Unit 1 - Life Science - Body Systems

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

Summary of the Unit

Students 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. Students will construct explanations for the interactions of systems in cells and organisms. Students understand that special structures are responsible for particular functions in organisms, and that for many organisms, the body is a system of multiple-interaction subsystems that form a hierarchy, from cells to the body. Students construct explanations for the interactions of systems in cells and organisms and how organisms gather and use information from the environment. The cross cutting concepts of systems and system models and cause and effect provide a framework for understanding the disciplinary core ideas. Students are expected to demonstrate proficiency in engaging in argument from evidence and obtaining, evaluating, and communicating information. Students use these science and engineering practices to demonstrate understanding of the disciplinary core ideas.

Enduring Understanding

- In multicellular organisms, the body is a system of multiple, interacting subsystems.
- Subsystems are groups of cells that work together to form tissues.
- Organs are groups of tissues that work together to perform a particular body function.
- Tissues and organs are specialized for particular body functions.
- Systems may interact with other systems.
- Systems may have subsystems and be part of larger complex systems.
- Interactions are limited to the circulatory, excretory, digestive, respiratory, muscular, and nervous systems.
- Scientists and engineers are guided by habits of mind such as intellectual honesty, tolerance of ambiguity, skepticism, and openness to new ideas.
- Sense receptors respond to different inputs (electromagnetic, mechanical, chemical).
- Sense receptors transmit responses as signals that travel along nerve cells to the brain.
- Signals are then processed in the brain.
- Brain processing results in immediate behaviors or memories.
- Cause-and-effect relationships may be used to predict response to stimuli in natural systems.

Essential Questions

What is the evidence that a body is actually a system of interacting subsystems composed of groups of interacting cells?

What would happen to your body if you had no skin? No muscles? etc.

How does the human body retrieve and use energy?

Why do deep ocean divers need air while they are under water?

Why do bubbles form when divers breathe out under water?

How do all of the human body systems help to maintain homeostasis?

How do organisms receive and respond to information from their environment?

How is the body a system of interacting subsystems composed of groups of cells?

How do our sensory receptors send information to our brain?

Summative Assessment / Summative Criteria

- Quarterly Assessment
- Department Based Tests / Quizzes
- Project Rubrics
- Mosa Mack "Make" and "Engineer" Rubrics
- CER Rubrics
- Lab Reflections

Resources

- Textbook N materials & worksheets
- Kesler Labs
- Centers / Stations
- Escape Rooms
- Science Videos
- Mosa Mack
- Discovery Education
- BrainPop
- Achieve 3000

Unit Plan w/ Associated Standards (Chart)

Topics / Timelines	Objectives	Activities	Assessments	Standards
Body Systems & Responses to Stimuli /	Identify each body system, how it works and the purpose it	Mosa Mack: Interaction of Body Systems	Department created unit	LS1-3

Approximately 1 Week maximum per Body System	serves for the human body. 1. Skeletal & Muscular 2. Skin 3. Digestive 4. Excretory 5. Repiratory 6. Circulatory, Lymphatic & Blood 7. Immunity 8. Nervous 9. Endocrine	Mosa Mack: The Nervous System Mosa Mack: Diabetes Lab investigations, experiments and simulations: Heart Rate Lab, Regulation of Human Heart Rate, Metabolism Food Label Lunch Lab, Feedback Mechanisms Lab, The Immune Response Activity, Studying our Senses, Breathing and Holding your Breath Project Options: Human Body Wanted Poster, Comparitive Anatomy Projet, Disease/Illness research project report Discovery Education virtual explorations Videos Brainpop: Body systems, Digestive system, Heart, Blood, Circulatory system, Endocrine system Textbook materials from Book N	tests Department created section quizzes Project rubrics Mosa Mack "make" and "engineer" rubrics Lab journals	LS1-8
	Explain how individual body systems respond to stimuli and help maintain homeostasis. Construct a visual model that links body systems together to keep the body functioning properly. Communicate understanding that a malfunction in one body system affects the function of the body as a whole.			

TECH.8.1.8.F.CS1	Identify and define authentic problems and significant questions for investigation.
LA.WHST.6-8.1	Write arguments focused on discipline-specific content.
LA.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.
LA.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.
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.
LA.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.
TECH.8.1.8.F.CS2	Plan and manage activities to develop a solution or complete a project.
LA.WHST.6-8.9	Draw evidence from informational texts to support analysis, reflection, and research.
LA.WHST.6-8.1.C	Use words, phrases, and clauses to create cohesion and clarify the relationships among claim(s), counterclaims, reasons, and evidence.
LA.SL.7.1	Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 7 topics, texts, and issues, building on others' ideas and expressing their own clearly.
TECH.8.1.8.F	Critical thinking, problem solving, and decision making: Students use critical thinking skills to plan and conduct research, manage projects, solve problems, and make informed decisions using appropriate digital tools and resources.
LA.SL.7.1.A	Come to discussions prepared, having read or researched material under study; explicitly draw on that preparation by referring to evidence on the topic, text, or issue to probe and reflect on ideas under discussion.
LA.SL.7.1.B	Follow rules for collegial discussions, track progress toward specific goals and deadlines, and define individual roles as needed.
CRP.K-12.CRP7.1	Career-ready individuals are discerning in accepting and using new information to make decisions, change practices or inform strategies. They use reliable research process to search for new information. They evaluate the validity of sources when considering the use and adoption of external information or practices in their workplace situation.
TECH.8.1.8.B.CS2	Create original works as a means of personal or group expression.
LA.SL.7.1.C	Pose questions that elicit elaboration and respond to others' questions and comments with relevant observations and ideas that bring the discussion back on topic as needed.
LA.SL.7.1.D	Acknowledge new information expressed by others and, when warranted, modify their own views.
TECH.8.1.8.B.CS1	Apply existing knowledge to generate new ideas, products, or processes.
SCI.MS-LS1-8	Gather and synthesize information that sensory receptors respond to stimuli by sending messages to the brain for immediate behavior or storage as memories.
SCI.MS-ESS2-5	Collect data to provide evidence for how the motions and complex interactions of air masses results in changes in weather conditions.
CAEP.9.2.8.B.3	Evaluate communication, collaboration, and leadership skills that can be developed through school, home, work, and extracurricular activities for use in a career.
CRP.K-12.CRP8	Utilize critical thinking to make sense of problems and persevere in solving them.
LA.RST.6-8.1	Cite specific textual evidence to support analysis of science and technical texts.
TECH.8.1.8.E.CS3	Evaluate and select information sources and digital tools based on the appropriateness for specific tasks.
LA.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.
LA.RST.6-8.3	Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.
LA.RST.6-8.4	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to

	grades 6-8 texts and topics.
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.6-8.8	Distinguish among facts, reasoned judgment based on research findings, and speculation in a text.
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.
LA.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.
TECH.8.1.8.E.1	Effectively use a variety of search tools and filters in professional public databases to find information to solve a real world problem.
TECH.8.1.8.E.CS2	Locate, organize, analyze, evaluate, synthesize, and ethically use information from a variety of sources and media.
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.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-LS1-8.LS1.D.1	Each sense receptor responds to different inputs (electromagnetic, mechanical, chemical), transmitting them as signals that travel along nerve cells to the brain. The signals are then processed in the brain, resulting in immediate behaviors or memories.
6-8.MS-LS1-8.2.1	Cause and effect relationships may be used to predict phenomena in natural systems.
SCI.MS-LS1-3	Use argument supported by evidence for how the body is a system of interacting subsystems composed of groups of cells.
TECH.8.1.8.E.CS4	Process data and report results.
TECH.8.1.8.B.1	Synthesize and publish information about a local or global issue or event (ex. telecollaborative project, blog, school web).

Suggested Modifications for Spec Ed, ESL, and Gifted Students

Structure lessons around questions that are authentic, relate to students' interests, social/family background and knowledge of their community.

- Provide students with multiple choices for how they can represent their understandings (e.g. multisensory techniques-auditory/visual aids; pictures, illustrations, graphs, charts, data tables, multimedia, modeling).
- Provide opportunities for students to connect with people of similar backgrounds (e.g. conversations via digital tool such as SKYPE, experts from the community helping with a project, journal articles, and biographies).
- Provide multiple grouping opportunities for students to share their ideas and to encourage work among

various backgrounds and cultures (e.g. multiple representation and multimodal experiences).

- Engage students with a variety of Science and Engineering practices to provide students with multiple entry points and multiple ways to demonstrate their understandings.
- Use project-based science learning to connect science with observable phenomena.
- Structure the 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.
- Restructure lesson using UDL principals

Cross Curricular / 21st Century Connections

English Language Arts

- Cite specific textual evidence to support analysis of science and technical texts that provide evidence for how the body is a system of interacting subsystems composed of cells.
- Trace and evaluate a text's argument that the body is a system of interacting subsystems composed of cells, distinguishing claims that are supported by reasons and evidence from claims that are not.
- Write arguments, supported by evidence, for how the body is a system of interacting subsystems composed of groups of cells.
- Gather relevant information concerning how sensory receptors function by responding to stimuli, then sending messages to the brain, which responds immediately through some form or behavior or by storing the message

Mathematics - N/A

Technological Innovations

- Discovery Education
- Mosa Mack
- BrainPop
- Achieve 3000

Unit 2 - Earth Science - Meteorology, Atmospheric Conditions & Climate

Content Area: **Science**
Course(s):
Time Period: **2nd Marking Period**
Length: **5-6 weeks**
Status: **Not Published**

Summary of the Unit

In this unit, students will be exploring Earth's large-scale systems interactions, the roles of water in Earth's surface processes, and weather and climate. Students make sense of how Earth's geosystems operate by modeling the flow of energy and the cycling of matter within and among different systems. A systems approach is also important here, examining the feedbacks between systems as energy from the Sun is transferred between systems and circulates through the ocean and atmosphere. The crosscutting concepts of cause and effect, systems and system models, and energy and matter are called out as frameworks for understanding the disciplinary core ideas. In this unit, students are expected to demonstrate proficiency in developing and using models and planning and carrying out investigations as they make sense of the disciplinary core ideas. Students are also expected to use these practices to demonstrate an understanding of the core ideas.

Enduring Understanding

- Water continually cycles among land, ocean, and atmosphere via transpiration, evaporation, condensation and crystallization, and precipitation, as well as downhill flows on land.
- Global movements of water and its changes in form are propelled by sunlight and gravity.
- The cycling of water through Earth’s systems is driven by energy from the sun and the force of gravity.
- Within Earth’s systems, the transfer of energy drives the motion and/or cycling of water.
- The motions and complex interactions of air masses result in changes in weather conditions.
- The complex patterns of the changes in and movement of water in the atmosphere, determined by winds, landforms, and ocean temperatures and currents, are major determinants of local weather patterns.
- Examples of data that can be used to provide evidence for how the motions and complex interactions of air masses result in changes in weather conditions include weather maps, diagrams, and visualizations; other examples can be obtained through laboratory experiments.
- Air masses flow from regions of high pressure to regions of low pressure, causing weather (defined by temperature, pressure, humidity, precipitation, and wind) at a fixed location to change over time.
- Because patterns of the changes and the movement of water in the atmosphere are so complex, weather can only be predicted probabilistically.
- Sudden changes in weather can result when different air masses collide.
- Weather can be predicted within probabilistic ranges.
- Cause-and effect-relationships may be used to predict changes in weather.
- Unequal heating and rotation of the Earth cause patterns of atmospheric and oceanic circulation that determine regional climates.
- Patterns of atmospheric and oceanic circulation that determine regional climates vary by latitude, altitude, and geographic land distribution.
- Atmospheric circulation that, in part, determines regional climates is the result of sunlight-driven

latitudinal banding, the Coriolis effect, and resulting prevailing winds.
- Ocean circulation that, in part, determines regional climates is the result of the transfer of heat by the global ocean convection cycle, which is constrained by the Coriolis effect and the outlines of continents.
- Models that can be used to describe how unequal heating and rotation of the Earth cause patterns of atmospheric and oceanic circulation that determine regional climates can be diagrams, maps and globes, or digital representations.

Essential Questions

What are the processes involved in the cycling of water through Earth's systems?

What is the relationship between the complex interactions of air masses and changes in weather conditions?

What factors interact and influence weather and climate?

What are the major factors that determine regional climates?

What factors affect weather and climate?

How do meteorologists predict the weather?

What are natural disasters and how are they predicted?

Summative Assessment / Summative Criteria

- Quarterly Assessment
- Department Based Tests / Quizzes
- Project Rubrics
- Mosa Mack "Make" and "Engineer" Rubrics
- CER Rubrics
- Lab Reflections

Resources

- Textbook C Materials and Worksheets
- Kesler Labs
- Centers

- Escape Rooms
- Science Videos
- Mosa Mack
- Discovery Education
- BrainPop
- Achieve 3000

Unit Plan w/ Associated Standards (Chart)

Topics	Objectives	Activities	Assessments	Standards
Weather / 3-4 Weeks	Create an annotated diagram demonstrating possible paths of water through the water cycle. Identify various weather factors and explain the effect they each have on weather patterns. Construct a kinesthetic model of a weather front. Design a weather report that predicts and explains a day of weather in a specific region.	Mosa Mack: Water Cycle Mosa Mack: Weather Lab investigations Discovery Education virtual explorations Videos Brainpop: Weather, Thunderstorms, Tornadoes, Hurricanes, Clouds, Wind, Snowflakes, The water cycle, Droughts, Natural Disasters	Department created unit tests Department created section quizzes Project rubrics Mosa Mack "make" and "engineer" rubrics	ESS2-1 ESS2-4 ESS2-5
Climate / 1-2 Weeks	Identify that higher latitudes receive less solar energy per unit of area than lower latitudes, resulting in temperature differences based on latitude. Create a model to identify and display the Coriolis effect and its impact on	Textbook materials from Book C Mosa Mack: Oceans & Climate Discovery Education virtual explorations Brainpop: Climate types, Ocean	Lab journals Department created unit tests Department created section	ESS2-6

currents and climate.	currents,	quizzes
Identify how geography influences a region's climate.	Textbook materials from Book C	Project rubrics
Analyze and interpret climate and geographical data from a variety of interactive maps.		Mosa Mack "make" and "engineer" rubrics
Identify the effect that thermal energy transfer has on climate.		Lab journals

TECH.8.1.8.F.CS1	Identify and define authentic problems and significant questions for investigation.
LA.WHST.6-8.1	Write arguments focused on discipline-specific content.
LA.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.
LA.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.
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.
LA.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.
TECH.8.1.8.F.CS2	Plan and manage activities to develop a solution or complete a project.
LA.WHST.6-8.9	Draw evidence from informational texts to support analysis, reflection, and research.
LA.WHST.6-8.1.C	Use words, phrases, and clauses to create cohesion and clarify the relationships among claim(s), counterclaims, reasons, and evidence.
LA.SL.7.1	Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 7 topics, texts, and issues, building on others' ideas and expressing their own clearly.
TECH.8.1.8.F	Critical thinking, problem solving, and decision making: Students use critical thinking skills to plan and conduct research, manage projects, solve problems, and make informed decisions using appropriate digital tools and resources.
LA.SL.7.1.A	Come to discussions prepared, having read or researched material under study; explicitly draw on that preparation by referring to evidence on the topic, text, or issue to probe and reflect on ideas under discussion.
LA.SL.7.1.B	Follow rules for collegial discussions, track progress toward specific goals and deadlines, and define individual roles as needed.
CRP.K-12.CRP7.1	Career-ready individuals are discerning in accepting and using new information to

	make decisions, change practices or inform strategies. They use reliable research process to search for new information. They evaluate the validity of sources when considering the use and adoption of external information or practices in their workplace situation.
TECH.8.1.8.B.CS2	Create original works as a means of personal or group expression.
LA.SL.7.1.C	Pose questions that elicit elaboration and respond to others' questions and comments with relevant observations and ideas that bring the discussion back on topic as needed.
SCI.MS-ESS2-6	Develop and use a model to describe how unequal heating and rotation of the Earth cause patterns of atmospheric and oceanic circulation that determine regional climates.
LA.SL.7.1.D	Acknowledge new information expressed by others and, when warranted, modify their own views.
TECH.8.1.8.B.CS1	Apply existing knowledge to generate new ideas, products, or processes.
SCI.MS-ESS2-5	Collect data to provide evidence for how the motions and complex interactions of air masses results in changes in weather conditions.
CAEP.9.2.8.B.3	Evaluate communication, collaboration, and leadership skills that can be developed through school, home, work, and extracurricular activities for use in a career.
CRP.K-12.CRP8	Utilize critical thinking to make sense of problems and persevere in solving them.
LA.RST.6-8.1	Cite specific textual evidence to support analysis of science and technical texts.
TECH.8.1.8.E.CS3	Evaluate and select information sources and digital tools based on the appropriateness for specific tasks.
LA.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.
LA.RST.6-8.3	Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.
LA.RST.6-8.4	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6-8 texts and topics.
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.6-8.8	Distinguish among facts, reasoned judgment based on research findings, and speculation in a text.
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.
LA.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.
TECH.8.1.8.E.1	Effectively use a variety of search tools and filters in professional public databases to find information to solve a real world problem.
TECH.8.1.8.E.CS2	Locate, organize, analyze, evaluate, synthesize, and ethically use information from a variety of sources and media.
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-ESS2-5.ESS2.C.1	The complex patterns of the changes and the movement of water in the

	atmosphere, determined by winds, landforms, and ocean temperatures and currents, are major determinants of local weather patterns.
6-8.MS-ESS2-5.ESS2.D.1	Because these patterns are so complex, weather can only be predicted probabilistically.
6-8.MS-ESS2-5.2.1	Cause and effect relationships may be used to predict phenomena in natural or designed systems.
6-8.MS-ESS2-6	Develop and use a model to describe how unequal heating and rotation of the Earth cause patterns of atmospheric and oceanic circulation that determine regional climates.
6-8.MS-ESS2-6.2	Modeling in 6–8 builds on K–5 experiences and progresses to developing, using, and revising models to describe, test, and predict more abstract phenomena and design systems.
6-8.MS-ESS2-6.2.1	Develop and use a model to describe phenomena.
6-8.MS-ESS2-6.ESS2.C.1	Variations in density due to variations in temperature and salinity drive a global pattern of interconnected ocean currents.
6-8.MS-ESS2-6.ESS2.D.1	Weather and climate are influenced by interactions involving sunlight, the ocean, the atmosphere, ice, landforms, and living things. These interactions vary with latitude, altitude, and local and regional geography, all of which can affect oceanic and atmospheric flow patterns.
6-8.MS-ESS2-6.ESS2.D.2	The ocean exerts a major influence on weather and climate by absorbing energy from the sun, releasing it over time, and globally redistributing it through ocean currents.
6-8.MS-ESS2-6.4.1	Models can be used to represent systems and their interactions—such as inputs, processes and outputs— and energy, matter, and information flows within systems.
SCI.MS-ESS2-4	Develop a model to describe the cycling of water through Earth's systems driven by energy from the sun and the force of gravity.
TECH.8.1.8.E.CS4	Process data and report results.
TECH.8.1.8.B.1	Synthesize and publish information about a local or global issue or event (ex. telecollaborative project, blog, school web).

Suggested Modifications for Spec Ed, ESL, and Gifted Students

Structure lessons around questions that are authentic, relate to students' interests, social/family background and knowledge of their community.

- Provide students with multiple choices for how they can represent their understandings (e.g. multisensory techniques-auditory/visual aids; pictures, illustrations, graphs, charts, data tables, multimedia, modeling).
- Provide opportunities for students to connect with people of similar backgrounds (e.g. conversations via digital tool such as SKYPE, experts from the community helping with a project, journal articles, and biographies).
- Provide multiple grouping opportunities for students to share their ideas and to encourage work among various backgrounds and cultures (e.g. multiple representation and multimodal experiences).
- Engage students with a variety of Science and Engineering practices to provide students with multiple entry points and multiple ways to demonstrate their understandings.

- Use project-based science learning to connect science with observable phenomena.
- Structure the 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.
- Restructure lesson using UDL principals

Cross Curricular / 21st Century Connections

English Language Arts/Literacy

- Support the analysis of science and technical texts by citing specific textual evidence for how the motions and complex interactions of air masses result in changes in weather conditions.
- Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with information that is gained from reading text about how the complex patterns of the changes and movement of water in the atmosphere, determined by winds, landforms, and ocean temperatures and currents are major determinants of local weather patterns.
- Gather relevant information from multiple print and digital sources about how the complex patterns of the changes and movement of water in the atmosphere, determined by winds, landforms, and ocean temperatures and currents, are major determinants of local weather patterns; assess the credibility of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and providing basic bibliographic information for sources.
- Include multimedia components and visual displays in presentations to clarify information about how unequal heating and rotation of the Earth cause patterns of atmospheric and oceanic circulation that determine regional climates.

Mathematics

- Reason abstractly and quantitatively by using data such as weather maps, diagrams, and visualizations or obtained through laboratory experiments to predict weather within probabilities ranges.
- Understand that positive and negative numbers are used together to describe quantities having opposite directions or values. Use positive and negative numbers to represent changes in atmospheric and oceanic temperatures, explaining the meaning of 0 in each situation.

Technological Innovations

- Mosa Mack
- Discovery Education
- BrainPop

- Achieve 3000

Unit 3 - Earth Science - Natural Resources & Human Impacts

Content Area: **Science**
Course(s):
Time Period: **2nd Marking Period**
Length: **3-4 weeks**
Status: **Not Published**

Summary of the Unit

In this unit of study, students analyze and interpret data and design solutions to build on their understanding of the ways that human activities affect Earth's systems. The emphasis of this unit is the significant and complex issues surrounding human uses of land, energy, mineral, and water resources and the resulting impacts of these uses. The crosscutting concepts of cause and effect and the influence of science, engineering, and technology on society and the natural world are called out as organizing concepts for these disciplinary core ideas. Building on Unit 3, students define a problem by precisely specifying criteria and constraints for solutions as well as potential impacts on society and the natural environment; systematically evaluate alternative solutions; analyze data from tests of different solutions; combining the best ideas into an improved solution; and develop and iteratively test and improve their model to reach an optimal solution. In this unit of study students are expected to demonstrate proficiency in analyzing and interpreting data and designing solutions. Students are also expected to use these practices to demonstrate an understanding of the core ideas.

Enduring Understanding

- Human activities have significantly altered the biosphere, sometimes damaging or destroying natural habitats and causing the extinction of other species.
- Changes to Earth's environments can have different impacts (negative and positive) for different living things.
- Typically as human populations and per capita consumption of natural resources increase, so do the negative impacts on Earth, unless the activities and technologies involved are engineered otherwise.
- Relationships can be classified as causal or correlational, and correlation does not necessarily imply causation.
- 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 by differences in such factors as climate, natural resources, and economic conditions. Thus technology use varies from region to region and over time.

Essential Questions

- How do we monitor the health of the environment (our life support system)?
- What does it mean to "go green"?
- Is there anything that can be done to remedy the problems that exist with our natural resources?
- Is it possible to predict and protect ourselves from natural hazards?
- What is climate and how does it compare to weather?

- What are temperature anomalies and what does this mean in terms of climate?
- What causes the climate and weather on Earth?
- What causes global climate change?
- How does global climate change impact society?
- How do scientists know what the past climate was like?
- What are some technologies and behaviors that will help to reduce climate change?
- What is a natural resource?
- What makes a natural resource renewable? Non-renewable?
- Where do natural resources come from?
- How are natural resources used in society? What are some examples?
- Why does the distribution of natural resources vary across the globe?
- Is there a correlation between natural resource consumption and population growth?
- Can a renewable resource ever be depleted?
- What impacts do humans have on Earth's environment when we gather and use natural resources?
- What is the relationship between ecological footprint per capita, human population growth, economic income and changes in biodiversity?
- What does it mean to be sustainable?
- What are some examples of sustainable activities and technologies?
- How does sustainability benefit both people and the planet?
- Is being sustainable an individual effort or a global effort? Why?

Summative Assessment / Summative Criteria

- Quarterly Assessment
- Department Based Tests / Quizzes
- Project Rubrics
- Mosa Mack "Make" and "Engineer" Rubrics
- CER Rubrics
- Lab Reflections

Resources

- Textbook C Materials and Worksheets
- Supplemental textbook materials, worksehets and misc. resources for Natural Resources
- Kesler Labs
- Centers
- Escape Rooms
- Science Videos
- Mosa Mack
- Discovery Education
- BrainPop
- Achieve 3000

Unit Plan w/ Associated Standards (Chart)

Topics	Objectives	Activities	Assessments	Standards
Natural Resources / 1-2 Weeks	Explain how each natural resource is distributed throughout the world and how this impacts environment and society. Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.	Mosa Mack: Renewable Resources Lab investigations Discovery Education virtual explorations Videos Brainpop: Natural resources, Fossil fuels, Energy sources, Nuclear energy, Solar energy, Gas and oil, Wind energy	Department created unit tests Department created section quizzes Project rubrics Mosa Mack "make" and "engineer" rubrics	ESS3-1 ESS3-3 ESS3-4 ESS3-5
Climate Change / 1-2 Weeks	Define the greenhouse effect and explain why it is necessary for life on earth, but also creating new problems. Calculate carbon footprints. Identify ways to conserve resources or mitigate the problems from overuse.	Mosa Mack: Climate Change & Ecological Footprint Discovery Education virtual explorations Brainpop: Climate change, Humans and the environment, National parks Textbook materials from Book C	Lab journals Department created unit tests Department created section quizzes Project rubrics Mosa Mack "make" and	ESS3-3

“engineer” rubrics

Lab journals

TECH.8.1.8.F.CS1	Identify and define authentic problems and significant questions for investigation.
LA.WHST.6-8.1	Write arguments focused on discipline-specific content.
LA.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.
LA.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.
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.
LA.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.
TECH.8.1.8.F.CS2	Plan and manage activities to develop a solution or complete a project.
LA.WHST.6-8.9	Draw evidence from informational texts to support analysis, reflection, and research.
LA.WHST.6-8.1.C	Use words, phrases, and clauses to create cohesion and clarify the relationships among claim(s), counterclaims, reasons, and evidence.
LA.SL.7.1	Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 7 topics, texts, and issues, building on others’ ideas and expressing their own clearly.
TECH.8.1.8.F	Critical thinking, problem solving, and decision making: Students use critical thinking skills to plan and conduct research, manage projects, solve problems, and make informed decisions using appropriate digital tools and resources.
LA.SL.7.1.A	Come to discussions prepared, having read or researched material under study; explicitly draw on that preparation by referring to evidence on the topic, text, or issue to probe and reflect on ideas under discussion.
LA.SL.7.1.B	Follow rules for collegial discussions, track progress toward specific goals and deadlines, and define individual roles as needed.
CRP.K-12.CRP7.1	Career-ready individuals are discerning in accepting and using new information to make decisions, change practices or inform strategies. They use reliable research process to search for new information. They evaluate the validity of sources when considering the use and adoption of external information or practices in their workplace situation.
TECH.8.1.8.B.CS2	Create original works as a means of personal or group expression.
LA.SL.7.1.C	Pose questions that elicit elaboration and respond to others’ questions and comments with relevant observations and ideas that bring the discussion back on topic as needed.
SCI.MS-ESS2-6	Develop and use a model to describe how unequal heating and rotation of the Earth cause patterns of atmospheric and oceanic circulation that determine regional climates.

LA.SL.7.1.D	Acknowledge new information expressed by others and, when warranted, modify their own views.
SCI.MS-ESS3-4	Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems.
TECH.8.1.8.B.CS1	Apply existing knowledge to generate new ideas, products, or processes.
SCI.MS-ESS3-3	Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.
SCI.MS-ESS2-5	Collect data to provide evidence for how the motions and complex interactions of air masses results in changes in weather conditions.
CAEP.9.2.8.B.3	Evaluate communication, collaboration, and leadership skills that can be developed through school, home, work, and extracurricular activities for use in a career.
CRP.K-12.CRP8	Utilize critical thinking to make sense of problems and persevere in solving them.
LA.RST.6-8.1	Cite specific textual evidence to support analysis of science and technical texts.
TECH.8.1.8.E.CS3	Evaluate and select information sources and digital tools based on the appropriateness for specific tasks.
LA.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.
LA.RST.6-8.3	Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.
SCI.MS-ESS3-1	Construct a scientific explanation based on evidence for how the uneven distributions of Earth's mineral, energy, and groundwater resources are the result of past and current geoscience processes.
LA.RST.6-8.4	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6-8 texts and topics.
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.6-8.8	Distinguish among facts, reasoned judgment based on research findings, and speculation in a text.
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.
LA.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.
TECH.8.1.8.E.1	Effectively use a variety of search tools and filters in professional public databases to find information to solve a real world problem.
TECH.8.1.8.E.CS2	Locate, organize, analyze, evaluate, synthesize, and ethically use information from a variety of sources and media.
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-ESS2-5.ESS2.C.1	The complex patterns of the changes and the movement of water in the atmosphere, determined by winds, landforms, and ocean temperatures and currents, are major determinants of local weather patterns.
6-8.MS-ESS2-5.ESS2.D.1	Because these patterns are so complex, weather can only be predicted

	probabilistically.
6-8.MS-ESS2-5.2.1	Cause and effect relationships may be used to predict phenomena in natural or designed systems.
6-8.MS-ESS2-6	Develop and use a model to describe how unequal heating and rotation of the Earth cause patterns of atmospheric and oceanic circulation that determine regional climates.
6-8.MS-ESS2-6.2	Modeling in 6–8 builds on K–5 experiences and progresses to developing, using, and revising models to describe, test, and predict more abstract phenomena and design systems.
6-8.MS-ESS2-6.2.1	Develop and use a model to describe phenomena.
6-8.MS-ESS2-6.ESS2.C.1	Variations in density due to variations in temperature and salinity drive a global pattern of interconnected ocean currents.
6-8.MS-ESS2-6.ESS2.D.1	Weather and climate are influenced by interactions involving sunlight, the ocean, the atmosphere, ice, landforms, and living things. These interactions vary with latitude, altitude, and local and regional geography, all of which can affect oceanic and atmospheric flow patterns.
6-8.MS-ESS2-6.ESS2.D.2	The ocean exerts a major influence on weather and climate by absorbing energy from the sun, releasing it over time, and globally redistributing it through ocean currents.
6-8.MS-ESS2-6.4.1	Models can be used to represent systems and their interactions—such as inputs, processes and outputs— and energy, matter, and information flows within systems.
SCI.MS-ESS2-4	Develop a model to describe the cycling of water through Earth's systems driven by energy from the sun and the force of gravity.
TECH.8.1.8.E.CS4	Process data and report results.
TECH.8.1.8.B.1	Synthesize and publish information about a local or global issue or event (ex. telecollaborative project, blog, school web).

Suggested Modifications for Spec Ed, ESL, and Gifted Students

Structure lessons around questions that are authentic, relate to students' interests, social/family background and knowledge of their community.

- Provide students with multiple choices for how they can represent their understandings (e.g. multisensory techniques-auditory/visual aids; pictures, illustrations, graphs, charts, data tables, multimedia, modeling).
- Provide opportunities for students to connect with people of similar backgrounds (e.g. conversations via digital tool such as SKYPE, experts from the community helping with a project, journal articles, and biographies).
- Provide multiple grouping opportunities for students to share their ideas and to encourage work among various backgrounds and cultures (e.g. multiple representation and multimodal experiences).
- Engage students with a variety of Science and Engineering practices to provide students with multiple entry points and multiple ways to demonstrate their understandings.
- Use project-based science learning to connect science with observable phenomena.

- Structure the 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.
- Restructure lesson using UDL principals

Cross Curricular / 21st Century Connections

ENGLISH LANGUAGE ARTS:

- Conduct short research projects to determine a method for monitoring and minimizing a human impact on the environment, drawing on several sources and generating additional, related, focused questions that allow multiple avenues of exploration.
- Gather relevant information from multiple print and digital sources about a method for monitoring and minimizing a human impact on the environment, assess the credibility of each source, and quote or paraphrase the data and conclusions of others while avoiding plagiarism and providing basic bibliographic information for sources.
- Draw evidence from informational texts about minimizing a human impact on the environment to support analysis, reflection, and research.
- Cite specific textual evidence about a method for monitoring and minimizing a human impact on the environment to support analysis of science and technical texts.
- Compare and contrast the information gained from experiments, simulations, videos, or multimedia sources with that gained from reading a text on a method for monitoring and minimizing a human impact on the environment.
- Integrate quantitative or technical information about a method for monitoring and minimizing a human impact on the environment expressed in words with a version of that information expressed visually

MATHEMATICS:

- Use abstract and quantitative reasoning to analyze and interpret data in order to determine similarities and differences in findings of how well designed methods meet the criteria and constraints of solutions that could reduce a human impact on the environment.
- Understand the concept of a ratio and use ratio language to describe a ratio relationship between human impacts on environments and the impact of methods to minimize these impacts.
- Use variables to represent quantities when analyzing and interpreting data to determine how well designed methods meet the criteria and constraints of solutions that could reduce a human impact on the environment and construct simple equations and inequalities to solve problems by reasoning about the quantities.
- While analyzing data to determine how well designed methods meet the criteria and constraints of solutions that could reduce a human impact on the environment, solve multistep mathematical problems posed with positive and negative rational numbers in any form (whole numbers, fractions, and decimals), using tools strategically. Apply properties of operations to calculate with numbers in any form; covert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies.

Technological Innovations

- Mosa Mack
- Discovery Education
- BrainPop
- Achieve 3000

Unit 4 - Physical Science - Thermal Energy

Content Area: **Science**
Course(s):
Time Period: **3rd Marking Period**
Length: **4-5 weeks**
Status: **Not Published**

Summary of the Unit

In this unit, students ask questions, plan and carry out investigations, engage in argument from evidence, analyze and interpret data, construct explanations, define problems and design solutions as they make sense of the difference between energy and temperature. They use the practices to make sense of how the total change of energy in any system is always equal to the total energy transferred into or out of the system. The crosscutting concepts of energy and matter, scale, proportion, and quantity, and influence of science, engineering, and technology on society and the natural world are the organizing concepts for these disciplinary core ideas. Students ask questions, plan and carry out investigations, engage in argument from evidence, analyze and interpret data, construct explanations, define problems and design solutions. Students are also expected to use these practices to demonstrate an understanding of the core ideas.

Enduring Understanding

- Changes in particle motion, temperature, and state of a pure substance occur when thermal energy is added or removed.
- Qualitative molecular-level models of solids, liquids, and gases can be used to show that adding or removing thermal energy increases or decreases the kinetic energy of the particles until a change of state occurs.
- Gases and liquids are made of molecules or inert atoms that are moving about relative to each other.
- In a liquid, the molecules are constantly in contact with others.
- In a gas, the molecules are widely spaced except when they happen to collide.
- In a solid, atoms are closely spaced and may vibrate in position but do not change relative locations.
- The changes of state that occur with variations in temperature or pressure can be described and predicted using models of matter.
- The term heat as used in everyday language refers both to thermal energy and the transfer of that thermal energy from one object to another.
- Thermal energy is the motion of atoms or molecules within a substance. • In science, heat is used to refer to the energy transferred due to the temperature difference between two objects.
- The temperature of a system is proportional to the average internal kinetic energy and potential energy per atom or molecule (whichever is the appropriate building block for the system's material).
- The details of the relationship between the average internal kinetic energy and the potential energy per atom or molecule depend on the type of atom or molecule and the interactions among the atoms in the material.
- Temperature is not a direct measure of a system's total thermal energy.
- The total thermal energy (sometimes called the total internal energy) of a system depends jointly on the temperature, the total number of atoms in the system, and the state of the material.
- Cause-and-effect relationships may be used to predict and describe changes in particle motion, temperature, and state of a pure substance when thermal energy is added or removed in natural systems.

Essential Questions

How can a standard thermometer be used to tell you how particles are behaving?

How is thermal energy transferred from one location to another?

How does thermal energy flow in a system?

Why is the temperature of an ice water mixture constant?

What are some examples of conduction, convection and radiation?

How does molecular motion relate to thermal energy?

How is the heat capacity of a substance determined?

How is specific heat calculated?

How does a material's heat capacity affect its ability to conduct?

How is temperature related to kinetic energy?

Why do things feel hot or cold?

What is the definition of thermal energy and how does it relate to heat?

How do conductors and insulators differ?

What are the 1st and 2nd laws of thermodynamics?

Summative Assessment / Summative Criteria

- Quarterly Assessment
- Department Based Tests / Quizzes
- Project Rubrics
- Mosa Mack "Make" and "Engineer" Rubrics
- CER Rubrics
- Lab Reflections

Resources

- Textbook L Materials and Worksheets
- Kesler Labs

- Centers
- Escape Rooms
- Science Videos
- Mosa Mack
- Discovery Education
- BrainPop
- Achieve 3000

Unit Plan w/ Associated Standards (Chart)

Topics	Objectives	Activities	Assessments	Standards
States of Matter / 1-2 Weeks	Distinguish between the states of matter.	Mosa Mack: Thermal Energy	Department created unit tests	PS1-3 PS1-4 PS3-3
	Explain how particle movement changes with each state of matter.	Lab investigations		
	Compare the amount of thermal energy added or removed from matter with the change of state in matter that will occur.	Discovery Education virtual explorations	Department created section quizzes	
	Develop a model that predicts and describes changes in particle motion, temperature, and state of a pure substance when thermal energy is added or removed.	Videos	Project rubrics	
	Use cause-and-effect relationships to predict changes in particle motion, temperature, and state of a pure substance when thermal energy is added or removed in natural or designed systems.	Brainpop: States of Matter, Matter Changing States,	Mosa Mack "make" and "engineer" rubrics	
		Textbook materials from Book L	Lab journals	
Thermal Energy / 2-3 Weeks	Define heat, thermal energy, temperature, radiation, conduction, and convection.	Design an insulated container or a solar oven	Department created unit tests	PS1-4

Idenntify materials which are conductors of heat.		Department created section quizzes	PS1-5
Explain how insulators work to keep substances cold.	Discovery Education virtual explorations		PS1-6
	Brainpop: Heat, Temperature	Project rubrics	PS3-4
	Textbook materials from Book L	Mosa Mack "make" and "engineer" rubrics	PS3-5
		Lab journals	

TECH.8.1.8.F.CS1	Identify and define authentic problems and significant questions for investigation.
LA.WHST.6-8.1	Write arguments focused on discipline-specific content.
LA.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.
LA.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.
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.
LA.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.
TECH.8.1.8.F.CS2	Plan and manage activities to develop a solution or complete a project.
LA.WHST.6-8.9	Draw evidence from informational texts to support analysis, reflection, and research.
LA.WHST.6-8.1.C	Use words, phrases, and clauses to create cohesion and clarify the relationships among claim(s), counterclaims, reasons, and evidence.
LA.SL.7.1	Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 7 topics, texts, and issues, building on others' ideas and expressing their own clearly.
TECH.8.1.8.F	Critical thinking, problem solving, and decision making: Students use critical thinking skills to plan and conduct research, manage projects, solve problems, and make informed decisions using appropriate digital tools and resources.
LA.SL.7.1.A	Come to discussions prepared, having read or researched material under study; explicitly draw on that preparation by referring to evidence on the topic, text, or issue to probe and reflect on ideas under discussion.
LA.SL.7.1.B	Follow rules for collegial discussions, track progress toward specific goals and

	deadlines, and define individual roles as needed.
CRP.K-12.CRP7.1	Career-ready individuals are discerning in accepting and using new information to make decisions, change practices or inform strategies. They use reliable research process to search for new information. They evaluate the validity of sources when considering the use and adoption of external information or practices in their workplace situation.
TECH.8.1.8.B.CS2	Create original works as a means of personal or group expression.
LA.SL.7.1.C	Pose questions that elicit elaboration and respond to others' questions and comments with relevant observations and ideas that bring the discussion back on topic as needed.
SCI.MS-ESS2-6	Develop and use a model to describe how unequal heating and rotation of the Earth cause patterns of atmospheric and oceanic circulation that determine regional climates.
LA.SL.7.1.D	Acknowledge new information expressed by others and, when warranted, modify their own views.
TECH.8.1.8.B.CS1	Apply existing knowledge to generate new ideas, products, or processes.
SCI.MS-PS3-4	Plan an investigation to determine the relationships among the energy transferred, the type of matter, the mass, and the change in the average kinetic energy of the particles as measured by the temperature of the sample.
SCI.MS-PS3-3	Apply scientific principles to design, construct, and test a device that either minimizes or maximizes thermal energy transfer.
SCI.MS-PS3-5	Construct, use, and present arguments to support the claim that when the kinetic energy of an object changes, energy is transferred to or from the object.
SCI.MS-PS1-3	Gather and make sense of information to describe that synthetic materials come from natural resources and impact society.
SCI.MS-ESS2-5	Collect data to provide evidence for how the motions and complex interactions of air masses results in changes in weather conditions.
CAEP.9.2.8.B.3	Evaluate communication, collaboration, and leadership skills that can be developed through school, home, work, and extracurricular activities for use in a career.
CRP.K-12.CRP8	Utilize critical thinking to make sense of problems and persevere in solving them.
LA.RST.6-8.1	Cite specific textual evidence to support analysis of science and technical texts.
TECH.8.1.8.E.CS3	Evaluate and select information sources and digital tools based on the appropriateness for specific tasks.
LA.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.
LA.RST.6-8.3	Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.
LA.RST.6-8.4	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6-8 texts and topics.
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.6-8.8	Distinguish among facts, reasoned judgment based on research findings, and speculation in a text.
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.
LA.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.
SCI.MS-PS1-4	Develop a model that predicts and describes changes in particle motion, temperature, and state of a pure substance when thermal energy is added or removed.
TECH.8.1.8.E.1	Effectively use a variety of search tools and filters in professional public databases to find information to solve a real world problem.
TECH.8.1.8.E.CS2	Locate, organize, analyze, evaluate, synthesize, and ethically use information from a variety of sources and media.
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-ESS2-5.ESS2.C.1	The complex patterns of the changes and the movement of water in the atmosphere, determined by winds, landforms, and ocean temperatures and currents, are major determinants of local weather patterns.
6-8.MS-ESS2-5.ESS2.D.1	Because these patterns are so complex, weather can only be predicted probabilistically.
6-8.MS-ESS2-5.2.1	Cause and effect relationships may be used to predict phenomena in natural or designed systems.
6-8.MS-ESS2-6	Develop and use a model to describe how unequal heating and rotation of the Earth cause patterns of atmospheric and oceanic circulation that determine regional climates.
6-8.MS-ESS2-6.2	Modeling in 6–8 builds on K–5 experiences and progresses to developing, using, and revising models to describe, test, and predict more abstract phenomena and design systems.
6-8.MS-ESS2-6.2.1	Develop and use a model to describe phenomena.
6-8.MS-ESS2-6.ESS2.C.1	Variations in density due to variations in temperature and salinity drive a global pattern of interconnected ocean currents.
6-8.MS-ESS2-6.ESS2.D.1	Weather and climate are influenced by interactions involving sunlight, the ocean, the atmosphere, ice, landforms, and living things. These interactions vary with latitude, altitude, and local and regional geography, all of which can affect oceanic and atmospheric flow patterns.
6-8.MS-ESS2-6.ESS2.D.2	The ocean exerts a major influence on weather and climate by absorbing energy from the sun, releasing it over time, and globally redistributing it through ocean currents.
6-8.MS-ESS2-6.4.1	Models can be used to represent systems and their interactions—such as inputs, processes and outputs— and energy, matter, and information flows within systems.
SCI.MS-ESS2-4	Develop a model to describe the cycling of water through Earth's systems driven by energy from the sun and the force of gravity.
TECH.8.1.8.E.CS4	Process data and report results.
TECH.8.1.8.B.1	Synthesize and publish information about a local or global issue or event (ex. telecollaborative project, blog, school web).

Suggested Modifications for Spec Ed, ESL, and Gifted Students

Structure lessons around questions that are authentic, relate to students' interests, social/family background

and knowledge of their community.

- Provide students with multiple choices for how they can represent their understandings (e.g. multisensory techniques-auditory/visual aids; pictures, illustrations, graphs, charts, data tables, multimedia, modeling).
- Provide opportunities for students to connect with people of similar backgrounds (e.g. conversations via digital tool such as SKYPE, experts from the community helping with a project, journal articles, and biographies).
- Provide multiple grouping opportunities for students to share their ideas and to encourage work among various backgrounds and cultures (e.g. multiple representation and multimodal experiences).
- Engage students with a variety of Science and Engineering practices to provide students with multiple entry points and multiple ways to demonstrate their understandings.
- Use project-based science learning to connect science with observable phenomena.
- Structure the 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.
- Restructure lesson using UDL principals

Cross Curricular / 21st Century Connections

English Language Arts/Literacy

- Support the analysis of science and technical texts by citing specific textual evidence for how the motions and complex interactions of air masses result in changes in weather conditions.
- Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with information that is gained from reading text about how the complex patterns of the changes and movement of water in the atmosphere, determined by winds, landforms, and ocean temperatures and currents are major determinants of local weather patterns.
- Gather relevant information from multiple print and digital sources about how the complex patterns of the changes and movement of water in the atmosphere, determined by winds, landforms, and ocean temperatures and currents, are major determinants of local weather patterns; assess the credibility of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and providing basic bibliographic information for sources.
- Include multimedia components and visual displays in presentations to clarify information about how unequal heating and rotation of the Earth cause patterns of atmospheric and oceanic circulation that determine regional climates.

Mathematics

- Reason abstractly and quantitatively by using data such as weather maps, diagrams, and visualizations or obtained through laboratory experiments to predict weather within probabilities ranges.

- Understand that positive and negative numbers are used together to describe quantities having opposite directions or values. Use positive and negative numbers to represent changes in atmospheric and oceanic temperatures, explaining the meaning of 0 in each situation.

Technological Innovations

- Mosa Mack
- Discovery Education
- BrainPop
- Achieve 3000

Unit 5 - Physical Science - Chemical Reactions

Content Area: **Science**
Course(s):
Time Period: **3rd Marking Period**
Length: **4-5 weeks**
Status: **Not Published**

Summary of the Unit

Students provide molecular-level accounts of states of matter and changes between states, of how chemical reactions involve regrouping of atoms to form new substances, and of how atoms rearrange during chemical reactions. Students also apply their understanding of optimization design and process in engineering to chemical reaction systems. The crosscutting concept of energy and matter provides a framework for understanding the disciplinary core ideas. Students are expected to demonstrate proficiency in developing and using models, analyzing and interpreting data, designing solutions, and obtaining, evaluating, and communicating information. Students are also expected to use these science and engineering practices to demonstrate understanding of the disciplinary core ideas.

Enduring Understanding

- Substances react chemically in characteristic ways.
- In a chemical process, the atoms that make up the original substances are regrouped into different molecules.
- New substances created in a chemical process have different properties from those of the reactants.
- The total number of each type of atom in a chemical process is conserved, and thus the mass does not change (the law of conservation of matter).
- Matter is conserved because atoms are conserved in physical and chemical processes.
- The law of conservation of mass is a mathematical description of natural phenomena
- Some chemical reactions release energy, while others store energy.
- The transfer of thermal energy can be tracked as energy flows through a designed or natural system.
- Models of all kinds are important for testing solutions.
- There are systematic processes for evaluating solutions with respect to how well they meet the criteria and constraints of a problem.
- The iterative process of testing the most promising solutions and modifying what is proposed on the basis of the test results leads to greater refinement and ultimately to an optimal solution.
- A solution needs to be tested and then modified on the basis of the test results in order to for it to be improved.
- Although one design may not perform the best across all tests, identifyingthe characteristics of the design that performed the best in each test can provide useful information for the redesign process.
- Some of the characteristics identified as having the best performance may be incorporated into the new design.

Essential Questions

What happens to the atoms when I bake a cake?

How can a device be designed, constructed, tested, and modified that either releases or absorbs thermal energy by chemical processes?

What happens when substances react chemically?

What happens to atoms of the original substances when a reaction occurs?

Will the properties of the substance that is produced as part of a reaction be the same as those of the original substances?

What happens to the total mass of all atoms as a reaction takes place?

How does the amount of stored energy change during a chemical reaction?

How does the everyday definition of “heat” differ from the scientific definition?

When does heat transfer between two objects?

How are temperature and energy related?

Summative Assessment / Summative Criteria

- Quarterly Assessment
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- Project Rubrics
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- CER Rubrics
- Lab Reflections

Resources

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Unit Plan w/ Associated Standards (Chart)

Topics	Objectives	Activities	Assessments	Standards
Chemical Reactions / 1-2 Weeks	Distinguish between chemical and physical changes. Identify evidence for chemical and physical changes. Explain that unlike physical changes, chemial changes break bonds to create new substances with different properties. Define the law of concervation of mass and matter.	Mosa Mack: Chemical & Physical Changes Lab investigations Discovery Education virtual explorations Videos Brainpop: Property changes, Compounds and mixtures, Ions, Periodic table of elements Textbook materials from Book N Practicing balancing equations	Department created unit tests Department created section quizzes Project rubrics Mosa Mack "make" and "engineer" rubrics Lab journals Department created unit tests	PS1-4 PS1-5 PS1-6
Balancing Equations / 2-3 Weeks	Identify parts of a chemical equation and their role in identifying the amounts of elements in a formula. Balance the reactants and products in a chemical equation. Explain why chemical equations must be balanced.	Discovery Education virtual explorations Brainpop: Chemical equations, chemical bonds Textbook materials from Book N	Department created section quizzes Project rubrics Mosa Mack "make" and "engineer" rubrics	PS1-4 PS1-5 PS1-6

TECH.8.1.8.F.CS1	Identify and define authentic problems and significant questions for investigation.
SCI.MS-PS1-4	Develop a model that predicts and describes changes in particle motion, temperature, and state of a pure substance when thermal energy is added or removed.
LA.WHST.6-8.1	Write arguments focused on discipline-specific content.
LA.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.
LA.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.
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.
LA.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.
TECH.8.1.8.F.CS2	Plan and manage activities to develop a solution or complete a project.
LA.WHST.6-8.9	Draw evidence from informational texts to support analysis, reflection, and research.
LA.WHST.6-8.1.C	Use words, phrases, and clauses to create cohesion and clarify the relationships among claim(s), counterclaims, reasons, and evidence.
LA.SL.7.1	Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 7 topics, texts, and issues, building on others' ideas and expressing their own clearly.
TECH.8.1.8.F	Critical thinking, problem solving, and decision making: Students use critical thinking skills to plan and conduct research, manage projects, solve problems, and make informed decisions using appropriate digital tools and resources.
SCI.MS-PS1-6	Undertake a design project to construct, test, and modify a device that either releases or absorbs thermal energy by chemical processes.
LA.SL.7.1.A	Come to discussions prepared, having read or researched material under study; explicitly draw on that preparation by referring to evidence on the topic, text, or issue to probe and reflect on ideas under discussion.
LA.SL.7.1.B	Follow rules for collegial discussions, track progress toward specific goals and deadlines, and define individual roles as needed.
CRP.K-12.CRP7.1	Career-ready individuals are discerning in accepting and using new information to make decisions, change practices or inform strategies. They use reliable research process to search for new information. They evaluate the validity of sources when considering the use and adoption of external information or practices in their workplace situation.
TECH.8.1.8.B.CS2	Create original works as a means of personal or group expression.
LA.SL.7.1.C	Pose questions that elicit elaboration and respond to others' questions and comments with relevant observations and ideas that bring the discussion back on topic as needed.
LA.SL.7.1.D	Acknowledge new information expressed by others and, when warranted, modify their own views.
TECH.8.1.8.B.CS1	Apply existing knowledge to generate new ideas, products, or processes.

CAEP.9.2.8.B.3	Evaluate communication, collaboration, and leadership skills that can be developed through school, home, work, and extracurricular activities for use in a career.
CRP.K-12.CRP8	Utilize critical thinking to make sense of problems and persevere in solving them.
LA.RST.6-8.1	Cite specific textual evidence to support analysis of science and technical texts.
TECH.8.1.8.E.CS3	Evaluate and select information sources and digital tools based on the appropriateness for specific tasks.
LA.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.
LA.RST.6-8.3	Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.
LA.RST.6-8.4	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6-8 texts and topics.
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.6-8.8	Distinguish among facts, reasoned judgment based on research findings, and speculation in a text.
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.
LA.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.
SCI.MS-PS1-5	Develop and use a model to describe how the total number of atoms does not change in a chemical reaction and thus mass is conserved.
TECH.8.1.8.E.1	Effectively use a variety of search tools and filters in professional public databases to find information to solve a real world problem.
6-8.MS-PS1-4.2.1	Develop a model to predict and/or describe phenomena.
6-8.MS-PS1-4.PS1.A.1	Gases and liquids are made of molecules or inert atoms that are moving about relative to each other.
6-8.MS-PS1-4.PS1.A.2	In a liquid, the molecules are constantly in contact with others; in a gas, they are widely spaced except when they happen to collide. In a solid, atoms are closely spaced and may vibrate in position but do not change relative locations.
6-8.MS-PS1-4.PS1.A.3	The changes of state that occur with variations in temperature or pressure can be described and predicted using these models of matter.
6-8.MS-PS1-4.PS3.A.1	The term “heat” as used in everyday language refers both to thermal energy (the motion of atoms or molecules within a substance) and the transfer of that thermal energy from one object to another. In science, heat is used only for this second meaning; it refers to the energy transferred due to the temperature difference between two objects.
6-8.MS-PS1-4.PS3.A.2	The temperature of a system is proportional to the average internal kinetic energy and potential energy per atom or molecule (whichever is the appropriate building block for the system’s material). The details of that relationship depend on the type of atom or molecule and the interactions among the atoms in the material. Temperature is not a direct measure of a system's total thermal energy. The total thermal energy (sometimes called the total internal energy) of a system depends jointly on the temperature, the total number of atoms in the system, and the state of the material.

6-8.MS-PS1-4.2.1	Cause and effect relationships may be used to predict phenomena in natural or designed systems.
6-8.MS-PS1-5	Develop and use a model to describe how the total number of atoms does not change in a chemical reaction and thus mass is conserved.
6-8.MS-PS1-5.2.1	Develop a model to describe unobservable mechanisms.
6-8.MS-PS1-5.PS1.B.1	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.
6-8.MS-PS1-5.PS1.B.2	The total number of each type of atom is conserved, and thus the mass does not change.
6-8.MS-PS1-5.5.1	Matter is conserved because atoms are conserved in physical and chemical processes.
6-8.MS-PS1-6	Undertake a design project to construct, test, and modify a device that either releases or absorbs thermal energy by chemical processes.
6-8.MS-PS1-6.6.1	Undertake a design project, engaging in the design cycle, to construct and/or implement a solution that meets specific design criteria and constraints.
6-8.MS-PS1-6.PS1.B.1	Some chemical reactions release energy, others store energy.
6-8.MS-PS1-6.ETS1.B.1	A solution needs to be tested, and then modified on the basis of the test results, in order to improve it.
6-8.MS-PS1-6.ETS1.C.1	Although one design may not perform the best across all tests, identifying the characteristics of the design that performed the best in each test can provide useful information for the redesign process—that is, some of the characteristics may be incorporated into the new design.
6-8.MS-PS1-6.ETS1.C.2	The iterative process of testing the most promising solutions and modifying what is proposed on the basis of the test results leads to greater refinement and ultimately to an optimal solution.
6-8.MS-PS1-6.5.1	The transfer of energy can be tracked as energy flows through a designed or natural system.
TECH.8.1.8.E.CS2	Locate, organize, analyze, evaluate, synthesize, and ethically use information from a variety of sources and media.
TECH.8.1.8.E.CS4	Process data and report results.
TECH.8.1.8.B.1	Synthesize and publish information about a local or global issue or event (ex. telecollaborative project, blog, school web).

Suggested Modifications for Spec Ed, ESL, and Gifted Students

Structure lessons around questions that are authentic, relate to students' interests, social/family background and knowledge of their community.

- Provide students with multiple choices for how they can represent their understandings (e.g. multisensory techniques-auditory/visual aids; pictures, illustrations, graphs, charts, data tables, multimedia, modeling).
- Provide opportunities for students to connect with people of similar backgrounds (e.g. conversations via digital tool such as SKYPE, experts from the community helping with a project, journal articles, and biographies).
- Provide multiple grouping opportunities for students to share their ideas and to encourage work among

various backgrounds and cultures (e.g. multiple representation and multimodal experiences).

- Engage students with a variety of Science and Engineering practices to provide students with multiple entry points and multiple ways to demonstrate their understandings.
- Use project-based science learning to connect science with observable phenomena.
- Structure the 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.
- Restructure lesson using UDL principals

Cross Curricular / 21st Century Connections

English Language Arts

- Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks related to chemical reactions that release energy and some that store energy.
- Cite specific textual evidence to support analysis of science and technical texts on the design and modification of a device that controls the transfer of energy to the environment using factors such as type and concentration of a substance.
- Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the design and modification of a device that controls the transfer of energy to the environment using factors such as type and concentration of a substance.
- Conduct research on the design and modification of a device that controls the transfer of energy to the environment using factors such as type and concentration of a substance 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.
- Draw evidence from informational texts to support analysis, reflection, and research on the design and modification of a device that controls the transfer of energy to the environment using factors such as type and concentration of a substance.
- Include multimedia components and visual displays in presentations to clarify claims and findings and emphasize salient points on the design and modification of a device that controls the transfer of energy to the environment.

Mathematics

- Integrate quantitative information expressed in words about atoms before and after a chemical process with a version of that information expressed in a physical model or drawing, including digital forms.
- Reason quantitatively and abstractly during communication about melting or boiling points.
- Use mathematics to model the law of conservation of matter.
- Use ratio and rate reasoning to describe how the total number of atoms does not change in a chemical reaction, and thus mass is conserved.
- Reason quantitatively and abstractly: Reason quantitatively using numbers to represent the criteria (amount, time, and temperature of substance) when testing a device that either releases or absorbs thermal energy by chemical processes; reason abstractly by assigning labels or symbols.

- Collect and analyze numerical data from tests of a device that either releases or absorbs thermal energy by chemical processes. Determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success. Pose problems with positive and negative rational numbers in any form, using tools strategically. Apply properties of operations to calculate the numerical data with numbers in any form, convert between forms as appropriate, and assess the reasonableness of answers using mental computations and estimation strategies.
- Develop a probability model and use it as part of an iterative process for testing to find the probability that a promising design solution will lead to an optimal solution. Compare probabilities from a model to observed frequencies; if the agreement is not good, explain possible sources of the discrepancy in order to ultimately develop an optimal design.

Technological Innovations

- Mosa Mack
- Discovery Education
- BrainPop
- Achieve 3000

Unit 6 - Physical Science - Waves

Content Area: **Science**
Course(s):
Time Period: **4th Marking Period**
Length: **7-9 weeks**
Status: **Not Published**

Summary of the Unit

In this unit of study, students develop and use models, use mathematical thinking, and obtain, evaluate, and communicate information in order to describe and predict characteristic properties and behaviors of waves. Students also apply their understanding of waves as a means of sending digital information. The crosscutting concepts of patterns and structure and function are used as organizing concepts for these disciplinary core ideas. Students develop and use models, use mathematical thinking, and obtain, evaluate, and communicate information. Students are also expected to use these practices to demonstrate an understanding of the core ideas.

Enduring Understanding

- A simple wave has a repeating pattern with a specific wavelength, frequency, and amplitude.
- Describe a simple model for waves that includes how the amplitude of a wave is related to the energy in a wave.
- Graphs and charts can be used to identify patterns in data.
- Waves can be described with both qualitative and quantitative thinking.
- When light shines on an object, it is reflected, absorbed, or transmitted through the object, depending on the object's material and the frequency (color) of the light.
- The path that light travels can be traced as straight lines, except at surfaces between different transparent materials (e.g., air and water, air and glass) where the light path bends.
- A wave model of light is useful for explaining brightness, color, and the frequency-dependent bending of light at a surface between media.
- Waves are reflected, absorbed, or transmitted through various materials.
- A sound wave needs a medium through which it is transmitted.
- Because light can travel through space, it cannot be a matter wave, like sound or water waves.
- The structure of a wave can be modified to serve particular functions by taking into account properties of different materials and how materials can be shaped and used.
- Structures can be designed to use properties of waves to serve particular functions.
- Waves can be used for communication purposes.
- Digitized signals (sent as wave pulses) are a more reliable way to encode and transmit information than are analog signals.
- Wave-related technologies extend the measurement, exploration, modeling, and computational capacity of scientific investigations.

Essential Questions

Why do surfers love physicists?

How do the light and sound system in the auditorium work?

If rotary phones worked for my grandparents, why did they invent cell phones?

Why is the sky blue?

Why is it suggested to wear white instead of black on warm days?

What causes a wave?

What are the basic “parts” of a wave?

What are the properties that all waves exhibit?

What is a mechanical wave?

How do pitch and loudness correspond to the structure of a wave?

How does the Human ear detect sound?

What happens to the pitch of a sound wave when the sound source is in motion?

What happens to the sound waves of a plane that travels faster than the speed of sound?

What is the relationship between wavelength, frequency and energy of electromagnetic radiation?

What are the different types of electromagnetic radiation?

What are the different types of wave behaviors?

How does the absorption of light result in the different colors that we see?

How do objects refract through different mediums?

What are older, less reliable methods of communication?

What are the advantages of using digitized signals (electromagnetic waves) for communication over older methods?

Why are electromagnetic waves a more reliable method for transmitting information?

Which waves on the electromagnetic spectrum are primarily used for communication?

How are radio and light waves used for communication?

What are some examples of items that use these forms of EM waves for communication?

Why is digital communication of information in society?

Summative Assessment / Summative Criteria

- Quarterly Assessment
- Department Based Tests / Quizzes
- Project Rubrics
- Mosa Mack "Make" and "Engineer" Rubrics
- CER Rubrics
- Lab Reflections

Resources

- Textbook/Textbook worksheets
- Kesler Labs
- Centers
- Escape Rooms
- Science Videos
- Mosa Mack
- Discovery Education
- BrainPop
- Achieve 3000

Unit Plan w/ Associated Standards (Chart)

Topics / Timelines	Objectives	Activities	Assessments	Standards
Introduction to Waves / 1-2 Weeks	Identify types of waves and their parts. Identify ways that waves are used in modern technology and communication purposes.	Mosa Mack: Waves Lab investigations: Slinkys, Ropes, Labeling wave parts Discovery Education virtual explorations Videos Brainpop: Waves, Refraction and defraction, Rainbows	Department created unit tests Department created section quizzes Project rubrics Mosa Mack “make” and “engineer”	PS4-1 PS4-2 PS4-3

			rubrics	
			Lab journals Department created unit tests	
		Mosa Mack: Waves		
		Lab investigations: Exploring how different types of waves interact with different types of matter	Department created section quizzes	PS4-1
Types of Waves / 1-2 Weeks	Distinguish between light (electromagnetic) and sound (mechanical) waves.		Project rubrics	PS4-2
		Discovery Education virtual explorations		PS4-3
		Videos	Mosa Mack "make" and "engineer" rubrics	
		Brainpop: Waves, Refraction and defraction, Rainbows	Lab journals	
Electromagnetic Spectrum / 1-2 Weeks	Illustrate and identify parts of the electromagnetic spectrum.	Mosa Mack: Waves	Department created unit tests	PS4-1
	Explain various light wave behaviors and when they occur.	Lab investigations: Prisms, water, mirrors	Department created section quizzes	PS4-2
	Explain how the human eyes receive and process information from waves.	Discovery Education virtual explorations		PS4-3
			Project rubrics	
		Videos		
		Brainpop: Waves, Refraction	Mosa Mack "make" and "engineer"	

		and defraction, Rainbows	rubrics	
			Lab journals	
		Mosa Mack: Waves	Department created unit tests	
	Identify parts of a sound wave and define the relationship between interactions with various materials/types of matter.	Lab investigations: Tuning forks, radios, speakers, etc	Department created section quizzes	PS4-1
Sound Waves / 1-2 Weeks				PS4-2
	Explain sound wave behaviors and when they occur.	Discovery Education virtual explorations	Project rubrics	PS4-3
	Explain how the human ears receive and process information from waves.	Videos	Mosa Mack “make” and “engineer” rubrics	
		Brainpop: Waves, Refraction and defraction, Rainbows		
			Lab journals	
Wave Applications / 1-2 Weeks	Distinguish between analog and digital waves and determine their uses in modern technology.	Mosa Mack "Waves" - Engineer	Department created unit tests	PS4-1
		Better Lesson Projects		PS4-2
	Research and explain various solutions for people with hearing and/or seeing disabilities.	Centers / Stations	Department created section quizzes	PS4-3
			Project rubrics	
			Mosa Mack	

"make" and "engineer" rubrics

Lab journals

TECH.8.1.8.F.CS1	Identify and define authentic problems and significant questions for investigation.
LA.WHST.6-8.1	Write arguments focused on discipline-specific content.
LA.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.
LA.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.
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.
LA.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.
TECH.8.1.8.F.CS2	Plan and manage activities to develop a solution or complete a project.
LA.WHST.6-8.9	Draw evidence from informational texts to support analysis, reflection, and research.
LA.WHST.6-8.1.C	Use words, phrases, and clauses to create cohesion and clarify the relationships among claim(s), counterclaims, reasons, and evidence.
LA.SL.7.1	Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 7 topics, texts, and issues, building on others' ideas and expressing their own clearly.
TECH.8.1.8.F	Critical thinking, problem solving, and decision making: Students use critical thinking skills to plan and conduct research, manage projects, solve problems, and make informed decisions using appropriate digital tools and resources.
LA.SL.7.1.A	Come to discussions prepared, having read or researched material under study; explicitly draw on that preparation by referring to evidence on the topic, text, or issue to probe and reflect on ideas under discussion.
LA.SL.7.1.B	Follow rules for collegial discussions, track progress toward specific goals and deadlines, and define individual roles as needed.
CRP.K-12.CRP7.1	Career-ready individuals are discerning in accepting and using new information to make decisions, change practices or inform strategies. They use reliable research process to search for new information. They evaluate the validity of sources when considering the use and adoption of external information or practices in their workplace situation.
TECH.8.1.8.B.CS2	Create original works as a means of personal or group expression.
LA.SL.7.1.C	Pose questions that elicit elaboration and respond to others' questions and comments with relevant observations and ideas that bring the discussion back on topic as needed.
LA.SL.7.1.D	Acknowledge new information expressed by others and, when warranted, modify

	their own views.
SCI.MS-PS4-2	Develop and use a model to describe that waves are reflected, absorbed, or transmitted through various materials.
TECH.8.1.8.B.CS1	Apply existing knowledge to generate new ideas, products, or processes.
CAEP.9.2.8.B.3	Evaluate communication, collaboration, and leadership skills that can be developed through school, home, work, and extracurricular activities for use in a career.
CRP.K-12.CRP8	Utilize critical thinking to make sense of problems and persevere in solving them.
LA.RST.6-8.1	Cite specific textual evidence to support analysis of science and technical texts.
TECH.8.1.8.E.CS3	Evaluate and select information sources and digital tools based on the appropriateness for specific tasks.
LA.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.
LA.RST.6-8.3	Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.
LA.RST.6-8.4	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6-8 texts and topics.
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.6-8.8	Distinguish among facts, reasoned judgment based on research findings, and speculation in a text.
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.
LA.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.
TECH.8.1.8.E.1	Effectively use a variety of search tools and filters in professional public databases to find information to solve a real world problem.
SCI.MS-PS4-3	Integrate qualitative scientific and technical information to support the claim that digitized signals are a more reliable way to encode and transmit information than analog signals.
6-8.MS-PS4-1	Use mathematical representations to describe a simple model for waves that includes how the amplitude of a wave is related to the energy in a wave.
6-8.MS-PS4-1.5.1	Use mathematical representations to describe and/or support scientific conclusions and design solutions.
6-8.MS-PS4-1.PS4.A.1	A simple wave has a repeating pattern with a specific wavelength, frequency, and amplitude.
6-8.MS-PS4-1.1.1	Graphs and charts can be used to identify patterns in data.
6-8.MS-PS4-2	Develop and use a model to describe that waves are reflected, absorbed, or transmitted through various materials.
6-8.MS-PS4-2.2.1	Develop and use a model to describe phenomena.
6-8.MS-PS4-2.PS4.A.1	A sound wave needs a medium through which it is transmitted.
6-8.MS-PS4-2.PS4.B.1	When light shines on an object, it is reflected, absorbed, or transmitted through the object, depending on the object's material and the frequency (color) of the light.

6-8.MS-PS4-2.PS4.B.2	The path that light travels can be traced as straight lines, except at surfaces between different transparent materials (e.g., air and water, air and glass) where the light path bends.
6-8.MS-PS4-2.PS4.B.3	A wave model of light is useful for explaining brightness, color, and the frequency-dependent bending of light at a surface between media.
6-8.MS-PS4-2.PS4.B.4	However, because light can travel through space, it cannot be a matter wave, like sound or water waves.
6-8.MS-PS4-2.6.1	Structures can be designed to serve particular functions by taking into account properties of different materials, and how materials can be shaped and used.
6-8.MS-PS4-3	Integrate qualitative scientific and technical information to support the claim that digitized signals are a more reliable way to encode and transmit information than analog signals.
6-8.MS-PS4-3.8.1	Integrate qualitative scientific and technical information in written text with that contained in media and visual displays to clarify claims and findings.
6-8.MS-PS4-3.PS4.C.1	Digitized signals (sent as wave pulses) are a more reliable way to encode and transmit information.
6-8.MS-PS4-3.6.1	Structures can be designed to serve particular functions.
TECH.8.1.8.E.CS2	Locate, organize, analyze, evaluate, synthesize, and ethically use information from a variety of sources and media.
SCI.MS-PS4-1	Use mathematical representations to describe a simple model for waves that includes how the amplitude of a wave is related to the energy in a wave.
TECH.8.1.8.E.CS4	Process data and report results.
TECH.8.1.8.B.1	Synthesize and publish information about a local or global issue or event (ex. telecollaborative project, blog, school web).

Suggested Modifications for Spec Ed, ESL, and Gifted Students

Structure lessons around questions that are authentic, relate to students' interests, social/family background and knowledge of their community.

- Provide students with multiple choices for how they can represent their understandings (e.g. multisensory techniques-auditory/visual aids; pictures, illustrations, graphs, charts, data tables, multimedia, modeling).
- Provide opportunities for students to connect with people of similar backgrounds (e.g. conversations via digital tool such as SKYPE, experts from the community helping with a project, journal articles, and biographies).
- Provide multiple grouping opportunities for students to share their ideas and to encourage work among various backgrounds and cultures (e.g. multiple representation and multimodal experiences).
- Engage students with a variety of Science and Engineering practices to provide students with multiple entry points and multiple ways to demonstrate their understandings.
- Use project-based science learning to connect science with observable phenomena.
- Structure the 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.
- Restructure lesson using UDL principals

Cross Curricular / 21st Century Connections

English Language Arts/Literacy

- Integrate multimedia and visual displays into presentations that describe a simple model for waves that includes how the amplitude of a wave is related to the energy in a wave, to clarify information.
- Integrate multimedia and visual displays into presentations of a model that describes that waves are reflected, absorbed, or transmitted through various materials to clarify information.
- Cite specific textual evidence to support the claim that digitized signals are a more reliable way to encode and transmit information than analog signals.
- Determine the central ideas or conclusions of a text; provide an accurate summary of the text to support the claim that digitized signals are a more reliable way to encode and transmit information than analog signals, distinct from prior knowledge or opinions.
- Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text to support the claim that digitized signals are a more reliable way to encode and transmit information than analog signals.
- Draw evidence from informational texts to support the analysis of digitized signals as a more reliable way to encode and transmit information than analog signals.
- Integrate multimedia and visual displays into presentations to strengthen claims and evidence showing that digitized signals as a more reliable way to encode and transmit information than analog signals.

Mathematics

- Include mathematical representations to describe a simple model for waves.
- Use mathematical representations to describe and/or support scientific conclusions about how the amplitude of a wave is related to the energy in a wave.
- Understand the concept of a ratio and use ratio language to describe the relationship between the amplitude of a wave and the energy in the wave.
- Use ratio and rate reasoning to solve problems showing the relationship between the amplitude of a wave and the energy of the wave.
- Recognize and represent proportional relationships when using mathematical representations to describe a simple model.
- When using mathematical representations to describe a simple model, interpret the equation $y = mx + b$ as defining a linear function whose graph is a straight line and give examples of functions that are not linear.

Technological Innovations

- Mosa Mack
- Discovery Education
- BrainPop

- Achieve 3000