6-8.MS-ESS2-1.ESS2.A.1	All Earth processes are the result of energy flowing and matter cycling within and among the planet's systems. This energy is derived from the sun and Earth's hot interior. The energy that flows and matter that cycles produce chemical and physical changes in Earth's materials and living organisms.
6-8.MS-ESS2-2	Construct an explanation based on evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales.
6-8.MS-ESS2-2.6.1	Construct a scientific explanation based on valid and reliable evidence obtained from sources (including the students' own experiments) and the assumption that theories and laws that describe nature operate today as they did in the past and will continue to do so in the future.
6-8.MS-ESS2-2.ESS2.A.1	The planet's systems interact over scales that range from microscopic to global in size, and they operate over fractions of a second to billions of years. These interactions have shaped Earth's history and will determine its future.

Suggested Modifications for SPED, ESL & Gifted Students

Small group instruction/individual instruction as warranted

directions to be read out loud

information presented in multiple learning modalities (multi- sensory)

use of technology and games to teach and model scientific concepts

skeletal notes/cloze notes provided

students provided additional time on a topic in accordance with individual IEP/504

ticketing/prize reward system utilized for behavioral management

formative assessments to indicate student groupings into heterogeneous and homogeneous groupings

curriculum content level-adjusted to meet student's needs based on assessments

frequent classroom breaks

leveled questioning techniques/scaffolding

redirection

repetition of directions

break down large tasks into smaller tasks

front-loading vocabulary

providing leading questions

reduced essay requirements

*Continually assess and adjust lesson content to meet students' needs.

Cross-Curricular/21st Century Connections

English Language Arts

- Cite specific textual evidence based on evidence from rock strata for how the geologic time scale is used to organize Earth’s 4.6-billion-year-old history to support analysis of science and technical texts.
- Write informative/explanatory texts to examine evidence from rock strata for how the geologic time scale is used to organize Earth’s 4.6 billion-year-old history and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content.
- Cite specific textual evidence for how geoscience processes have changed Earth’s surface at varying

time and spatial scales to support analysis of science and technical texts.
- Use informative/explanatory texts to examine evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content.
- Include multimedia components and visual displays in presentations about evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales to clarify claims and findings and emphasize salient points.
- Cite specific textual evidence of past plate motion to support analysis of science texts.
- Integrate quantitative or technical information about evidence of past plate motions expressed in words in a text with a version of that information expressed in a flowchart, diagram, model, graph, or table.
- Compare and contrast the information gained from experiments, simulations, video, or multimedia sources showing evidence of past plate motion with that gained from reading a text on the same topic.

Mathematics

- Use variables to represent numbers and write expressions when solving problems while constructing explanations from evidence from rock strata for how the geologic time scale is used to organize Earth's 4.6-billion-year-old history; understand that a variable can represent an unknown number or, depending on the purpose at hand, any number in a specific set.
- Use variables to represent quantities in a real-world or mathematical problem when solving problems while constructing explanations from evidence from rock strata for how the geologic time scale is used to organize Earth's 4.6-billion-year-old history, and construct simple equations and inequalities to solve problems by reasoning about the quantities.
- Reason abstractly and quantitatively when analyzing evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales.
- Use variables to represent numbers and write expressions when solving a real-world or mathematical problem involving evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales. Understand that a variable can represent an unknown number or, depending on the purpose at hand, any number in a specified set.
- Use variables to represent quantities in a real-world or mathematical problem involving evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales, and construct simple equations and inequalities to solve problems by reasoning about the quantities.
- Use numbers, symbols, and words while analyzing and interpreting data on the distribution of fossils and rocks, continental shapes, and sea floor structures to provide evidence of past plate motions.
- Use variables to represent numerical data and write expressions when solving a problems involved in the analysis of data about past plate motions. Understand that a variable can represent an unknown number or, depending on the purpose at hand, any number in a specified set.
- Use variables to represent quantities when analyzing data about past plate motions and construct simple equations and inequalities to solve problems by reasoning about the quantities.

Connections to other DCIs in this grade-band: MS.PS1.A (MS-ESS2-1),(MS-ESS2-4),(MS-ESS2-5); MS.PS1.B (MS-ESS2-1),(MS-ESS2-2); MS.PS2.A (MS-ESS2-5),(MS-ESS2-6); MS.PS2.B (MS-ESS2-4); MS.PS3.A (MS-ESS2-4),(MS-ESS2-5); MS.PS3.B (MS-ESS2-1),(MS-ESS2-5),(MS-ESS2-6); MS.PS3.D (MS-ESS2-4); MS.PS4.B (MS-ESS2-6); MS.LS2.B (MSESS2-1),(MS-ESS2-2); MS.LS2.C (MS-ESS2-1); MS.LS4.A (MS-ESS2-3); MS.ESS1.B (MS-ESS2-1); MS.ESS3.C (MS-ESS2-1)

Articulation of DCIs across grade-bands: 3.PS2.A (MS-ESS2-4),(MS-ESS2-6); 3.LS4.A (MS-ESS2-3); 3.ESS2.D (MS-ESS2-5),(MS-ESS2-6); 3.ESS3.B (MS-ESS2-3); 4.PS3.B (MS-ESS2- 1),(MS-ESS2-4); 4.ESS1.C (MS-ESS2-2),(MS-ESS2-3); 4.ESS2.A (MS-ESS2-1),(MS-ESS2-2); 4.ESS2.B (MS-ESS2-3); 4.ESS2.E (MS-ESS2-2); 4.ESS3.B (MS-ESS2-3); 5.PS2.B (MSESS2-4); 5.ESS2.A (MS-ESS2-1),(MS-ESS2-2),(MS-ESS2-5),(MS-ESS2-6); 5.ESS2.C (MS-ESS2-4); HS.PS1.B (MS-ESS2-1); HS.PS2.B (MS-ESS2-4),(MS-ESS2-6); HS.PS3.B (MS-ESS2- 1),(MS-ESS2-4),(MS-ESS2-6); HS.PS3.D (MS-ESS2-2),(MS-ESS2-6); HS.PS4.B (MS-ESS2-4); HS.LS1.C (MS-ESS2-1); HS.LS2.B (MS-ESS2-1),(MS-ESS2-2); HS.LS4.A (MS-ESS2-3); HS.LS4.C (MS-ESS2-3); HS.ESS1.B (MS-ESS2-6); HS.ESS1.C (MS-ESS2-2),(MS-ESS2-3); HS.ESS2.A (MS-ESS2-1),(MS-ESS2-2),(MS-ESS2-3),(MS-ESS2-4),(MS-ESS2-6); HS.ESS2.B (MS-ESS2-2),(MS-ESS2-3); HS.ESS2.C (MS-ESS2-1),(MS-ESS2-2),(MS-ESS2-4),(MS-ESS2-5); HS.ESS2.D (MS-ESS2-2),(MS-ESS2-4),(MS-ESS2-5),(MS-ESS2-6); HS.ESS2.E (MS-ESS2- 1),(MS-ESS2-2); HS.ESS3.D (MS-ESS2-2)

Technological Innovations

Mosa Mack Science https://mosamack.com/

Discovery Science http://www.discoveryeducation.com/

Brainpop https://www.brainpop.com/

Achieve 3000 http://www.achieve3000.com/

Better Lesson https://betterlesson.com/

NGSS https://www.nextgenscience.org/

STEM Learning https://www.stem.org.uk/

Khan Academy - Math and Science https://www.khanacademy.org/

Science News https://student.societyforscience.org/sciencenews-students

Nature http://www.nature.com/

National Geographic http://ngm.nationalgeographic.com/

The Smithsonian http://www.smithsonianmag.com/

Science Daily http://ngm.nationalgeographic.com/

Popular Science http://www.popsci.com/

NASA http://www.nasa.gov/

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HHMI Biointeractive https://www.hhmi.org/biointeractive

Unit 4 - Earth Science - Fossils & Geologic Time

Content Area: **Science**
Course(s):
Time Period: **3rd Marking Period**
Length: **3-4 weeks**
Status: **Not Published**

Summary of the Unit

Students examine fossil formation processes as related to geologic processes. Students will be able to identify different types of fossils, including carbon films, molds, casts, and trace fossils, as well as explain how each are created. Students will discover the law of superposition and how layering matters in fossil age. Students will explore how this information and fossil locations, both geographically and geologically, contributed to determining index fossils and the creation of the geologic time scale.

(Based on NJ Model Curriculum Summary)

Enduring Understandings

Students will understand the following:

- Fossils are formed from the remains of living organisms.
- The great diversity of fossils on Earth provides clues to Earth's past.
- Paleontologists use fossils and the rocks in which they form to determine how organisms lived and the environmental conditions of an area at the time.
- Index fossils, relative age dating, and absolute age dating have been used in combination to develop the geologic time scale.

Essential Questions

- If no one was there, how do we know the Earth’s history?
- What evidence do scientists use to learn about past environments?
- What evidence to scientists use to determine the age of rocks?
- Why don't all dead organisms become fossils?
- What is a mass extinction?
- How is Earth's history recorded?

Summative Assessment and/or Summative Criteria

Students will understand the following:

- Fossils tell the story of Earth's history.

- The law of superposition explains that fossils found deeper within soil layers are older than those found closer to the surface.
- There are different types of fossils based on how the remains were preserved.
- Geologic time is divided by major mass extinctions.
- Mass extinctions occur when many species disappear at once.

Resources

- Mosa Mack Unit: Rocks
- Discovery Education Techbook: Rocks and Minerals Unit, Plate Tectonics Unit
- BrainPOP: Carbon Dating, Fossils, Geologic Time
- Textbook B Materials: Geologic Changes

Resources for Implementing Three-Dimensional Science Assessments

As educators, districts, and states implement new science standards, they are faced with creating and implementing new three-dimensional assessments to help monitor student progress and provide feedback to students, parents, and teachers. Achieve has worked with teachers, states, and researchers to develop a variety of tools and resources to help design and implement assessments that are worth students' and teachers' time.

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Unit Summary and associated standards

Topics /Timelines	Objectives	Activities	Assessments	Standards
		Model trace fossils using clay		
		Fossil stations to observe different types of fossils.		
	Define fossil as the remains of a once living thing.			
	Identify the different types of fossils and how they form.	Mosa Mack: Rock Cycle & Earth's History - Extension: History of the Earth	Department created quizzes and tests	
Fossils/2 weeks	Describe the necessary conditions for a dead organism to fossilize, and explain why not all dead organisms become fossils.	Discovery Education: Colossal Fossil Jostle	Fossil identification	ESS1-4
	Explain the law of superposition and how fossil age and location helps scientists determine things about past environments.	Brainpop: Fossils, Dinosaurs, Carbon Dating		
		Model law of superposition		
	Explain how the geologic time scale was developed.	Textbook B Materials: Chapter 10 Students create a timeline of their life, dividing it into major before/after events	Department created quizzes/tests	
Geologic Time/2 weeks	Differentiate between eons, eras, periods, and epochs and compare geologic time units to units that students are familiar with (ie: months, days, weeks).	Draw a model of the geologic time scale useing measuring tape and typewriter tape	Quarterly Assessment	ESS1-4
			Game project	

Identify possible causes of mass extinctions.	Create a game for the geologic time scale	rubric
Distinguish major events in the paleozoic, mesozoic, and cenozoic eras.	Brainpop: Geologic time, Ice age	
Identify a relationship between environmental change and evolution.	Textbook B Materials: Chapter 11	

MA.K-12.2	Reason abstractly and quantitatively.
MA.6.EE.B.6	Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set.
LA.SL.8.5	Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest.
MA.K-12.4	Model with mathematics.
LA.WHST.6-8.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes.
SCI.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.
LA.RST.6-8.1	Cite specific textual evidence to support analysis of science and technical texts.
MA.7.RP.A.2	Recognize and represent proportional relationships between quantities.
LA.RST.6-8.7	Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).
MA.6.RP.A.1	Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities.
MA.7.EE.B.4	Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities.
6-8.MS-ESS1-3.3.1	Time, space, and energy phenomena can be observed at various scales using models to study systems that are too large or too small.
6-8.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.
6-8.MS-ESS1-4.6.1	Construct a scientific explanation based on valid and reliable evidence obtained from sources (including the students' own experiments) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future.
6-8.MS-ESS1-4.ESS1.C.1	The geologic time scale interpreted from rock strata provides a way to organize Earth's history. Analyses of rock strata and the fossil record provide only relative dates, not an absolute scale.
6-8.MS-ESS1-4.3.1	Time, space, and energy phenomena can be observed at various scales using models to study systems that are too large or too small.

Suggested Modifications for SPED, ESL & Gifted Students

- Small group instruction/individual instruction as warranted
- directions to be read out loud
- information presented in multiple learning modalities (multi- sensory)
- use of technology and games to teach and model scientific concepts
- skeletal notes/cloze notes provided
- students provided additional time on a topic in accordance with individual IEP/504
- ticketing/prize reward system utilized for behavioral management
- formative assessments to indicate student groupings into heterogeneous and homogeneous groupings
- curriculum content level-adjusted to meet student's needs based on assessments
- frequent classroom breaks
- eveled questioning techniques
- redirection
- repetition of direction
- break down large tasks into smaller tasks
- front-loading vocabulary
- providing leading questions
- reduced essay requirements
- leveled questioning techniques/scaffolding

*Continually assess and adjust lesson content to meet students' needs.

Cross-Curricular/21st Century Connections

English Language Arts

- Cite specific textual evidence based on evidence from rock strata for how the geologic time scale is used to organize Earth’s 4.6-billion-year-old history to support analysis of science and technical texts.
- Write informative/explanatory texts to examine evidence from rock strata for how the geologic time scale is used to organize Earth’s 4.6 billion-year-old history and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content.
- Cite specific textual evidence for how geoscience processes have changed Earth’s surface at varying time and spatial scales to support analysis of science and technical texts.
- Use informative/explanatory texts to examine evidence for how geoscience processes have changed Earth’s surface at varying time and spatial scales and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content.
- Include multimedia components and visual displays in presentations about evidence for how geoscience processes have changed Earth’s surface at varying time and spatial scales to clarify claims and findings and emphasize salient points.
- Cite specific textual evidence of past plate motion to support analysis of science texts.
- Integrate quantitative or technical information about evidence of past plate motions expressed in words in a text with a version of that information expressed in a flowchart, diagram, model, graph, or table.
- Compare and contrast the information gained from experiments, simulations, video, or multimedia sources showing evidence of past plate motion with that gained from reading a text on the same topic.

Mathematics

- Use variables to represent numbers and write expressions when solving problems while constructing explanations from evidence from rock strata for how the geologic time scale is used to organize Earth's 4.6-billion-year-old history; understand that a variable can represent an unknown number or, depending on the purpose at hand, any number in a specific set.
- Use variables to represent quantities in a real-world or mathematical problem when solving problems while constructing explanations from evidence from rock strata for how the geologic time scale is used to organize Earth's 4.6-billion-year-old history, and construct simple equations and inequalities to solve problems by reasoning about the quantities.
- Reason abstractly and quantitatively when analyzing evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales.
- Use variables to represent numbers and write expressions when solving a real-world or mathematical problem involving evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales. Understand that a variable can represent an unknown number or, depending on the purpose at hand, any number in a specified set.
- Use variables to represent quantities in a real-world or mathematical problem involving evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales, and construct simple equations and inequalities to solve problems by reasoning about the quantities.
- Use numbers, symbols, and words while analyzing and interpreting data on the distribution of fossils and rocks, continental shapes, and sea floor structures to provide evidence of past plate motions.
- Use variables to represent numerical data and write expressions when solving a problems involved in the analysis of data about past plate motions. Understand that a variable can represent an unknown number or, depending on the purpose at hand, any number in a specified set.
- Use variables to represent quantities when analyzing data about past plate motions and construct simple equations and inequalities to solve problems by reasoning about the quantities.

Connections to other DCIs in this grade-band: MS.PS1.A (MS-ESS2-1),(MS-ESS2-4),(MS-ESS2-5); MS.PS1.B (MS-ESS2-1),(MS-ESS2-2); MS.PS2.A (MS-ESS2-5),(MS-ESS2-6); MS.PS2.B (MS-ESS2-4); MS.PS3.A (MS-ESS2-4),(MS-ESS2-5); MS.PS3.B (MS-ESS2-1),(MS-ESS2-5),(MS-ESS2-6); MS.PS3.D (MS-ESS2-4); MS.PS4.B (MS-ESS2-6); MS.LS2.B (MSESS2-1),(MS-ESS2-2); MS.LS2.C (MS-ESS2-1); MS.LS4.A (MS-ESS2-3); MS.ESS1.B (MS-ESS2-1); MS.ESS3.C (MS-ESS2-1)

Articulation of DCIs across grade-bands: 3.PS2.A (MS-ESS2-4),(MS-ESS2-6); 3.LS4.A (MS-ESS2-3); 3.ESS2.D (MS-ESS2-5),(MS-ESS2-6); 3.ESS3.B (MS-ESS2-3); 4.PS3.B (MS-ESS2- 1),(MS-ESS2-4); 4.ESS1.C (MS-ESS2-2),(MS-ESS2-3); 4.ESS2.A (MS-ESS2-1),(MS-ESS2-2); 4.ESS2.B (MS-ESS2-3); 4.ESS2.E (MS-ESS2-2); 4.ESS3.B (MS-ESS2-3); 5.PS2.B (MSESS2-4); 5.ESS2.A (MS-ESS2-1),(MS-ESS2-2),(MS-ESS2-5),(MS-ESS2-6); 5.ESS2.C (MS-ESS2-4); HS.PS1.B (MS-ESS2-1); HS.PS2.B (MS-ESS2-4),(MS-ESS2-6); HS.PS3.B (MS-ESS2- 1),(MS-ESS2-4),(MS-ESS2-6); HS.PS3.D (MS-ESS2-2),(MS-ESS2-6); HS.PS4.B (MS-ESS2-4); HS.LS1.C (MS-ESS2-1); HS.LS2.B (MS-ESS2-1),(MS-ESS2-2); HS.LS4.A (MS-ESS2-3); HS.LS4.C (MS-ESS2-3); HS.ESS1.B (MS-ESS2-6); HS.ESS1.C (MS-ESS2-2),(MS-ESS2-3); HS.ESS2.A (MS-ESS2-1),(MS-ESS2-2),(MS-ESS2-3),(MS-ESS2-4),(MS-ESS2-6); HS.ESS2.B (MS-ESS2-2),(MS-ESS2-3); HS.ESS2.C (MS-ESS2-1),(MS-ESS2-2),(MS-ESS2-4),(MS-ESS2-5); HS.ESS2.D (MS-ESS2-2),(MS-ESS2-4),(MS-ESS2-5),(MS-ESS2-6); HS.ESS2.E (MS-ESS2- 1),(MS-ESS2-2); HS.ESS3.D

(MS-ESS2-2)

Technological Innovations

Mosa Mack Science https://mosamack.com/

Discovery Science http://www.discoveryeducation.com/

Brainpop https://www.brainpop.com/

Achieve 3000 http://www.achieve3000.com/

Better Lesson https://betterlesson.com/

NGSS https://www.nextgenscience.org/

STEM Learning https://www.stem.org.uk/

Khan Academy - Math and Science https://www.khanacademy.org/

Science News https://student.societyforscience.org/sciencenews-students

Nature http://www.nature.com/

National Geographic http://ngm.nationalgeographic.com/

The Smithsonian http://www.smithsonianmag.com/

Science Daily http://ngm.nationalgeographic.com/

Popular Science http://www.popsci.com/

NASA http://www.nasa.gov/

Science for Kids http://www.sciencekids.co.nz/

How Stuff Works http://www.howstuffworks.com/

Aurum Science http://www.aurumscience.com/

Phet interactive simulations https://phet.colorado.edu/

HHMI Biointeractive https://www.hhmi.org/biointeractive

Unit 5 - Life Science - Evolution, Selection & Adaptation

Content Area: **Science**
Course(s):
Time Period: **4th Marking Period**
Length: **5-6 weeks**
Status: **Not Published**

Summary of the Unit

Students construct explanations based on evidence to support fundamental understandings of natural selection and evolution. They will use ideas of genetic variation in a population to make sense of how organisms survive and reproduce, thus passing on the traits of the species. The crosscutting concepts of *patterns* and *structure and function* are called out as organizing concepts that students use to describe biological evolution. Students use the practices of *constructing explanations*, *obtaining, evaluating, and communicating information*, and *using mathematical and computational thinking*. Students are also expected to use these practices to demonstrate understanding of the core ideas.

Enduring Understandings

- The process of evolution drives the diversity and unity of life.
- Change in the genetic makeup of a population over time is evolution.
- Organisms are linked by lines of descent from common ancestry.
- Life continues to evolve within a changing environment.
- The origin of living systems is explained by natural processes.
- Biological systems utilize free energy and molecular building blocks to grow, to reproduce, and to maintain dynamic homeostasis.
- Growth, reproduction and maintenance of the organization of living systems require free energy and matter.
- Growth, reproduction and dynamic homeostasis require that cells create and maintain internal environments that are different from their external environments.
- Organisms use feedback mechanisms to regulate growth and reproduction, and to maintain dynamic homeostasis.
- Growth and dynamic homeostasis of a biological system are influenced by changes in the system's environment.
- Many biological processes involved in growth, reproduction and dynamic homeostasis include temporal regulation and coordination.
- Living systems store, retrieve, transmit, and respond to information essential to life processes.
- Heritable information provides for continuity of life.
- Expression of genetic information involves cellular and molecular mechanisms.
- The processing of genetic information is imperfect and is a source of genetic variation.
- Cells communicate by generating, transmitting and receiving chemical signals. Transmission of information results in changes within and between biological systems.
- Biological systems interact, and these systems and their interactions possess complex properties.
- Interactions within biological systems lead to complex properties.
- Competition and cooperation are important aspects of biological systems. Naturally occurring diversity among and between components within biological systems affects interactions with the environment.

Essential Questions

- How has life on earth changed throughout time?
- How has the history of life been recorded through the fossil records?
- How are fossils of the past similar to organisms of today? Why do some organisms become fossils and others do not?
- What common patterns of development are similar in embryos of different species?
- What enable some species to carry on genetically while others become extinct?
- How do different environments affect evolution of the same species?
- What are some of the changes due to environment that could potential affect our own species adaptation?

Summative Assessment and/or Summative Criteria

Observable features of the student performance by the end of the course:

- Use graphs, charts, and images to identify patterns within the fossil record.
- Analyze and interpret data within the fossil record to determine similarities and differences in findings.
- Make logical and conceptual connections between evidence in the fossil record and explanations about the existence, diversity, extinction, and change in many life forms throughout the history of life on Earth.
- Apply scientific ideas to construct explanations for evolutionary relationships.
- Apply the patterns in gross anatomical structures among modern organisms and between modern organisms and fossil organisms to construct explanations of evolutionary relationships.
- Apply scientific ideas about evolutionary history to construct an explanation for evolutionary relationships evidenced by similarities or differences in the gross appearance of anatomical structures.

Resources

- Mosa Mack Unit: Selection & Adaptations
- Finch Beak Adaptations Lab
- Claims Evidence Reasoning: Finch Beaks
- Better Lesson: Facilitating Student Discussion: Natural Selection
- Better Lesson: How Does Color Help An Animal To Survive?
- "Who Wants to Live 1,000,000 years?" Online Simulator
- Kessler Stations: Fossils, Natural Selection
- Escape Room - Fossils
- Escape Room - Animal Adaptations
- Color variation over time in rock pocket mouse populations - interactive
- Design your own super species project
- Model adaptations in an organism project

Resources for Implementing Three-Dimensional Science Assessments

As educators, districts, and states implement new science standards, they are faced with creating and implementing new three-dimensional assessments to help monitor student progress and provide feedback to

students, parents, and teachers. Achieve has worked with teachers, states, and researchers to develop a variety of tools and resources to help design and implement assessments that are worth students' and teachers' time.

Task Annotation Project in Science: The Task Annotation Project in Science (TAPS) was launched to provide an answer to the questions "what does it look like to ask students to demonstrate progress toward three-dimensional standards?" and "what are the most important features of high-quality science tasks?" This suite of resources includes annotated examples of assessment tasks for elementary, middle, and high school as well as a series of short resources that highlight the major takeaways across the whole project.

Science Assesesment Criteria: This document describes the most important features of statewide summative assessments designed for three-dimensional standards based on *A Framework for K-12 Science Education*, such as the NGSS.

Science Assessment Task Screening Tools: These two tools are intended to assist educators in evaluating science assessment tasks to determine whether they are designed for three-dimensional science standards based on the *Framework for K–12 Science Education*, such as the Next Generation Science Standards.

Transforming Science Assessment: Challenges and Recommendations for States: This brief describes some key challenges associated with developing assessments for new three-dimensional science standards and recommendations for states to consider.

Transforming Science Assessment: Systems for Innovation: This series of resources is designed to provide state education leaders with 1) information about how states are currently pursuing statewide assessment systems in science; 2) analyses of what features influence different approaches, with an eye to supporting state leaders as they make their own decisions regarding science assessment systems; 3) detailed state profiles that highlight how and why some states have made decisions regarding designing and enacting different examples of systems of assessment; and 4) a how-to guide for policymakers looking to enact systems of assessment in science.

Unit Plan w/ Associated Standards (Chart)

Topics / Timelines	Objectives	Activities
		Mosa Mack: Ev
	Identify major events in the geologic time scale and make connections with biological evolution.	"Who Wants to Simulator
Geologic Time and The Fossil Record/1-2 weeks	Describe how the geologic time scale is systematically arranged based on mass extinctions and the existance of different types of species throughout time.	Kessler Station
	Define differenet types of fossils and explain how they are formed.	Escape Room -

		BrainPOP: Geo Dinosaurs
		Discovery Educ Change over tir Mosa Mack Un
		Finch Beak Ada
		Claims Evidenc
	Identify Charles Darwin and explain how species change over time according to his theory of evolution by natural natural selection.	Better Lesson: Natural Selecti
Darwin's Theory and Natural Selection/2 weeks	Explain how changes in the environment have a cause and effect relationship with the survival of a species.	Better Lesson: Animal To Surv
	Identify evidence from biology as support for the theory of evolution.	BrainPOP: Cha
		Discovery Educ Darwin and Na
Adaptations/2 weeks	Explain how variations emerge through mutations.	Escape Room -
	Identify and describe various types of adaptations.	Student Debate Organisms
	Compare and contrast pros and cons of selective breeding.	Color variation populations - in

Design your ow

Model adaptati

BrainPOP: Hib
Antibiotic resis
Evolution

Discovery Educ
Adaptations

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. [Clarification Statement: 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.] [Assessment Boundary: Assessment does not include the names of individual species or geological eras in the fossil record.]

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. [Clarification Statement: Emphasis is on explanations of the evolutionary relationships among organisms in terms of similarity or differences of the gross appearance of anatomical structures.]

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. [Clarification Statement: Emphasis is on inferring general patterns of relatedness among embryos of different organisms by comparing the macroscopic appearance of diagrams or pictures.] [Assessment Boundary: Assessment of comparisons is limited to gross appearance of anatomical structures in embryological development.]

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. [Clarification Statement: Emphasis is on using simple probability statements and proportional reasoning to construct explanations.]

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. [Clarification Statement: Emphasis is on using mathematical models, probability statements, and proportional reasoning to support explanations of trends in changes to populations over time.] [Assessment Boundary: Assessment does not include Hardy Weinberg calculations.]

Science and Engineering Practices

Analyzing and Interpreting Data Analyzing data in 6–8 builds on K–5 experiences and progresses to extending quantitative analysis to investigations, distinguishing between correlation and causation, and basic statistical techniques of data and error analysis. Analyze displays of data to identify linear and nonlinear relationships. (MS-LS4-3)

□ Analyze and interpret data to determine similarities and differences in findings. (MS-LS4-1)

<u>Using Mathematics and Computational Thinking</u> Mathematical and computational thinking in 6–8 builds on K–5 experiences and progresses to identifying patterns in large data sets and using mathematical concepts to support explanations and arguments. □ Use mathematical representations to support scientific conclusions and design solutions. (MS-LS4-6)

Constructing Explanations and Designing Solutions Constructing explanations and designing solutions in 6–8 builds on K–5 experiences and progresses to include constructing explanations and designing solutions supported by multiple sources of evidence consistent with scientific ideas, principles, and theories. □ Apply scientific ideas to construct an explanation for realworld phenomena, examples, or events. (MS-LS4-2)

□ Construct an explanation that includes qualitative or quantitative relationships between variables that describe phenomena.(MS-LS4-4)

<u>Disciplinary Core Ideas</u>

LS4.A: Evidence of Common Ancestry and Diversity □ The collection of fossils and their placement in chronological order (e.g., through the location of the sedimentary layers in which they are found or through radioactive dating) is known as the fossil record. It documents the existence, diversity, extinction, and change of many life forms throughout the history of life on Earth. (MS-LS4-1)

□ Anatomical similarities and differences between various organisms living today and between them and organisms in the fossil record, enable the reconstruction of evolutionary history and the inference of lines of evolutionary descent. (MS-LS4-2)

□ Comparison of the embryological development of different species also reveals similarities that show relationships not evident in the fully-formed anatomy. (MS-LS4-3)

LS4.B: Natural Selection □ Natural selection leads to the predominance of certain traits in a population, and the suppression of others. (MS-LS4-4)

LS4.C: Adaptation □ Adaptation by natural selection acting over generations is one important process by which species change over time in response to changes in environmental conditions. Traits that support successful survival and reproduction in the new environment become more common; those that do not become less common. Thus, the distribution of traits in a population changes. (MS-LS4-6)

<u>Crosscutting Concepts</u>

<u>Patterns</u> □ Patterns can be used to identify cause and effect relationships. (MS-LS4-2)

□ Graphs, charts, and images can be used to identify patterns in data. (MS-LS4-1),(MS-LS4- 3) Cause and Effect

□ Phenomena may have more than one cause, and some cause and effect relationships in systems can only be described using probability. (MS-LS4-4),(MS-LS4-5),(MS-LS4-6)

<u>Connections to Nature of Science Scientific Knowledge</u> Assumes an Order and Consistency in Natural Systems □ Science assumes that objects and events in natural systems occur in consistent patterns that are understandable through measurement and observation. (MS-LS4-1),(MS-LS4-2)

TECH.8.1.8.F.CS1	Identify and define authentic problems and significant questions for investigation.
MA.6.G.A	Solve real-world and mathematical problems involving area, surface area, and volume.
TECH.8.1.8.A.3	Use and/or develop a simulation that provides an environment to solve a real world problem or theory.

TECH.8.2.8.D.2	Identify the design constraints and trade-offs involved in designing a prototype (e.g., how the prototype might fail and how it might be improved) by completing a design problem and reporting results in a multimedia presentation, design portfolio or engineering notebook.
TECH.8.1.8.F.CS2	Plan and manage activities to develop a solution or complete a project.
TECH.8.1.8.C.CS4	Contribute to project teams to produce original works or solve problems.
TECH.8.1.8	Educational Technology: All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and to create and communicate knowledge.
TECH.8.1.8.A	Technology Operations and Concepts: Students demonstrate a sound understanding of technology concepts, systems and operations.
TECH.8.1.8.B	Creativity and Innovation: Students demonstrate creative thinking, construct knowledge and develop innovative products and process using technology.
SCI.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.
MA.6.EE.C	Represent and analyze quantitative relationships between dependent and independent variables.
TECH.8.2.8.A.4	Redesign an existing product that impacts the environment to lessen its impact(s) on the environment.
TECH.8.2.8.C.5b	Create a technical sketch of a product with materials and measurements labeled.
SCI.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.
TECH.8.1.8.B.CS1	Apply existing knowledge to generate new ideas, products, or processes.
TECH.8.2.8.D.5	Explain the impact of resource selection and the production process in the development of a common or technological product or system.
SCI.MS-LS4-5	Gather and synthesize information about the technologies that have changed the way humans influence the inheritance of desired traits in organisms.
LA.W.6.3.E	Provide a conclusion that follows from the narrated experiences or events.
LA.W.6.1	Write arguments to support claims with clear reasons and relevant evidence. For example, in a problem involving motion at constant speed, list and graph ordered pairs of distances and times, and write the equation d = 65t to represent the relationship between distance and time.
SCI.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.
LA.W.6.1.A	Introduce claim(s) and organize the reasons and evidence clearly.
TECH.8.2.8.A.5	Describe how resources such as material, energy, information, time, tools, people, and capital contribute to a technological product or system.
TECH.8.1.8.F.CS3	Collect and analyze data to identify solutions and/or make informed decisions.
LA.W.6.1.B	Support claim(s) with clear reasons and relevant evidence, using credible sources and demonstrating an understanding of the topic or text.
LA.W.6.5	With some guidance and support from peers and adults, develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach.
TECH.8.2.8.C.8	Develop a proposal for a chosen solution that include models (physical, graphical

	or mathematical) to communicate the solution to peers.
TECH.8.2.8.D.4	Research and publish the steps for using and maintaining a product or system and incorporate diagrams or images throughout to enhance user comprehension.
TECH.8.2.8.C.5a	Explain the interdependence of a subsystem that operates as part of a system.
LA.RL.6.7	Compare and contrast the experience of reading a story, drama, or poem to listening to or viewing an audio, video, or live version of the text, including contrasting what they "see" and "hear" when reading the text to what they perceive when they listen or watch.
TECH.8.2.8.D.CS1	Apply the design process.
TECH.8.2.8.D.1	Design and create a product that addresses a real world problem using a design process under specific constraints.
LA.W.6.2.A	Introduce a topic and organize ideas, concepts, and information, using text structures (e.g., definition, classification, comparison/contrast, cause/effect, etc.) and text features (e.g., headings, graphics, and multimedia) when useful to aiding comprehension.
TECH.8.2.8.B.3	Research and analyze the ethical issues of a product or system on the environment and report findings for review by peers and /or experts.
LA.W.6.2.B	Develop the topic with relevant facts, definitions, concrete details, quotations, or other information and examples.
LA.W.6.2.D	Use precise language and domain-specific vocabulary to inform about or explain the topic.
LA.RI.6.1	Cite textual evidence and make relevant connections to support analysis of what the text says explicitly as well as inferences drawn from the text.
LA.RI.6.2	Determine a central idea of a text and how it is conveyed through particular details; provide a summary of the text distinct from personal opinions or judgments.
LA.RI.6.3	Analyze in detail how a key individual, event, or idea is introduced, illustrated, and elaborated in a text (e.g., through examples or anecdotes).
LA.SL.6.1	Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 6 topics, texts, and issues, building on others' ideas and expressing their own clearly.
LA.RI.6.4	Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings.
LA.SL.6.2	Interpret information presented in diverse media and formats (e.g., visually, quantitatively, orally) and explain how it contributes to a topic, text, or issue under study.
LA.RI.6.7	Integrate information presented in different media or formats (e.g., visually, quantitatively) as well as in words to develop a coherent understanding of a topic or issue.
LA.SL.6.3	Deconstruct a speaker's argument and specific claims, distinguishing claims that are supported by reasons and evidence from claims that are not.
LA.RI.6.8	Trace and evaluate the argument and specific claims in a text, distinguishing claims that are supported by reasons and evidence from claims that are not.
LA.SL.6.4	Present claims and findings, sequencing ideas logically and using pertinent descriptions, facts, and details to accentuate main ideas or themes; use appropriate speaking behaviors (e.g., eye contact, adequate volume, and clear pronunciation).
LA.SL.6.5	Include multimedia components (e.g., graphics, images, music, sound) and visual displays in presentations to clarify information.

TECH.8.1.8.A.1	Demonstrate knowledge of a real world problem using digital tools.
TECH.8.2.8.B.4	Research examples of how humans can devise technologies to reduce the negative consequences of other technologies and present your findings.
TECH.8.2.8.E.1	Identify ways computers are used that have had an impact across the range of human activity and within different careers where they are used.
TECH.8.2.8.D.CS3	Assess the impact of products and systems.
TECH.8.2.8.C.7	Collaborate with peers and experts in the field to research and develop a product using the design process, data analysis and trends, and maintain a design log with annotated sketches to record the developmental cycle.
TECH.8.2.8.D.6	Identify and explain how the resources and processes used in the production of a current technological product can be modified to have a more positive impact on the environment.
SCI.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.
6-8.MS-LS1-3.4.1	Systems may interact with other systems; they may have sub-systems and be a part of larger complex systems.
6-8.MS-LS1-4.7	Engaging in argument from evidence in 6–8 builds on K–5 experiences and progresses to constructing a convincing argument that supports or refutes claims for either explanations or solutions about the natural and designed world(s).
6-8.MS-LS1-4.7.1	Use an oral and written argument supported by empirical evidence and scientific reasoning to support or refute an explanation or a model for a phenomenon or a solution to a problem.
6-8.MS-LS3-2.LS3.B	Variation of Traits
6-8.MS-LS3-2.2.1	Cause and effect relationships may be used to predict phenomena in natural systems.
6-8.MS-LS4	Biological Evolution: Unity and Diversity
6-8.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.
6-8.MS-LS4-1.4	Analyzing data in 6–8 builds on K–5 experiences and progresses to extending quantitative analysis to investigations, distinguishing between correlation and causation, and basic statistical techniques of data and error analysis.
6-8.MS-LS4-1.4.1	Analyze and interpret data to determine similarities and differences in findings.
6-8.MS-LS4-1.LS4.A	Evidence of Common Ancestry and Diversity
6-8.MS-LS4-1.LS4.A.1	The collection of fossils and their placement in chronological order (e.g., through the location of the sedimentary layers in which they are found or through radioactive dating) is known as the fossil record. It documents the existence, diversity, extinction, and change of many life forms throughout the history of life on Earth.
6-8.MS-LS4-1.1.1	Graphs, charts, and images can be used to identify patterns in data.
6-8.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.
6-8.MS-LS4-2.6	Constructing explanations and designing solutions in 6–8 builds on K–5 experiences and progresses to include constructing explanations and designing solutions supported by multiple sources of evidence consistent with scientific ideas, principles, and theories.

6-8.MS-LS4-2.6.1	Apply scientific ideas to construct an explanation for real-world phenomena, examples, or events.
6-8.MS-LS4-2.LS4.A	Evidence of Common Ancestry and Diversity
6-8.MS-LS4-2.LS4.A.1	Anatomical similarities and differences between various organisms living today and between them and organisms in the fossil record, enable the reconstruction of evolutionary history and the inference of lines of evolutionary descent.
6-8.MS-LS4-2.1.1	Patterns can be used to identify cause and effect relationships.
6-8.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.
6-8.MS-LS4-3.4.1	Analyze displays of data to identify linear and nonlinear relationships.
6-8.MS-LS4-3.LS4.A	Evidence of Common Ancestry and Diversity
6-8.MS-LS4-3.LS4.A.1	Comparison of the embryological development of different species also reveals similarities that show relationships not evident in the fully-formed anatomy.
6-8.MS-LS4-3.1	Patterns
6-8.MS-LS4-3.1.1	Graphs, charts, and images can be used to identify patterns in data.
6-8.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.
6-8.MS-LS4-4.LS4.B	Natural Selection
6-8.MS-LS4-4.LS4.B.1	Natural selection leads to the predominance of certain traits in a population, and the suppression of others.
6-8.MS-LS4-5.LS4.B.1	In artificial selection, humans have the capacity to influence certain characteristics of organisms by selective breeding. One can choose desired parental traits determined by genes, which are then passed on to offspring.
6-8.MS-LS4-5.2.1	Phenomena may have more than one cause, and some cause and effect relationships in systems can only be described using probability.
6-8.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.
6-8.MS-LS4-6.LS4.C.1	Adaptation by natural selection acting over generations is one important process by which species change over time in response to changes in environmental conditions. Traits that support successful survival and reproduction in the new environment become more common; those that do not become less common. Thus, the distribution of traits in a population changes.
TECH.8.1.8.C.CS2	Communicate information and ideas to multiple audiences using a variety of media and formats.
6-8.MS-ETS1-1	Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.
6-8.MS-ETS1-1.1.1	Define a design problem that can be solved through the development of an object, tool, process or system and includes multiple criteria and constraints, including scientific knowledge that may limit possible solutions.
6-8.MS-ETS1-1.ETS1.A.1	The more precisely a design task's criteria and constraints can be defined, the more likely it is that the designed solution will be successful. Specification of constraints includes consideration of scientific principles and other relevant knowledge that are likely to limit possible solutions.

6-8.MS-ETS1-2	Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.
6-8.MS-ETS1-2.7	Engaging in argument from evidence in 6–8 builds on K–5 experiences and progresses to constructing a convincing argument that supports or refutes claims for either explanations or solutions about the natural and designed world.
TECH.8.1.8.A.CS1	Understand and use technology systems.
SCI.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.

Suggested Modifications for SPED, ESL & Gifted Students

- Small group instruction/individual instruction as warranted
- directions to be read out loud
- information presented in multiple learning modalities (multi- sensory)
- use of technology and games to teach and model scientific concepts
- skeletal notes/cloze notes provided
- students provided additional time on a topic in accordance with individual IEP/504
- ticketing/prize reward system utilized for behavioral management
- formative assessments to indicate student groupings into heterogeneous and homogeneous groupings
- curriculum content level-adjusted to meet student's needs based on assessments
- frequent classroom breaks
- redirection
- repetition of direction
- break down large tasks into smaller tasks
- front-loading vocabulary
- providing leading questions
- reduced essay requirements
- leveled questioning techniques/scaffolding
- use project-based learning to connect science with observable phenomena
- structure learning around explaining or solving a social or community-based issue
- provide ELL students with multiple literacy strategies
- collaborate with after school programs or clubs to extend learning opportunities

*Continually assess and adjust lesson content to meet students' needs.

Cross-Curricular/21st Century Connections

21st Century Connections

- **CRP4. Communicate clearly and effectively and with reason.**
- **CRP5. Consider the environmental, social and economic impacts of decisions.**
- **CRP6. Demonstrate creativity and innovation.**
- **CRP7. Employ valid and reliable research strategies.**
- **CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.**
- **CRP9. Model integrity, ethical leadership and effective management.**

- **CRP10. Plan education and career paths aligned to personal goals.**
- **CRP11. Use technology to enhance productivity.**
- **CRP12. Work productively in teams while using cultural global competence.**

Connections to other DCIs in this grade-band:

MS.ESS2.C

Articulation of DCIs across grade-bands:

5.PS1.A ; HS.PS1.A ; HS.ESS1.A

Common Core State Standards Connections

ELA/Literacy

RST.6-8.7 Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table). (MS-PS1-1)

Mathematics

MP.3 Reason abstractly and quantitatively. (MS-PS1-1)

MP.4 Model with mathematics. (MS-PS1-1)

Technological Innovations

Smartboard Activities for Natural Selection http://exchange.smarttech.com/search.html?q=%20natural%20selection

Mosa Mack Science https://mosamack.com/

Discovery Science http://www.discoveryeducation.com/

Brainpop https://www.brainpop.com/

Achieve 3000 http://www.achieve3000.com/

Better Lesson https://betterlesson.com/

NGSS https://www.nextgenscience.org/

STEM Learning https://www.stem.org.uk/

Khan Academy - Math and Science https://www.khanacademy.org/

Science News https://student.societyforscience.org/sciencenews-students

Nature http://www.nature.com/

National Geographic http://ngm.nationalgeographic.com/

The Smithsonian http://www.smithsonianmag.com/

Science Daily http://ngm.nationalgeographic.com/

Popular Science http://www.popsci.com/

NASA http://www.nasa.gov/

Science for Kids http://www.sciencekids.co.nz/

How Stuff Works http://www.howstuffworks.com/

Aurum Science http://www.aurumscience.com/

Natural
Selection https://www.ngsslifescience.com/science.php/science/biology_lesson_plans_natural_selection

Phet interactive simulations https://phet.colorado.edu/

HHMI Biointeractive https://www.hhmi.org/biointeractive

NSTA Evolution https://www.nsta.org/evolution/

Unit 6 - Life Science - Cells

Content Area: **Science**
Course(s):
Time Period: **4th Marking Period**
Length: **3-4 weeks**
Status: **Not Published**

Summary of the Unit

Students demonstrate age appropriate abilities to plan and carry out investigations to develop evidence that living organisms are made of cells. Students gather information to support explanations of the relationship between structure and function in cells. They are able to communicate an understanding of cell theory and understand that all organisms are made of cells. Students understand that special structures are responsible for particular functions in organisms. They then are able to use their understanding of cell theory to develop and use physical and conceptual models of cells. The crosscutting concepts of scale, proportion, and quantity and structure and function provide a framework for understanding the disciplinary core ideas. Students are expected to demonstrate proficiency in planning and carrying out investigations, analyzing and interpreting data, and developing and using models, Students are also expected to use these to use these science and engineering practices to demonstrate understanding of the disciplinary core ideas.

Enduring Understandings

- Earth's systems can be broken down into individual components, which have observable measurable properties. Students formulate an answer to the question, "How can one explain the ways cells contribute to the function of living organisms?"
- Students gather information and use this information to support explanations of the structure and function relationship of cells.
- Students will be able to communicate understanding of cell theory.
- Students will develop a basic understanding of the role of cells in body systems and how those systems work to support the life functions of the organism.
- The understanding of cells provides a context for the plant process of photosynthesis and the movement of matter and energy needed for the cell.
- Students can construct an explanation for how environmental and genetic factors affect growth of organisms.
- They can connect this to the role of animal behaviors in reproduction of animals as well as the dependence of some plants on animal behaviors for their reproduction.
- Crosscutting concepts of cause and effect, structure and function, and matter and energy are called out as organizing concepts for the core ideas about processes of living organisms.

Essential Questions

- How do the structures of organisms contribute to life's functions?
- How do organisms grow, develop and reproduce?
- How do individual organisms obtain and use matter and energy, and how does energy move through an ecosystem?

- How do organisms interact with other organisms in the physical environment to obtain matter and energy?
- How does genetic variation among organisms in species affect survival and reproduction?
- How does the environment influence genetic traits in populations over multiple generations?
- How do the functions of cells support an entire organism?

Summative Assessment and/or Summative Criteria

Observable features of the student performance by the end of the course:

- Analyze the similarities and differences between plant and animal cells
- Understand the relationship between cells and molecules
- Identify the functions of each organelle within a cell
- Demonstrate how cells are vital to our overall well being
- Create a model of a specific kind of cell

Resources

- Mosa Mack Unit on Cells
- 5E Lesson Plan on Cells
- Cell City Project
- Cell Celebration Lesson Plan
- Microscopes and Identification of Cells on Slides
- Cloning Debates

Resources for Implementing Three-Dimensional Science Assessments

As educators, districts, and states implement new science standards, they are faced with creating and implementing new three-dimensional assessments to help monitor student progress and provide feedback to students, parents, and teachers. Achieve has worked with teachers, states, and researchers to develop a variety of tools and resources to help design and implement assessments that are worth students' and teachers' time.

Task Annotation Project in Science: The Task Annotation Project in Science (TAPS) was launched to provide an answer to the questions "what does it look like to ask students to demonstrate progress toward three-dimensional standards?" and "what are the most important features of high-quality science tasks?" This suite of resources includes annotated examples of assessment tasks for elementary, middle, and high school as well as a series of short resources that highlight the major takeaways across the whole project.

Science Assesesment Criteria: This document describes the most important features of statewide summative assessments designed for three-dimensional standards based on *A Framework for K-12 Science Education*,

such as the NGSS.

Science Assessment Task Screening Tools: These two tools are intended to assist educators in evaluating science assessment tasks to determine whether they are designed for three-dimensional science standards based on the *Framework for K–12 Science Education*, such as the Next Generation Science Standards.

Transforming Science Assessment: Challenges and Recommendations for States: This brief describes some key challenges associated with developing assessments for new three-dimensional science standards and recommendations for states to consider.

Transforming Science Assessment: Systems for Innovation: This series of resources is designed to provide state education leaders with 1) information about how states are currently pursuing statewide assessment systems in science; 2) analyses of what features influence different approaches, with an eye to supporting state leaders as they make their own decisions regarding science assessment systems; 3) detailed state profiles that highlight how and why some states have made decisions regarding designing and enacting different examples of systems of assessment; and 4) a how-to guide for policymakers looking to enact systems of assessment in science.

Unit Plan w/ Associated Standards (Chart)

Topics / Timelines	Objectives	Activities	Assessments	Standards
Cell types, structure, shape and movement/2 weeks	Define and explain cell theory. Describe characteristics of cells. Explain that all living things are made of cells. Differntiate between eukaryotic and prokaryotic cells. Illustrate the parts, structure and functions within a cell.	Mosa Mack: Cells Cell City Project Cell Stations Cell Celebration Cloning Debates Brainpop: Cells, Cell structures, Mitosis Discovery Education Textbook and Labs: Cells & Cell processes	Quarterly Assessment Unit Quizes Unit Projects Labs	LS1-1 LS1-2

			Quarterly Assessment	
Differntiation of types of cells/1-2 weeks	Differentiate between animal and plant cells.	Mosa Mack: Plant & Animal Structure	Unit Quizes	LS1-1
	Describe the levels of organization.	Discovery Education Textbook and Labs: Cells & Cell processes	Unit Projects	LS1-2
			Labs	

MS-LS1-1 Conduct an investigation to provide evidence that living things are made of cells; either one cell or many different numbers and types of cells. [Clarification Statement: 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 many and varied cells.]

MS-LS1-3. Use argument supported by evidence for how the body is a system of interacting subsystems composed of groups of cells. [Clarification Statement: Emphasis is on the conceptual understanding that cells form tissues and tissues form organs specialized for particular body functions. Examples could include the interaction of subsystems within a system and the normal functioning of those systems.] [*Assessment Boundary: Assessment does not include the mechanism of one body system independent of others. Assessment is limited to the circulatory, excretory, digestive, respiratory, muscular, and nervous systems.*]

Science and Engineering Practices

Engaging in Argument from Evidence

Engaging in argument from evidence in 6–8 builds on K–5 experiences and progresses to constructing a convincing argument that supports or refutes claims for either explanations or solutions about the natural and designed world(s).

- Use an oral and written argument supported by evidence to support or refute an explanation or a model for a phenomenon.

Disciplinary Core Ideas

LS1.A: Structure and Function

In multicellular organisms, the body is a system of multiple interacting subsystems. These subsystems are groups of cells that work together to form tissues and organs that are specialized for particular body functions.

Crosscutting Concepts

Systems and System Models

- Systems may interact with other systems; they may have sub-systems and be a part of larger complex systems.

Connections to Nature of Science

Science is a Human Endeavor

- Scientists and engineers are guided by habits of mind such as intellectual honesty, tolerance of ambiguity, skepticism, and

openness to new ideas.

TECH.8.1.8.F.CS1	Identify and define authentic problems and significant questions for investigation.
MA.6.G.A	Solve real-world and mathematical problems involving area, surface area, and volume.
TECH.8.1.8.A.3	Use and/or develop a simulation that provides an environment to solve a real world problem or theory.
SCI.MS-LS1-1	Conduct an investigation to provide evidence that living things are made of cells; either one cell or many different numbers and types of cells.
TECH.8.2.8.D.2	Identify the design constraints and trade-offs involved in designing a prototype (e.g., how the prototype might fail and how it might be improved) by completing a design problem and reporting results in a multimedia presentation, design portfolio or engineering notebook.
TECH.8.1.8.F.CS2	Plan and manage activities to develop a solution or complete a project.
TECH.8.1.8.C.CS4	Contribute to project teams to produce original works or solve problems.
TECH.8.1.8	Educational Technology: All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and to create and communicate knowledge.
TECH.8.1.8.A	Technology Operations and Concepts: Students demonstrate a sound understanding of technology concepts, systems and operations.
TECH.8.1.8.B	Creativity and Innovation: Students demonstrate creative thinking, construct knowledge and develop innovative products and process using technology.
MA.6.EE.C	Represent and analyze quantitative relationships between dependent and independent variables.
TECH.8.2.8.A.4	Redesign an existing product that impacts the environment to lessen its impact(s) on the environment.
TECH.8.2.8.C.5b	Create a technical sketch of a product with materials and measurements labeled.
TECH.8.1.8.B.CS1	Apply existing knowledge to generate new ideas, products, or processes.
TECH.8.2.8.D.5	Explain the impact of resource selection and the production process in the development of a common or technological product or system.
LA.W.6.3.E	Provide a conclusion that follows from the narrated experiences or events.
LA.W.6.1	Write arguments to support claims with clear reasons and relevant evidence. For example, in a problem involving motion at constant speed, list and graph ordered pairs of distances and times, and write the equation d = 65t to represent the relationship between distance and time.
LA.W.6.1.A	Introduce claim(s) and organize the reasons and evidence clearly.
TECH.8.2.8.A.5	Describe how resources such as material, energy, information, time, tools, people, and capital contribute to a technological product or system.
TECH.8.1.8.F.CS3	Collect and analyze data to identify solutions and/or make informed decisions.
LA.W.6.1.B	Support claim(s) with clear reasons and relevant evidence, using credible sources and demonstrating an understanding of the topic or text.
LA.W.6.5	With some guidance and support from peers and adults, develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new

	approach.
TECH.8.2.8.C.8	Develop a proposal for a chosen solution that include models (physical, graphical or mathematical) to communicate the solution to peers.
TECH.8.2.8.D.4	Research and publish the steps for using and maintaining a product or system and incorporate diagrams or images throughout to enhance user comprehension.
TECH.8.2.8.C.5a	Explain the interdependence of a subsystem that operates as part of a system.
LA.RL.6.7	Compare and contrast the experience of reading a story, drama, or poem to listening to or viewing an audio, video, or live version of the text, including contrasting what they "see" and "hear" when reading the text to what they perceive when they listen or watch.
TECH.8.2.8.D.CS1	Apply the design process.
TECH.8.2.8.D.1	Design and create a product that addresses a real world problem using a design process under specific constraints.
LA.W.6.2.A	Introduce a topic and organize ideas, concepts, and information, using text structures (e.g., definition, classification, comparison/contrast, cause/effect, etc.) and text features (e.g., headings, graphics, and multimedia) when useful to aiding comprehension.
TECH.8.2.8.B.3	Research and analyze the ethical issues of a product or system on the environment and report findings for review by peers and /or experts.
LA.W.6.2.B	Develop the topic with relevant facts, definitions, concrete details, quotations, or other information and examples.
LA.W.6.2.D	Use precise language and domain-specific vocabulary to inform about or explain the topic.
LA.RI.6.1	Cite textual evidence and make relevant connections to support analysis of what the text says explicitly as well as inferences drawn from the text.
LA.RI.6.2	Determine a central idea of a text and how it is conveyed through particular details; provide a summary of the text distinct from personal opinions or judgments.
LA.RI.6.3	Analyze in detail how a key individual, event, or idea is introduced, illustrated, and elaborated in a text (e.g., through examples or anecdotes).
LA.SL.6.1	Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 6 topics, texts, and issues, building on others' ideas and expressing their own clearly.
LA.RI.6.4	Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings.
LA.SL.6.2	Interpret information presented in diverse media and formats (e.g., visually, quantitatively, orally) and explain how it contributes to a topic, text, or issue under study.
LA.RI.6.7	Integrate information presented in different media or formats (e.g., visually, quantitatively) as well as in words to develop a coherent understanding of a topic or issue.
LA.SL.6.3	Deconstruct a speaker's argument and specific claims, distinguishing claims that are supported by reasons and evidence from claims that are not.
LA.RI.6.8	Trace and evaluate the argument and specific claims in a text, distinguishing claims that are supported by reasons and evidence from claims that are not.
LA.SL.6.4	Present claims and findings, sequencing ideas logically and using pertinent descriptions, facts, and details to accentuate main ideas or themes; use appropriate speaking behaviors (e.g., eye contact, adequate volume, and clear pronunciation).

LA.SL.6.5	Include multimedia components (e.g., graphics, images, music, sound) and visual displays in presentations to clarify information.
TECH.8.1.8.A.1	Demonstrate knowledge of a real world problem using digital tools.
TECH.8.2.8.B.4	Research examples of how humans can devise technologies to reduce the negative consequences of other technologies and present your findings.
SCI.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.
TECH.8.2.8.E.1	Identify ways computers are used that have had an impact across the range of human activity and within different careers where they are used.
TECH.8.2.8.D.CS3	Assess the impact of products and systems.
TECH.8.2.8.C.7	Collaborate with peers and experts in the field to research and develop a product using the design process, data analysis and trends, and maintain a design log with annotated sketches to record the developmental cycle.
6-8.MS-PS1-1	Develop models to describe the atomic composition of simple molecules and extended structures.
TECH.8.2.8.D.6	Identify and explain how the resources and processes used in the production of a current technological product can be modified to have a more positive impact on the environment.
6-8.MS-LS1	From Molecules to Organisms: Structures and Processes
6-8.MS-LS1-1	Conduct an investigation to provide evidence that living things are made of cells; either one cell or many different numbers and types of cells.
6-8.MS-LS1-1.LS1.A	Structure and Function
6-8.MS-LS1-1.LS1.A.1	All living things are made up of cells, which is the smallest unit that can be said to be alive. An organism may consist of one single cell (unicellular) or many different numbers and types of cells (multicellular).
6-8.MS-LS1-1.3.1	Phenomena that can be observed at one scale may not be observable at another scale.
6-8.MS-LS1-3	Use argument supported by evidence for how the body is a system of interacting subsystems composed of groups of cells.
6-8.MS-LS1-3.7	Engaging in argument from evidence in 6–8 builds on K–5 experiences and progresses to constructing a convincing argument that supports or refutes claims for either explanations or solutions about the natural and designed world(s).
6-8.MS-LS1-3.7.1	Use an oral and written argument supported by evidence to support or refute an explanation or a model for a phenomenon.
6-8.MS-LS1-3.LS1.A	Structure and Function
6-8.MS-LS1-3.LS1.A.1	In multicellular organisms, the body is a system of multiple interacting subsystems. These subsystems are groups of cells that work together to form tissues and organs that are specialized for particular body functions.
6-8.MS-LS1-3.4	Systems and System Models
6-8.MS-LS1-3.4.1	Systems may interact with other systems; they may have sub-systems and be a part of larger complex systems.
TECH.8.1.8.C.CS2	Communicate information and ideas to multiple audiences using a variety of media and formats.
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6-8.MS-ETS1-2	Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.
6-8.MS-ETS1-2.7	Engaging in argument from evidence in 6–8 builds on K–5 experiences and progresses to constructing a convincing argument that supports or refutes claims for either explanations or solutions about the natural and designed world.
6-8.MS-ETS1-2.7.1	Evaluate competing design solutions based on jointly developed and agreed-upon design criteria.
TECH.8.1.8.A.CS1	Understand and use technology systems.

Suggested Modifications for SPED, ESL & Gifted Students

- directions read out loud, repeated, clarified
- small group instruction/individual instruction as warranted
- information presented in multiple learning modalities (multi- sensory)
- use of technology and games to teach and model scientific concepts
- skeletal notes/cloze notes provided
- students provided additional time on a topic in accordance with individual IEP/504
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- formative assessments to drive student groupings into heterogeneous and homogeneous groups for cooperative teams
- curriculum content level-adjusted to meet student's needs based on assessments
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- break down large tasks into smaller tasks
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- providing leading questions
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- use project-based learning to connect science with observable phenomena
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21st Century Connections

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- CRP5. Consider the environmental, social and economic impacts of decisions.
- CRP6. Demonstrate creativity and innovation.
- CRP7. Employ valid and reliable research strategies.
- CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.
- CRP9. Model integrity, ethical leadership and effective management.
- CRP10. Plan education and career paths aligned to personal goals.
- CRP11. Use technology to enhance productivity.
- CRP12. Work productively in teams while using cultural global competence.

English Language Arts

- Conduct a short research project collecting evidence that living things are made of cells to answer a question (including a self-generated question). Draw on several sources and generate additional related, focused questions that allow for multiple avenues of exploration.
- Integrate multimedia and visual displays of cells and specific cell parts into presentations to clarify information, strengthen claims and evidence, and add interest.

Mathematics

- Use variables to represent two quantities, such as the number of cells that makes up an organism and units representing the size or type of the organism, and determine the relationship between these two variables.
- Write an equation to express one quantity, thought of as the dependent variable, in terms of the other quantity, thought of as the independent variable. Analyze the relationship between the dependent and independent variables using graphs and tables, and relate these to the equation.
- Use variables to represent two quantities in a real-world problem that change in relationship to one another—for example, determining the ratio of a cell's surface area to its volume. Write an equation to express one quantity, thought of as the dependent variable, in terms of the other quantity, thought of as the independent variable. Analyze the relationship between the dependent and independent variables using graphs and tables, and relate these to the equation.

Articulation of DCIs across grade-bands:

HS.LS1.A

Common Core State Standards Connections

ELA/Literacy

RST.6-8.7 Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table). (MS-LS1-1)

Mathematics

MP.3 Reason abstractly and quantitatively. (MS-LS1-1)

8.EE.C.9 Use variables to represent two quantities in a real-world problem that change in relationship to one another; write an equation to express one quantity, thought of as the dependent variable, in terms of the other quantity, thought of as the independent variable. Analyze the relationship between the dependent and independent variables using graphs and tables, and relate these to the equation. *(MS-LS1-3)*

Technological Innovations

Mosa Mack Science https://mosamack.com/

Discovery Science http://www.discoveryeducation.com/

Brainpop https://www.brainpop.com/

Achieve 3000 http://www.achieve3000.com/

Better Lesson https://betterlesson.com/

NGSS https://www.nextgenscience.org/

STEM Learning https://www.stem.org.uk/

Khan Academy - Math and Science https://www.khanacademy.org/

Science News https://student.societyforscience.org/sciencenews-students

Nature http://www.nature.com/

National Geographic http://ngm.nationalgeographic.com/

The Smithsonian http://www.smithsonianmag.com/

Science Daily http://ngm.nationalgeographic.com/

Popular Science http://www.popsci.com/

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