Subject	PS6: Structure & Function
Unit	Unit 1: Science Boot Camp
Est. Length	7 lessons (Aug - Sept)
Big Idea	Science is essential to understanding the world and strongly impacts daily life.
Essential Questions	1. What tools are used in science? 2. What is the scientific method? 3. How are tables, graphs, and pictures analyzed and understood?
MA State Standards *Power standards in bold	Not aligned to any specific MA standards, see science practices below.
Common Core State Standards (CCSS)	Reading ● RST.6-8.1: Cite specific textual evidence to support analysis of science and technical texts. ● RST.6-8.2: Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions. ● RST.6-8.3: Follow precisely a multistep procedure when carrying out experiments, taking measurements, or

performing technical tasks.

- RST.6-8.4: Determine the meaning of key symbols, key terms, and other domain-specific words and phrases as they are used in specific scientific or technical context relevant to grades 6 - 8.
- RST.6-8.5: Analyze the structure an author uses to organize a text, including how the major sections contribute to the whole and to an understanding of the topic.
- RST.6-8.6: Analyze the author's purpose in providing an explanation describing a procedure, or discussing an experiment in text.
- 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).
- RST.6-8.8: Distinguish among facts, reasoned judgment based on research findings, and speculation in a text.
- 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.
- RST.6-8.10: By the end of grade 8, read and comprehend science/technical texts in the grades 6-8 text complexity band independently and proficiently.

Writing

- WHST.6-8.1: Write arguments focused on *discipline-specific content*.
    - WHST.6-8.1.A: Introduce claim(s) about a topic or issue, acknowledge and distinguish the claim(s) from alternate or opposing claims, and organize the reasons and evidence logically.
    - WHST.6-8.1.B: Support claim(s) with logical reasoning and relevant, accurate data and evidence that demonstrate an understanding of the topic or text, using credible sources.
    - WHST.6-8.1.C: Use words, phrases, and clauses to create cohesion and clarify the relationships among claim(s), counterclaims, reasons, and evidence.
    - WHST.6-8.1.D: Establish and maintain a formal style.
    - WHST.6-8.1.E: Provide a concluding statement or section that follows from and supports the argument presented.
- WHST.6-8.2: Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.
    - WHST.6-8.2.A: Introduce a topic clearly, previewing what is to follow; organize ideas, concepts, and information into broader categories as appropriate to achieving purpose; include formatting (e.g., headings), graphics (e.g., charts, tables), and multimedia when useful to aiding comprehension.
    - WHST.6-8.2.B: Develop the topic with relevant, well-chosen facts, definitions, concrete details, quotations, or other information and examples.
    - WHST.6-8.2.C: Use appropriate and varied transitions to create cohesion and clarify the relationships among ideas and concepts.
    - WHST.6-8.2.D: Use precise language and domain-specific vocabulary to inform about or explain

	the topic. ○ WHST.6-8.2.E: Establish and maintain a formal style and objective tone. ○ WHST.6-8.2.F: Provide a concluding statement or section that follows from and supports the information or explanation presented. ● WHST.6-8.4: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. ● WHST.6-8.5: 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, focusing on how well purpose and audience have been addressed. ● WHST.6-8.6: Use technology, including the Internet, to produce and publish writing and present the relationships between information and ideas clearly and efficiently. ● WHST.6-8.7: Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration. ● 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. ● WHST.6-8.9: Draw evidence from informational texts to support analysis, reflection, and research. ● WHST.6-8.10: Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.
Science Practices (SP)	**1. Asking scientific questions & defining engineering problems** 2. Developing & using models 3. Planning & carrying out investigations **4. Analyzing & interpreting data** 5. Using mathematics & computational thinking 6. Constructing scientific explanations & designing engineering solutions **7. Engaging in argument from evidence** 8. Obtaining, evaluating, and communicating information
Assessment Alignment	<u>Minor assessments</u> ● Quiz BC1 <u>Major assessments</u> ● None
Honors	Design an experiment using the scientific method and providing examples of how each step would be

Assignments	completed. Students will observe the dissolving of various food/candy/common items and describe how to conduct this experiment and record observations.
10 Key Vocabulary Words	Analyze, Data, Evidence, Experiment, Hypothesis, Observation, Prediction, Scientific Method, Theory, Variable

Prior knowledge that students have entering this unit

1. Students entering CCSC will most likely have a range of knowledge from little exposure to scientific principles to a significant familiarity with scientific concepts.

Where this knowledge goes next

1. Students will next study Earth & Space Science and the skills and terminology learned in Science Boot Camp will assist students in future observations and activities within class.
2. Students will be able to read and explain scientific tables, graphs, and pictures. Additionally students will be able to correctly use measurement tools and write a hypothesis for future science topics.

Descriptive outline narrative of unit

Students will begin the year enrolled in Science Boot Camp, where they will learn the basic principles of science. Students will learn how to read and interpret scientific tables, graphs, and pictures and will also be able to explain important terminology. Students will learn how to use scientific measurement and recording tools to aide in scientific investigations.

Day	Lesson #/name	MA	CCSS	Content Objective	Language Objective	Science practice(s)
1	BC1	N/A	RST.6-8.2	SWBAT identify various fields of science and explain the impact of	(S): Explain to a partner how science impacts daily life.	SP8: Obtain, evaluate, and communicate information

				science on daily life.		
2	BC2	N/A	RST.6-8.9	SWBAT demonstrate proper use of a microscope, ruler, and electronic balance.	(S): Explain to a partner how to use a microscope, ruler, or electronic balance.	SP5: Use mathematics and computational thinking
3	BC3	N/A	RST.6-8.9	SWBAT demonstrate proper use of a beaker, eye dropper, and graduated cylinder.	(S): Explain to a partner how to use a beaker, eye dropper, or graduated cylinder.	SP5: Use mathematics and computational thinking
4	BC4	N/A	WHST.6-8.1	SWBAT list and explain each step of the scientific method.	(W): Name and explain in 2-3 sentences one step of the scientific method.	SP1: Ask scientific questions and define engineering problems
5	BC5	N/A	WHST.6-8.1	SWBAT identify and explain the difference between a hypothesis and a scientific theory.	(S): Explain to a partner the difference between a hypothesis and a scientific theory.	SP7: Engage in argument from evidence
6	BC6	N/A	WHST.6-8.4	SWBAT interpret scientific data to write a conclusion summarizing experimental results.	(W): Write a 2-4 sentence conclusion that summarizes experimental results.	SP4: Analyze and interpret data
7	BC7	N/A	RST.6-8.9	SWBAT translate scientific data from a table or chart into a graph.	(R): Read a scientific table and explain the findings to a partner.	SP5: Use mathematics and computational thinking

Subject	PS6: Structure & Function
Unit	Unit 2: Earth & Space Science
Est. Length	17 lessons (September - October)
Big Idea	Earth has a specific place in the universe and specific structures that move within the Earth.
Essential Questions	1. What are the phases of the moon? 2. How do scientists determine the age of rocks and how they have moved over time? 3. How does the Earth relate to other celestial bodies?
MA State Standards *Power standards in bold	**6.MS-ESS1-1a. Develop and use a model of the Earth-Sun-Moon system to explain the causes of lunar phases and eclipses of the Sun and Moon.** ● Clarification Statement: Examples of models can be physical, graphical, or conceptual and should emphasize relative positions and distances. 6.MS-ESS1-4. Analyze and interpret rock layers and index fossils to determine the relative ages of rock formations that result from processes occurring over long periods of time. ● Clarification Statements: Analysis includes laws of superposition and cross cutting relationships limited to minor displacement faults that offset layers. Processes that occur over long periods of time include changes in rock types through weathering, erosion, heat, and pressure. ● State Assessment Boundary: Strata sequences that have been reordered or overturned, names of specific periods or epochs and events within them, or the identification and naming of minerals or rock types are not expected in state assessment. 6.MS-ESS1-5(MA). Use graphical displays to illustrate that Earth and its solar system are one of many in the Milky Way galaxy, which is one of billions of galaxies in the universe. ● Clarification Statement: Graphical displays can include maps, charts, graphs, and data tables. **6.MS-ESS2-3. Analyze and interpret maps showing the distribution of fossils and rocks, continental shapes, and seafloor structures to provide evidence that Earth's plates have moved great distances, collided, and spread apart.** ● Clarification Statement: Maps may show 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), similar to Wegener's visuals. ● State Assessment Boundary: Mechanisms for plate motion or paleomagnetic anomalies in oceanic and continental crust are not expected in state assessment.
Common Core State Standards (CCSS)	Reading ● RST.6-8.1: Cite specific textual evidence to support analysis of science and technical texts. ● RST.6-8.2: Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions. ● RST.6-8.3: Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks. ● RST.6-8.4: Determine the meaning of key symbols, key terms, and other domain-specific words and phrases as they are used in specific scientific or technical context relevant to grades 6 - 8. ● RST.6-8.5: Analyze the structure an author uses to organize a text, including how the major sections contribute to the whole and to an understanding of the topic. ● RST.6-8.6: Analyze the author's purpose in providing an explanation describing a procedure, or discussing an experiment in text. ● 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). ● RST.6-8.8: Distinguish among facts, reasoned judgment based on research findings, and speculation in a text. ● 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. ● RST.6-8.10: By the end of grade 8, read and comprehend science/technical texts in the grades 6-8 text complexity band independently and proficiently. Writing ● WHST.6-8.1: Write arguments focused on *discipline-specific content*. ○ WHST.6-8.1.A: Introduce claim(s) about a topic or issue, acknowledge and distinguish the claim(s) from alternate or opposing claims, and organize the reasons and evidence logically. ○ WHST.6-8.1.B: Support claim(s) with logical reasoning and relevant, accurate data and evidence that demonstrate an understanding of the topic or text, using credible sources. ○ WHST.6-8.1.C: Use words, phrases, and clauses to create cohesion and clarify the relationships among claim(s), counterclaims, reasons, and evidence. ○ WHST.6-8.1.D: Establish and maintain a formal style. ○ WHST.6-8.1.E: Provide a concluding statement or section that follows from and supports the argument presented. ● WHST.6-8.2: Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. ○ WHST.6-8.2.A: Introduce a topic clearly, previewing what is to follow; organize ideas, concepts,

	and information into broader categories as appropriate to achieving purpose; include formatting (e.g., headings), graphics (e.g., charts, tables), and multimedia when useful to aiding comprehension. ○ WHST.6-8.2.B: Develop the topic with relevant, well-chosen facts, definitions, concrete details, quotations, or other information and examples. ○ WHST.6-8.2.C: Use appropriate and varied transitions to create cohesion and clarify the relationships among ideas and concepts. ○ WHST.6-8.2.D: Use precise language and domain-specific vocabulary to inform about or explain the topic. ○ WHST.6-8.2.E: Establish and maintain a formal style and objective tone. ○ WHST.6-8.2.F: Provide a concluding statement or section that follows from and supports the information or explanation presented. ● WHST.6-8.4: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. ● WHST.6-8.5: 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, focusing on how well purpose and audience have been addressed. ● WHST.6-8.6: Use technology, including the Internet, to produce and publish writing and present the relationships between information and ideas clearly and efficiently. ● WHST.6-8.7: Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration. ● 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. ● WHST.6-8.9: Draw evidence from informational texts to support analysis, reflection, and research. ● WHST.6-8.10: Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.
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Assessment Alignment	Minor assessments ● ESS Quiz 1 (6.MS-ESS1-1a, 6.MS-ESS1-5(MA); Solar System, Earth-Sun-Moon System) ● ESS Quiz 2 (6.MS-ESS1-4, 6.MS-ESS2-3; Rock Layers, Continental Drift) Major assessments ● Earth-Sun-Moon model project- Lunar Phases ● Unit test
Honors Assignments	1) Using NASA.gov, read two different articles from the section “Stars and Galaxies.” The articles will be narrowed to 5 articles from which students will choose two. Summarize each article with a 7-10 sentence paragraph, describing important facts from the article. Also, students will write 3 scientifically based questions that could be answered through further investigation. Create a chart or graph illustrating differences between various galaxies. 2) Students will create a Powerpoint/Video showing how tectonic plates shifted from Pangaea and Gondwanaland to modern position. Students will also cite evidence of plate movement through fossils, continental shapes, etc. Students will include the predicted future position of plates.
20 Key Vocabulary Words	Axis, continental drift, crescent, Earth-Sun-Moon model, fossil record, galaxy, gibbous, index fossils, Law of Superposition, lunar eclipse, mid-ocean ridge, revolution, rock cycle, rotation, seafloor spreading, solar eclipse, solar system, subduction, waning, waxing

Prior knowledge that students have entering this unit
1. Students will know how to read and interpret scientific tables, graphs, and pictures. 2. Students will know how to use scientific tools for measurement, data collection, and analysis. 3. Students will have an understanding of important scientific vocabulary such as hypothesis, theory, observation, prediction, and experiment.

Where this knowledge goes next
1. Students will next study Life Science which connects to the location of fossils due to plate tectonics learned in the ESS unit. 2. Students will shift from a study of science encompassing the entire planet Earth and focus on individual life forms.

3. Students will apply knowledge from Earth & Space Science to later science topics through an understanding of how Earth processes affect life on Earth.

Descriptive outline narrative of unit

Students will begin the unit with an overview of how to use models to interpret data about the solar system and universe. This will be a carryover from Science Boot Camp where students learned how to utilize scientific charts, tables, and pictures. From here, students will explain how the Earth-Sun-Moon system causes seasonal changes as well as day and night. Students will also be able to explain the lunar phases and how eclipses are formed. Students will form an understanding of the large size of the universe and its contents, such as solar systems, galaxies, and planets. Students will then take a closer look at planet Earth and study how older rocks are typically found at deeper levels due to the Law of Superposition. Students will be able to identify how the Law of Superposition helps to illustrate the geologic time scale. Students will next learn about how plate tectonics shape Earth's surface through continental drift and the formation of mid-ocean rifts, earthquakes, volcanoes, and mountain ranges.

Day	Lesson #/name	MA	CCSS	Content Objective	Language Objective	Science practice(s)
1	ESS1	6.MS-ESS 1-1a	RST.6-8.9	SWBAT explain how to use various models to interpret data about the solar system and universe.	(R): Read a model to understand data about the solar system by identifying parts of the model.	SP2: Develop & use models
2	ESS2	6.MS-ESS 1-1a	RST.6-8.4	SWBAT explain how the side of the Earth facing the Sun causes day and night.	(S): Explain to a partner how the positions of Earth and the Sun create day and night by using: rotation, axis, sun, Earth.	SP7: Engage in argument from evidence
3	ESS3	6.MS-ESS 1-1a	WHST.6-8.7	SWBAT identify how Earth's tilt and rotation cause a change in seasons.	(W): Write a 2-4 sentence summary explaining how Earth's tilt and rotation cause a change in seasons by using: tilt, rotation, season.	SP8: Obtain, evaluate, and communicate information

4	ESS4	6.MS-ESS 1-1a	RST.6-8 .8	SWBAT identify and describe the 8 lunar phases.	(W): Write a sentence that explains each of the eight lunar phases by using the names of each phase.	SP4: Analyze and interpret data
5	ESS5	6.MS-ESS 1-1a	WHST. 6-8.1	SWBAT compare and contrast lunar and solar eclipses based on the Earth-Sun-Moon relationship.	(R): Read a diagram to explain the difference between solar eclipses and lunar eclipses by identifying the parts of the diagram.	SP6: Construct scientific explanations
6	ESS6	6.MS-ESS 1-5(MA)	WHST. 6-8.2	SWBAT explain that each star is a sun for its own solar system.	(S): Define a solar system to a partner by using: star, planet, moon, space.	SP8: Obtain, evaluate, and communicate information
7	ESS7	6.MS-ESS 1-5(MA)	RST.6-8 .7	SWBAT explain features that various types of galaxies and solar systems may possess including the location and number of planets.	(R): Read a diagram and identify types of stars and galaxies by pointing out different types of stars.	SP2: Develop & use models
8	ESS8	6.MS-ESS 1-4	WHST. 6-8.4	SWBAT explain how relative dating uses the Law of Superposition to determine the age of fossils.	(R): Identify how the Law of Superposition applies to fossils based on a diagram by identifying older and younger fossils.	SP7: Engage in argument from evidence
9	ESS9	6.MS-ESS 1-4	WHST. 6-8.5	SWBAT justify how index fossils are evidence that supports the Law of Superposition.	(W): Write 2-4 sentences explaining how fossil evidence supports the Law of Superposition using: Law of Superposition, index fossils, evidence..	SP7: Engage in argument from evidence
10	ESS10	6.MS-ESS 1-4	WHST. 6-8.8	SWBAT identify how the Law of Superposition provides evidence of the geologic time scale.	(L): In one sentence, summarize a partner's explanation of how the Law of Superposition contributes to the concept of the geologic time scale by relaying	SP1: Ask scientific questions

					the information to the partner.	
11	ESS11	6.MS-ESS 1-4	RST.6-8.1	SWBAT identify forces that transform rocks into different forms.	(R): Identify processes of the rock cycle based on a diagram by pointing out the steps on a diagram.	SP4: Analyze and interpret data
12	ESS12	6.MS-ESS 1-4	RST.6-8.8	SWBAT identify and describe the steps of the rock cycle.	(S): Explain to a partner one of the steps of the rock cycle by the name of the step and a description of how it occurs.	SP6: Construct scientific explanations
13	ESS13	6.MS-ESS 2-3	WHST.6-8.2	SWBAT draw a diagram that illustrates the process of seafloor spreading.	(W): Draw a diagram identifying the process of seafloor spreading using: seafloor spreading, mid-ocean rift, divergent.	SP2: Develop and use models
14	ESS14	6.MS-ESS 2-3	WHST.6-8.9	SWBAT describe the processes of how occurrences at subduction zones cause volcanoes, earthquakes, and mountain ranges.	(W): Define and summarize how volcanoes, earthquakes, or mountain ranges form by listing term and writing an accurate description..	SP8: Obtain, evaluate and communicate information
15	ESS15	6.MS-ESS 2-3	RST.6-8.10	SWBAT analyze and explain evidence for seafloor spreading based on fossil evidence.	(S): Explain to a partner how fossils support seafloor spreading by using: seafloor spreading, fossils, evidence.	SP7: Engage in argument from evidence
16	ESS16	6.MS-ESS 2-3	RST.6-8.9	SWBAT discuss the rate of seafloor spreading based on rock formations and fossil evidence.	(R): Read a diagram that illustrates seafloor spreading by pointing out parts of the diagram.	SP2: Develop & use models
17	ESS17	6.MS-ESS 2-3	RST.6-8.4	SWBAT identify evidence for the theory of continental drift based on continental similarities.	(W): Identify two pieces of evidence supporting the theory of continental drift by identifying parts of a diagram.	SP4: Analyze and interpret data

Subject	PS6: Structure & Function
Unit	Unit 3: Life Science
Est. Length	21 lessons (November - January)
Big Idea	Organisms share similar structures and are formed by multiple levels of organization.
Essential Questions	1. How can fossil evidence be used to find connections between organisms? 2. What are the functions of cell organelles? 3. How do body systems work together?
MA State Standards *Power standards in bold	6.MS-LS1-1. Provide evidence that all organisms (unicellular and multicellular) are made of cells. ● Clarification Statement: Evidence can be drawn from multiple types of organisms, such as plants, animals, and bacteria. **6.MS-LS1-2. Develop and use a model to describe how parts of cells contribute to the cellular functions of obtaining food, water, and other nutrients from its environment, disposing of wastes, and providing energy for cellular processes.** ● Clarification Statement: Parts of plant and animal cells include (a) the nucleus, which contains a cell's genetic material and regulates its activities; (b) chloroplasts, which produce necessary food (sugar) and oxygen through photosynthesis (in plants); (c) mitochondria, which release energy from food through cellular respiration; (d) vacuoles, which store materials, including water, nutrients, and waste; (e) the cell membrane, which is a selective barrier that enables nutrients to enter the cell and wastes to be expelled; and (f) the cell wall, which provides structural support (in plants). ● State Assessment Boundary: Specific biochemical steps or chemical processes, the role of ATP, active transport processes involving the cell membrane, or identifying or comparing different types of cells are not expected in state assessment. 6.MS-LS1-3. Construct an argument supported by evidence that the body systems interact to carry out essential functions of life. ● Clarification Statement: Emphasis is on the functions and interactions of the body systems, not specific body parts or organs. An argument should convey that different types of cells can join together to form specialized tissues, which in turn may form organs that work together as body systems. Body systems to be included are the circulatory, digestive, respiratory, excretory, muscular/skeletal, and nervous systems. □Essential

	functions of life include obtaining food and other nutrients (water, oxygen, minerals), releasing energy from food, removing wastes, responding to stimuli, maintaining internal conditions, and growing/developing. An example of interacting systems could include the respiratory system taking in oxygen from the environment which the circulatory system delivers to cells for cellular respiration, or the digestive system taking in nutrients which the circulatory system transports to cells around the body. ● State Assessment Boundary: The mechanism of one body system independent of others or the biochemical processes involved in body systems are not expected in state assessment. Describing the function or comparing different types of cells, tissues, or organs are not expected in state assessment. **6.MS-LSR-1 Analyze and interpret evidence from the fossil record to describe organisms and their environment, extinctions, and changes to life forms throughout the history of Earth.** ● Clarification Statement: Examples of evidence include sets of fossils that indicate a specific type of environment, anatomical structures that indicate the function of an organism in the environment, and fossilized tracks that indicate behavior of organisms. ● State Assessment Boundary: Names of individual species, geological eras in the fossil record, or mechanisms for extinction or speciation are not expected in state assessment. 6.MS-LS4-2 Construct an argument using anatomical structures to support evolutionary relationships among and between fossil organisms and modern organisms. ● Clarification Statement: Evolutionary relationships include (a) some organisms have similar traits with similar functions because they were inherited from a common ancestor, (b) some organisms have similar traits that serve similar functions because they live in similar environments, and (c) some organisms have traits inherited from common ancestors that no longer serve their original function because their environments are different than their ancestors' environments.
Common Core State Standards (CCSS)	Reading ● RST.6-8.1: Cite specific textual evidence to support analysis of science and technical texts. ● RST.6-8.2: Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions. ● RST.6-8.3: Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks. ● RST.6-8.4: Determine the meaning of key symbols, key terms, and other domain-specific words and phrases as they are used in specific scientific or technical context relevant to grades 6 - 8. ● RST.6-8.5: Analyze the structure an author uses to organize a text, including how the major sections contribute to the whole and to an understanding of the topic. ● RST.6-8.6: Analyze the author's purpose in providing an explanation describing a procedure, or discussing an experiment in text. ● 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). ● RST.6-8.8: Distinguish among facts, reasoned judgment based on research findings, and speculation in a text. ● 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. ● RST.6-8.10: By the end of grade 8, read and comprehend science/technical texts in the grades 6-8 text complexity band independently and proficiently. Writing ● WHST.6-8.1: Write arguments focused on *discipline-specific content*. ○ WHST.6-8.1.A: Introduce claim(s) about a topic or issue, acknowledge and distinguish the claim(s) from alternate or opposing claims, and organize the reasons and evidence logically. ○ WHST.6-8.1.B: Support claim(s) with logical reasoning and relevant, accurate data and evidence that demonstrate an understanding of the topic or text, using credible sources. ○ WHST.6-8.1.C: Use words, phrases, and clauses to create cohesion and clarify the relationships among claim(s), counterclaims, reasons, and evidence. ○ WHST.6-8.1.D: Establish and maintain a formal style. ○ WHST.6-8.1.E: Provide a concluding statement or section that follows from and supports the argument presented. ● WHST.6-8.2: Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. ○ WHST.6-8.2.A: Introduce a topic clearly, previewing what is to follow; organize ideas, concepts, and information into broader categories as appropriate to achieving purpose; include formatting (e.g., headings), graphics (e.g., charts, tables), and multimedia when useful to aiding comprehension. ○ WHST.6-8.2.B: Develop the topic with relevant, well-chosen facts, definitions, concrete details, quotations, or other information and examples. ○ WHST.6-8.2.C: Use appropriate and varied transitions to create cohesion and clarify the relationships among ideas and concepts. ○ WHST.6-8.2.D: Use precise language and domain-specific vocabulary to inform about or explain the topic. ○ WHST.6-8.2.E: Establish and maintain a formal style and objective tone. ○ WHST.6-8.2.F: Provide a concluding statement or section that follows from and supports the information or explanation presented. ● WHST.6-8.4: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. ● WHST.6-8.5: 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, focusing on how well purpose and

	audience have been addressed. ● WHST.6-8.6: Use technology, including the Internet, to produce and publish writing and present the relationships between information and ideas clearly and efficiently. ● WHST.6-8.7: Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration. ● 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. ● WHST.6-8.9: Draw evidence from informational texts to support analysis, reflection, and research. ● WHST.6-8.10: Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.
Science Practices (SP)	**1. Asking scientific questions & defining engineering problems** 2. Developing & using models 3. Planning & carrying out investigations **4. Analyzing & interpreting data** 5. Using mathematics & computational thinking 6. Constructing scientific explanations & designing engineering solutions **7. Engaging in argument from evidence** 8. Obtaining, evaluating, and communicating information
Assessment Alignment	Minor assessments ● LS Quiz 1 (6.MS-LS4-1, 6.MS-LS4-2; Biological Evolution) ● LS Quiz 2 (6.MS-LS1-3; Body Systems) Major assessments ● **Cell analogy project (6.MS-LS1-1; 6.MS-LS1-2)** ● Unit test
Honors Assignments	Students will create a poster illustrating how either the immune system or digestive system affect the musculoskeletal system.
20 Key Vocabulary Words	Fossil, environment, anatomy, structure, organism, evolution, cell, organelle, organ, tissue, cardiovascular system, respiratory system, musculoskeletal system, homeostasis, unicellular, multicellular, nucleus, mitochondria, cell membrane, plant cell

Prior knowledge that students have entering this unit
1. Students will understand how to read, analyze and explain scientific charts, graphs, and illustrations. 2. Students will have a knowledge of fossils based on plate tectonics and will expand upon this understanding. 3. Students will be able to explain that the Earth is part of the solar system and Milky Way galaxy and that its interaction with the Sun and Moon impact life on Earth.

Where this knowledge goes next
1. Students will apply knowledge learned about the entire Earth to knowledge of individual life forms. 2. Previous information regarding plate tectonics will develop into a closer study of how life forms have evolved over time and how individual organisms are composed. 3. A breakdown of the hierarchy of life will be investigated and students will be able to explain the components of life forms.

Descriptive outline narrative of unit
Students will begin by connecting the Life Science unit with the Earth Science unit by expanding upon previously learned knowledge regarding fossils. First, students will look into specific adaptations observed in fossils to explain how adaptations provide information about organisms and the environment. Students will expand this understanding by categorizing fossils based on environmental evidence and anatomical similarities and hypothesize reasons for extinction. This will bring students to an explanation of observed evolutionary changes in organisms over time based on fossil evidence. Students will observe homologous anatomical similarities between organisms and infer evolutionary relationships between organisms, culminating in a claim that modern and prehistoric organisms are connected. Students will observe evidence that organisms adapt to environments over time and hypothesize how this process occurs. Based on this evidence, students will learn the basics of the cell theory and explain that living things are made of cells and have similar characteristics. Next, students will identify and distinguish the functions of various organelles within cells that make survival possible. Furthermore, students will compare and contrast plant cells with animal cells and be able to explain how organelles work together to ensure survival. Students will identify the levels of organization within living things and the four major observable levels

of organization within the human body. Students will understand how the parts of the human body work together to continue life and will specifically be able to explain the functions of the cardiovascular, respiratory, and musculoskeletal systems.

Day	Lesson #/name	MA	CCSS	Content Objective	Language Objective	Science practice(s)
1	LS1	6.MS-LS4-1	WHST.6-8.1	SWBAT describe how adaptations observed in fossils can provide information about organisms and their environment.	(R): Read a diagram comparing fossils to identify how an organism moves.	SP2: Using models
2	LS2	6.MS-LS4-1	RST.6-8.9	SWBAT place fossils into categories based on environmental evidence and hypothesize reasons for extinction.	(W): Explain reasons in 2-4 sentences why an organism may have become extinct by using evidence.	SP7: Engaging in argument from evidence
3	LS3	6.MS-LS4-1	WHST.6-8.1	SWBAT analyze fossils to describe similarities between different organisms.	(R): Read a diagram of a fossil to identify how organisms are similar based on the shape of their limbs.	SP4: Analyzing data
4	LS4	6.MS-LS4-1	WHST.6-8.2	SWBAT describe changes to the structure of organisms over time based on fossil evidence.	(L): Listen to a video describing changes to organisms and explain 2-4 facts to a partner.	SP8: Obtaining & communicating information
5	LS5	6.MS-LS4-2	RST.6-8.9	SWBAT identify homologous anatomical similarities between various organisms.	(R): Identify 2-4 similarities between 2 organisms based on body structure.	SP4: Analyzing and interpreting data
6	LS6	6.MS-LS4-2	WHST.6-8.1	SWBAT justify how anatomical similarities can be used to infer the evolutionary relationships between organisms.	(S): Explain to a partner how organisms are related based on 2-4 pieces of evidence from their body structure.	SP7: Engage in argument from evidence
7	LS7	6.MS-LS4-2	WHST.6-8.9	SWBAT justify the claim that modern and prehistoric organisms are connected through evolution.	(W): Use evidence to describe how modern and prehistoric organisms are related in 2-4	SP6: Constructing scientific explanations

					sentences.	
8	LS8	6.MS-LS4-2	WHST.6-8.6	SWBAT explain how organisms evolve and adapt to the environment over time. (brief introduction to genetic modification and mutations in cells).	(W): Connect the words *evolve* and *adapt* to live organisms by writing a 3-5 sentence paragraph.	SP8: Obtaining and communicating information
9	LS9	6.MS-LS1-1	WHST.6-8.10	SWBAT explain that living things are made of cells that have common characteristics.	(L): Listen to a video explaining what living things have in common and construct a list of commonalities	SP1: Asking scientific questions
10	LS10	6.MS-LS1-1	WHST.6-8.4	SWBAT describe differences between unicellular and multicellular organisms.	(R): Read a diagram and identify three differences between cells	SP2: Developing and using models
11	LS11	6.MS-LS1-2	WHST.6-8.10	SWBAT name and explain the three parts of the cell theory.	(S): Explain 1 part of cell theory in detail to a partner using the words *cell, life, organization*	SP8: Obtaining & communicating information
12	LS12	6.MS-LS1-2	RST.6-8.8	SWBAT identify and distinguish the function of different cell organelles.	(R): Read a list of organelle jobs and identify the correct job for each organelle.	SP4: Analyzing and interpreting data
13	LS13	6.MS-LS1-2	WHST.6-8.2	SWBAT explain how organelles work together to help cells function.	(W): Explain the roles of 3 different organelles in the cell	SP6: Construct scientific explanations
14	LS14	6.MS-LS1-2	RST.6-8.9	SWBAT compare and contrast plant and animal cells.	(S): Explain how plant and animal cells are different to a partner with at least 2 examples.	SP7: Engaging in argument from evidence
15	LS15	6.MS-LS1-2	WHST.6-8.8	SWBAT build a model of a cell and identify the function of various organelles.	(S): Explain the function of organelles to a partner while building a model of a cell	SP3: Plan & carry out investigations
16	LS16	6.MS-LS1-3	RST.6-8.7	SWBAT identify the eight levels of organization of living things.	(R): Read a diagram and identify the 8 levels of organization within living things	SP2: Develop & use models

17	LS17	6.MS-LS1-3	WHST.6-8.2	SWBAT describe the four levels of organization within the human body.	(W): Describe in 2-4 sentences one level of organization within the human body	SP7: Engaging in argument from evidence
18	LS18	6.MS-LS1-3	WHST.6-8.9	SWBAT work in groups to explain how each level of organization in the human body works together.	(S): Explain to a partner in 2-4 sentences how one level of the human body works together	SP4: Analyzing & interpreting data
19	LS19	6.MS-LS1-3	WHST.6-8.6	SWBAT explain the functions of the cardiovascular and respiratory systems.	(R): Read a diagram and identify the relationship between the cardiovascular and respiratory systems.	SP2: Develop & use models
20	LS20	6.MS-LS1-3	RST.6-8.1	SWBAT explain the function and importance of the musculoskeletal system.	(W): Explain 3 ways that the musculoskeletal system is used on a daily basis to help humans move	SP1: Asking scientific questions
21	LS21	6.MS-LS1-3	WHST.6-8.2	SWBAT describe how body systems work together.	(S): Explain to a partner how at least two different body systems work together using two pieces of evidence	SP7: Engaging in argument from evidence

Subject	PS6: Structure & Function
Unit	Unit 4: Physical Science
Est. Length	20 lessons (January - March)
Big Idea	Matter interacts with its environment through physical forces and chemical reactions.
Essential Questions	1. How does matter interact with its environment? 2. How are substances characterized by their physical and chemical properties? 3. How do waves travel through various mediums?
MA State Standards *Power standards in bold	**6.MS-PS1-6 Plan and conduct an experiment involving exothermic and endothermic chemical reactions to measure and describe the release or absorption of thermal energy.** ● Clarification Statement: Emphasis is on describing transfer of energy to and from the environment. Examples of chemical reactions could include dissolving ammonium chloride or calcium chloride. 6.MS-PS1-7(MA) Use a particulate model of matter to explain that density is the amount of matter (mass) in a given volume. Apply proportional reasoning to describe, calculate, and compare relative densities of different materials. 6.MS-PS1-8(MA) Conduct an experiment to show that many materials are mixtures of pure substances that can be separated by physical means into their component pure substances. ● Clarification Statement: Examples of common mixtures include salt water, oil and vinegar, milk, and air. 6.MS-PS2-4 Use evidence to support the claim that gravitational forces between objects are attractive and are only noticeable when one or both of the objects have a very large mass. ● Clarification Statement: Examples of objects with very large masses include the Sun, Earth, and other planets. ● State Assessment Boundary: Newton's law of gravitation or Kepler's laws are not expected in state assessment. **6.MS-PS4-1 Use diagrams of a simple wave to explain that (a) a wave has a repeating pattern with a specific amplitude, frequency, and wavelength, and (b) the amplitude of a wave is related to the energy of the wave.** ● State Assessment Boundaries: Electromagnetic waves are not expected in state assessment. State assessment will be limited to standard repeating waves.

	6.MS-PS4-2 Use diagrams and other models to show that both light rays and mechanical waves are reflected, absorbed, or transmitted through various materials. ● Clarification Statements: Materials may include solids, liquids, and gases. Mechanical waves (including sound) need a material (medium) through which they are transmitted. Examples of models could include drawings, simulations, and written descriptions. ● State Assessment Boundary: State assessment will be limited to qualitative applications. 6.MS-PS4-3 Present qualitative scientific and technical information to support the claim that digitized signals (sent as wave pulses representing 0s and 1s) can be used to encode and transmit information. ● State Assessment Boundary: Binary counting or the specific mechanism of any given device are not expected in state assessment.
Common Core State Standards (CCSS)	Reading ● RST.6-8.1: Cite specific textual evidence to support analysis of science and technical texts. ● RST.6-8.2: Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions. ● RST.6-8.3: Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks. ● RST.6-8.4: Determine the meaning of key symbols, key terms, and other domain-specific words and phrases as they are used in specific scientific or technical context relevant to grades 6 - 8. ● RST.6-8.5: Analyze the structure an author uses to organize a text, including how the major sections contribute to the whole and to an understanding of the topic. ● RST.6-8.6: Analyze the author's purpose in providing an explanation describing a procedure, or discussing an experiment in text. ● 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). ● RST.6-8.8: Distinguish among facts, reasoned judgment based on research findings, and speculation in a text. ● 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. ● RST.6-8.10: By the end of grade 8, read and comprehend science/technical texts in the grades 6-8 text complexity band independently and proficiently. Writing ● WHST.6-8.1: Write arguments focused on *discipline-specific content*. ○ WHST.6-8.1.A: Introduce claim(s) about a topic or issue, acknowledge and distinguish the claim(s) from alternate or opposing claims, and organize the reasons and evidence logically.

	○ WHST.6-8.1.B: Support claim(s) with logical reasoning and relevant, accurate data and evidence that demonstrate an understanding of the topic or text, using credible sources. ○ WHST.6-8.1.C: Use words, phrases, and clauses to create cohesion and clarify the relationships among claim(s), counterclaims, reasons, and evidence. ○ WHST.6-8.1.D: Establish and maintain a formal style. ○ WHST.6-8.1.E: Provide a concluding statement or section that follows from and supports the argument presented. ● WHST.6-8.2: Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. ○ WHST.6-8.2.A: Introduce a topic clearly, previewing what is to follow; organize ideas, concepts, and information into broader categories as appropriate to achieving purpose; include formatting (e.g., headings), graphics (e.g., charts, tables), and multimedia when useful to aiding comprehension. ○ WHST.6-8.2.B: Develop the topic with relevant, well-chosen facts, definitions, concrete details, quotations, or other information and examples. ○ WHST.6-8.2.C: Use appropriate and varied transitions to create cohesion and clarify the relationships among ideas and concepts. ○ WHST.6-8.2.D: Use precise language and domain-specific vocabulary to inform about or explain the topic. ○ WHST.6-8.2.E: Establish and maintain a formal style and objective tone. ○ WHST.6-8.2.F: Provide a concluding statement or section that follows from and supports the information or explanation presented. ● WHST.6-8.4: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. ● WHST.6-8.5: 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, focusing on how well purpose and audience have been addressed. ● WHST.6-8.6: Use technology, including the Internet, to produce and publish writing and present the relationships between information and ideas clearly and efficiently. ● WHST.6-8.7: Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration. ● 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. ● WHST.6-8.9: Draw evidence from informational texts to support analysis, reflection, and research. ● WHST.6-8.10: Write routinely over extended time frames (time for reflection and revision) and shorter time

	frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.
Science Practices (SP)	**1. Asking scientific questions & defining engineering problems** 2. Developing & using models 3. Planning & carrying out investigations **4. Analyzing & interpreting data** 5. Using mathematics & computational thinking 6. Constructing scientific explanations & designing engineering solutions **7. Engaging in argument from evidence** 8. Obtaining, evaluating, and communicating information
Assessment Alignment	Minor assessments ● PS Quiz 1 (PS1-6, PS1-7, PS1-8; Matter and Interactions) ● PS Quiz 2 (PS4-1, PS4-2, PS4-3; Waves and Applications) Major assessments ● Students will create an “Astronaut Lab Manual” describing effects of gravity on mass and weight ● Unit test
Honors Assignments	1) Create a poster of 10 mixtures and/or suspensions and list the ingredients of each as well as a specific use of each mixture/suspension. Provide the chemical formula. 2) Go to “sciencenewsforstudents.org” and find 1 article each from a Physics, Chemistry, and Technology topic. Students will identify 5 key words from each article, define each, and write a student-produced sentence using the word. Students will also write a summary paragraph of each article (5-10 sentences) and also write a paragraph connecting the information from the article to their daily life/experiences. Students will also produce a graphic (personal photograph/drawing/etc.) for each article.
20 Key Vocabulary Words	Chemical reaction, exothermic, endothermic, heat, transfer, mass, weight, density, pure substance, mixture, solution, suspension, gravitational force (gravity), reflect, absorb, transmit, mechanical wave, frequency, wavelength, amplitude

Prior knowledge that students have entering this unit
1. Students can explain how the body systems work together to maintain homeostasis.

2. Students can compare similarities between various organisms based on common evolutionary characteristics.
3. Students can read diagrams and identify key facts from illustrations portraying scientific information.

Where this knowledge goes next

1. SWBAT explain how the human body is affected by physical science principles of gravity and chemical reactions.
2. SWBAT compare mixtures and substances based on physical and chemical characteristics.
3. SWBAT read and interpret diagrams portraying waves and explain information from the diagram.

Descriptive outline narrative of unit

Students will begin the unit with exposure to chemical reactions. Students will be able to identify characteristics of chemical reactions that indicate that such a reaction has occurred. Following this, students will investigate how energy is transferred between an object and its surroundings. This leads students to comparing endothermic and exothermic reactions and students will be able to identify evidence that each type of reaction has occurred.

From here students will begin looking at physical characteristics of objects. First, students will make the observation that objects can have the same size but maintain different densities. Next, students will learn how to calculate the density of various objects using the density formula. Following this, students will learn to explain the difference and name examples of pure substances and mixtures. Students will perform an experiment that uses physical means to separate a mixture into pure substances. From here, students will identify the difference between mass and weight and explain how these factors differ in different places within the Solar system. Students will demonstrate knowledge that gravitational force is affected by mass and the distance between objects. Students will be able to explain that gravitational forces differ depending on location.

After this, students will begin learning how to interpret a diagram portraying a wave. Students will first learn to identify the various parts of a wave. Using this knowledge, students will explain how mechanical waves and sound waves have specific, consistent characteristics that can be recognized in an illustration. Students will be able to identify how waves move through absorption, reflection and transmission as well as the reasons why waves speed up and slow down in various media. Next students will explain

how waves travel through solids and how light waves travel through gases. Finally, students will use their acquired knowledge to explain how digital signals can be used to encode and transmit information.

Day	Lesson #/name	MA	CCSS	Content Objective	Language Objective	Science practice(s)
1	PS1	6.MS-PS1-6	WHST.6-8.1	SWBAT provide examples of physical properties, physical changes, chemical properties, and chemical changes.	(R): Identify in a table 2-3 examples of chemical properties or changes.	SP4: Analyzing & interpreting data
2	PS2	6.MS-PS1-6	WHST.6-8.2	SWBAT identify characteristics that provide evidence that a chemical reaction has occurred.	(L): Identify from a video 3-5 characteristics of evidence that chemical reactions have occurred.	SP8: Obtaining, evaluating, and communicating information
3	PS3	6.MS-PS1-6	WHST.6-8.2	SWBAT explain how energy is transferred between the environment and the surroundings.	(R): Read a diagram to describe how energy is transferred within the environment	SP4: Analyzing & interpreting data
4	PS4	6.MS-PS1-6	WHST.6-8.4	SWBAT explain the difference between an exothermic and endothermic reaction.	(S): Explain to a partner the definition of an exothermic reaction.	SP8: Obtaining, evaluating, and communicating information
5	PS5	6.MS-PS1-6	RST.6-8.9	SWBAT identify evidence that an exothermic or endothermic reaction has occurred.	(W): Write 2-4 sentences using evidence from a demonstration that a chemical reaction has occurred.	SP6: Constructing scientific explanations & designing engineering solutions
6	PS6	6.MS-PS1-7 (MA)	WHST.6-8.9	SWBAT describe how objects can have the same size but different densities.	(S): Explain to a partner that a bowling ball and soccer ball have different densities.	SP1: Asking scientific questions & defining engineering problems
7	PS7	6.MS-PS1-7 (MA)	RST.6-8.3	SWBAT calculate the density of various objects.	(R): Read a diagram and identify the density formula.	SP5: Using mathematics & computational thinking
8	PS8	6.MS-	RST.6-8	SWBAT identify the difference	(W): Justify if a substance is	SP6: Constructing scientific

		PS1-8 (MA)	.8	between pure substances and mixtures.	pure using 2 pieces of evidence.	explanations & designing engineering solutions
9	PS9	6.MS-PS1-8 (MA)	RST.6-8 .3	SWBAT perform an experiment that uses physical means to separate a mixture into two pure substances.	(R): Read directions in a lab procedure to separate two substances.	SP3: Planning & carrying out investigations
10	PS10	6.MS-PS2-4	WHST. 6-8.2	SWBAT explain the difference between mass and weight and how these vary at different places in the Solar System.	(S): Explain to a partner the difference between mass and weight of astronauts.	SP7: Engaging in argument from evidence
11	PS11	6.MS-PS2-4	WHST. 6-8.7	SWBAT explain how mass affects gravitational force between one or more objects with large mass.	(W): Identify two examples that show how mass affects gravity.	SP4: Analyzing & interpreting data
12	PS12	6.MS-PS2-4	WHST. 6-8.8	SWBAT demonstrate and provide examples of how objects exert gravitational forces on each other.	(W): Identify 2-3 examples in a data table of how objects exert gravitational forces on each other.	SP8: Obtaining, evaluating, and communicating information
13	PS13	6.MS-PS2-4	RST.6-8 .10	SWBAT identify that gravitational forces exist in space based on observations of objects in the solar system.	(L): Summarize from a video about how gravity affects objects in space.	SP2: Developing & using models
14	PS14	6.MS-PS4-1	RST.6-8 .8	SWBAT identify the four parts of a wave.	(R): Read a diagram and identify the trough, crest, amplitude, and wavelength of a wave.	SP5: Using mathematics & computational thinking
15	PS15	6.MS-PS4-1	WHST. 6-8.1	SWBAT explain how mechanical energy and waves have specific, consistent characteristics.	(S): Explain to a partner 2 consistent & specific traits of waves.	SP2: Developing & using models
16	PS16	6.MS-PS4-2	RST.6-8 .2	SWBAT identify the difference between waves that reflect, absorb, and transmit.	(W): Explain in 2 sentences how waves reflect, absorb, or transmit through a substance.	SP7: Engaging in argument from evidence

17	PS17	6.MS-PS4-2	WHST.6-8.9	SWBAT explain how waves speed up and slow down in different media.	(S): Explain to a partner how waves speed up when moving through a medium.	SP1: Asking scientific questions & defining engineering problems
18	PS18	6.MS-PS4-2	WHST.6-8.6	SWBAT explain how mechanical waves, like an earthquake, can travel through solids.	(S): Explain to a partner how mechanical waves travel through Earth's crust.	SP4: Analyzing & interpreting data
19	PS19	6.MS-PS4-2	RST.6-8.1	SWBAT identify how light waves travel using reflection, absorption, transmission.	(R): Read a chart to identify how waves travel using reflection, absorption, or transmission.	SP6: Constructing scientific explanations & designing engineering solutions
20	PS20	6.MS-PS4-3	WHST.6-8.6	SWBAT explain how digital signals can be used to encode and transmit information.	(W): Write 2-4 sentences explaining how information is transmitted.	SP1: Asking scientific questions & defining engineering problems

Subject	PS6: Structure & Function
Unit	Unit 5: Technology & Engineering
Est. Length	20 lessons (March - June)
Big Idea	Solutions to design problems can be solved by utilizing various materials, tools, and manufacturing processes.
Essential Questions	1. What materials are appropriate to create a prototype? 2. How can one find a successful solution to a design problem? 3. What is the iterative design process?
MA State Standards *Power standards in bold	**6.MS-ETS1-1 Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution. Include potential impacts on people and the natural environment that may limit possible solutions.** 6.MS-ETS1-5(MA) Create visual representations of solutions to a design problem. Accurately interpret and apply scale and proportion to visual representations. ● Clarification Statements: Examples of visual representations can include sketches, scaled drawings, and orthographic projections. Examples of scale can include 1⁄4″ = 1′0″ and 1 cm = 1 m. 6.MS-ETS1-6(MA) Communicate a design solution to an intended user, including design features and limitations of the solution. ● Clarification Statement: Examples of intended users can include students, parents, teachers, manufacturing personnel, engineers, and customers. **6.MS-ETS2-1(MA) Analyze and compare properties of metals, plastics, wood, and ceramics, including flexibility, ductility, hardness, thermal conductivity, electrical conductivity, and melting point.** 6.MS-ETS2-2(MA) Given a design task, select appropriate materials based on specific properties needed in the construction of a solution. ● Clarification Statement: Examples of materials can include metals, plastics, wood, and ceramics. 6.MS-ETS2-3(MA) Choose and safely use appropriate measuring tools, hand tools, fasteners, and common

	hand-held power tools used to construct a prototype. ● Examples of measuring tools include a tape measure, a meter stick, and a ruler. ● Examples of hand tools include a hammer, a screwdriver, a wrench, and pliers. ● Examples of fasteners include nails, screws, nuts and bolts, staples, glue, and tape. ● Examples of common power tools include jigsaw, drill, and sander.
Common Core State Standards (CCSS)	Reading ● RST.6-8.1: Cite specific textual evidence to support analysis of science and technical texts. ● RST.6-8.2: Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions. ● RST.6-8.3: Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks. ● RST.6-8.4: Determine the meaning of key symbols, key terms, and other domain-specific words and phrases as they are used in specific scientific or technical context relevant to grades 6 - 8. ● RST.6-8.5: Analyze the structure an author uses to organize a text, including how the major sections contribute to the whole and to an understanding of the topic. ● RST.6-8.6: Analyze the author's purpose in providing an explanation describing a procedure, or discussing an experiment in text. ● 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). ● RST.6-8.8: Distinguish among facts, reasoned judgment based on research findings, and speculation in a text. ● 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. ● RST.6-8.10: By the end of grade 8, read and comprehend science/technical texts in the grades 6-8 text complexity band independently and proficiently. Writing ● WHST.6-8.1: Write arguments focused on *discipline-specific content*. ○ WHST.6-8.1.A: Introduce claim(s) about a topic or issue, acknowledge and distinguish the claim(s) from alternate or opposing claims, and organize the reasons and evidence logically. ○ WHST.6-8.1.B: Support claim(s) with logical reasoning and relevant, accurate data and evidence that demonstrate an understanding of the topic or text, using credible sources. ○ WHST.6-8.1.C: Use words, phrases, and clauses to create cohesion and clarify the relationships among claim(s), counterclaims, reasons, and evidence. ○ WHST.6-8.1.D: Establish and maintain a formal style. ○ WHST.6-8.1.E: Provide a concluding statement or section that follows from and supports the argument presented.

	● WHST.6-8.2: Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. ○ WHST.6-8.2.A: Introduce a topic clearly, previewing what is to follow; organize ideas, concepts, and information into broader categories as appropriate to achieving purpose; include formatting (e.g., headings), graphics (e.g., charts, tables), and multimedia when useful to aiding comprehension. ○ WHST.6-8.2.B: Develop the topic with relevant, well-chosen facts, definitions, concrete details, quotations, or other information and examples. ○ WHST.6-8.2.C: Use appropriate and varied transitions to create cohesion and clarify the relationships among ideas and concepts. ○ WHST.6-8.2.D: Use precise language and domain-specific vocabulary to inform about or explain the topic. ○ WHST.6-8.2.E: Establish and maintain a formal style and objective tone. ○ WHST.6-8.2.F: Provide a concluding statement or section that follows from and supports the information or explanation presented. ● WHST.6-8.4: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. ● WHST.6-8.5: 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, focusing on how well purpose and audience have been addressed. ● WHST.6-8.6: Use technology, including the Internet, to produce and publish writing and present the relationships between information and ideas clearly and efficiently. ● WHST.6-8.7: Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration. ● 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. ● WHST.6-8.9: Draw evidence from informational texts to support analysis, reflection, and research. ● WHST.6-8.10: Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.
Science Practices (SP)	1. **Asking scientific questions & defining engineering problems** 2. Developing & using models 3. Planning & carrying out investigations 4. **Analyzing & interpreting data** 5. Using mathematics & computational thinking

	6. Constructing scientific explanations & designing engineering solutions **7. Engaging in argument from evidence** 8. Obtaining, evaluating, and communicating information
Assessment Alignment	Minor assessments ● ETS Quiz 1 (ETS1-1; ETS1-5; ETS1-6; Engineering Design) ● ETS Quiz 2 (ETS2-1; ETS2-2; Materials, Tools & Manufacturing) Major assessments ● Students will design a go-kart out of recycled materials for which they will design a prototype and create their go-kart based on engineering principles ● Unit test
Honors Assignments	Design a second go-kart based on the analysis of the first go-kart to create one that is faster. Students will write a lab report describing the new choices of materials. The second go-kart must demonstrate knowledge of safe use of hand tools and common power tools.
20 Key Vocabulary Words	Iterative design problem, solution, limitations, flexibility, ductility, hardness, electrical conductivity, thermal conductivity, physical properties, physical characteristic, prototype, scientific method, design, speed, velocity, acceleration, mass, weight, friction

Prior knowledge that students have entering this unit
1. Students will have achieved a knowledge of physical science concepts in the field of physics and can explain the types of waves and how these disturbances travel through various media. 2. Students have demonstrated understanding of chemistry concepts from physical science and can identify chemical properties, chemical changes, physical properties and physical changes. 3. Students have been introduced to the scientific method and can identify variables.

Where this knowledge goes next
1. Students will use knowledge of physics to create a successful prototype of a go-kart that will operate in a race. 2. Students will use knowledge of chemistry to select appropriate materials for iterative designs.

3. Students will develop understanding of the scientific method and variables through the use of various iterative designs which will allow students to demonstrate adequacy with scientific concepts.

Descriptive outline narrative of unit

Students will begin the unit with reviewing the process of the scientific method to review critical information necessary to begin a unit based on iterative design and engineering. Students will review the scientific method and the concepts of variables, constants and controls and practice identifying these concepts in various scenarios. Additionally, students will identify the criteria and constraints of an iterative design problem, building upon their previously learned skills. Students will learn to explain how solutions can impact both people and the environment. From here, students will learn the parts necessary for an effective visual representation of information and will create a diagram displaying information. Students will learn to identify features and limitations to various solutions to design problems and will present this information to peers to demonstrate mastery. Next, students will compare materials useful in design. Students will compare properties of various materials and explain the difference between characteristics of a variety of materials. Using observation, students will also learn to compare and explain differences in materials used in design based on physical properties and characteristics. Using this mastered knowledge, students will plan a solution to an iterative design problem and create a model solution. Students will demonstrate this knowledge through the creation of a prototype for a go-kart using recycled materials. Students will complete the construction of their go-kart and will present their design choices to their peers.

Day	Lesson #/name	MA	CCSS	Content Objective	Language Objective	Science practice(s)
1	ETS1	6.MS-ETS1-1	WHST.6-8.2	SWBAT explain the steps and purpose of the scientific method.	W: Write the basic steps of the scientific method	SP8: Obtaining, evaluating, and communicating information
2	ETS2	6.MS-ETS1-1	RST.6-8.1	SWBAT identify the criteria and constraints of an iterative design problem.	R: Identify criteria for an iterative design problem from a listed purpose	SP1: Asking scientific questions & defining engineering problems
3	ETS3	6.MS-ETS1-1	WHST.6-8.1	SWBAT explain how iterative design solutions can impact people and the	S: Explain to a partner how a solution can make a positive	SP7: Engaging in argument from evidence

				environment.	impact on the environment	
4	ETS4	6.MS-ETS1-5	RST.6-8.9	SWBAT identify the necessary parts of a visual representation needed to solve an iterative design problem.	R: Identify necessary parts of a diagram to solve a problem	SP3: Planning & carrying out investigations
5	ETS5	6.MS-ETS1-5	WHST.6-8.8	SWBAT create a visual representation of a solution for an iterative design problem.	W: Write 2-4 sentences that explain that each part of a diagram has a purpose	SP2: Developing & using models
6	ETS6	6.MS-ETS1-5	RST.6-8.10	SWBAT interpret the visual representations of solutions to iterative design problems.	S: Explain the legend of a diagram to a partner to identify a given solution to a problem	SP4: Analyzing & interpreting data
7	ETS7	6.MS-ETS1-6	RST.6-8.7	SWBAT identify the features and limitations to iterative design solutions.	L: Identify limitations to a solution from a video's solution to a problem	SP8: Obtaining, evaluating, and communicating information
8	ETS8	6.MS-ETS1-6	WHST.6-8.7	SWBAT present iterative design solutions to peers.	S: Explain a design proposal to a group of peers using the words *design, solution, variable*	SP7: 7. Engaging in argument from evidence
9	ETS9	6.MS-ETS2-1	WHST.6-8.9	SWBAT compare the properties of materials like metals, plastics, wood, and ceramics.	R: Interpret a data table comparing properties of metals, plastic and woods	SP4: Analyzing & interpreting data
10	ETS10	6.MS-ETS2-1	WHST.6-8.4	SWBAT explain the difference between flexibility, ductility, hardness, conductivity.	W: In 2-4 sentences identify the properties of a substance	SP1: Asking scientific questions & defining engineering problems
11	ETS11	6.MS-ETS2-1	WHST.6-8.5	SWBAT explain how materials differ in physical properties.	S: Explain the properties of a substance to a partner, focusing on color, size, and shape	SP6: Constructing scientific explanations & designing engineering solutions
12	ETS12	6.MS-ETS2-1	WHST.6-8.7	SWBAT compare materials based on their physical properties and characteristics.	W: Compare in 2-4 sentences how 2 materials differ in physical properties.	SP4: Analyzing & interpreting data

13	ETS13	6.MS-ETS2-2	RST.6-8.3	SWBAT identify appropriate materials to execute a successful iterative design solution.	R: Identify materials for a design based on reading a prototype.	SP8: Obtaining, evaluating, and communicating information
14	ETS14	6.MS-ETS2-2	RST.6-8.3	SWBAT use the scientific method to construct a solution to an iterative design problem.	W: List how the scientific method applies to a design solution.	SP1: Asking scientific questions & defining engineering problems
15	ETS15	6.MS-ETS2-2	WHST.6-8.6	SWBAT design a model to solve a iterative design problem.	S: Explain to a partner why a model would solve a design problem.	SP7: Engaging in argument from evidence
16	ETS16	6.MS-ETS2-2	WHST.6-8.9	SWBAT use knowledge of design to create a solution for an iterative design problem.	R: Identify materials useful to make a go-kart from a chart.	SP3: Planning & carrying out investigations
17	ETS17	6.MS-ETS2-3	WHST.6-8.2	SWBAT plan a prototype for a go-kart using recycled materials.	W: Explain a material design choice for a go-kart prototype.	SP6: 6. Constructing scientific explanations & designing engineering solutions
18	ETS18	6.MS-ETS2-3	RST.6-8.4	SWBAT utilize hand tools and fasteners to create a go-kart.	S: Explain to a partner 2 safety measures for a hand tool.	SP3: Planning & carrying out investigations
19	ETS19	6.MS-ETS2-3	RST.6-8.3	SWBAT complete the construction of a go-kart based on iterative design principles.	W: Defend a design choice in 2-4 sentences.	SP7: Engaging in argument from evidence
20	ETS20	6.MS-ETS2-3	WHST.6-8.2	SWBAT present a go-kart prototype to the class.	L: Write down 3 facts about design based on peer presentations.	SP8: Obtaining, evaluating, and communicating information