PITTSGROVE TOWNSHIP SCHOOL DISTRICT

Pittsgrove Township
School District
P.R.I.D.E. Patience Respect Integrity Diligence Empathy

Course Name: Science	**Grade Level(s): 8**
Department: Science	**Credits: NA**
BOE Adoption Date: September 17, 2020	**Revision Date(s):**

Course Description

Eighth Grade Science focuses on an integration of life, earth, and physical science. The goal of the middle school science program is to develop scientific literacy in all students. An effective approach to science education engages students physically and mentally in an inquiry based laboratory program. The program must provide students with experiences that will expand, change, enhance, and modify the way in which they view and understand the world. The program intends to nurture a child's natural curiosity with a student-centered approach which emphasizes student engagement, discovery, and self-reflection and which also promotes the development of critical thinking skills. Most importantly, the program and instructional approaches should instill a love of science and learning in the students that will serve them throughout their lives.

Mission Statement

The Pittsgrove Township School District believes in growing all learners to thrive. *The district offers an intellectually rigorous, dynamic curriculum aligned to state and national standards coupled with research-based practices in classrooms. The Pittsgrove Township School District strives to highlight critical thinking, problem-solving, intercultural literacy, digital literacy, collaboration, innovation, and a growth mindset as part of the instructional core of learning. The district provides high quality resources to provide young people the knowledge they need to approach the future as leaders and learners.*

Curriculum & Instruction Goals

1. To ensure students are college and career ready upon graduation
2. To vertically and horizontally align curriculum PreK-12 to ensure successful transition of students at each grade level
3. To identify individual student strengths and weaknesses utilizing various assessment measures (formative, summative, alternative, etc.) so as to differentiate instruction while meeting the rigor of the applicable content standards
4. To improve student achievement as assessed through multiple measures including, but not limited to, state testing, local assessments, and ongoing progress monitoring

How to Read this Document

This curricular document contains both a *pacing guide* and *curriculum units*. The pacing guide serves to communicate an estimated timeframe as to *when* critical knowledge and skills will be taught throughout the year. The pacing, however, may differ slightly depending upon the unique needs of each learner. The *curriculum units* contain more detailed information as to the content, goals, objectives, instructional strategies, resources, and assessments.

NJ Administrative Code and Statutes Key
^=Amistad Law **O=Diversity & Inclusion Law** **<>=Holocaust** **+=LGBT and Disabilities Law** ***=AAPI (Asian American and Pacific Islanders)** **$=Financial Literacy** **Use this key to understand where the NJ mandates are being implemented in the K-12 curriculum units.**

Pacing Guide

Course Title: Science 8
Prerequisite(s): Science 7

Unit Title	Duration/ Month(s)	Related Standards	Learning Goals	Critical Knowledge and Skills
Unit 1: Evidence of a Common Ancestry	**15 days**	**MS-LS4-1** **MS-LS4-2** **MS-LS4-3**	• Analyze and interpret **data** for **patterns** in the **fossil record** that document the **existence**, **diversity**, **extinction**, and **change** of **life forms** throughout the **history** of **life** on Earth under the **assumption** that natural **laws** operate today as in the past. • Apply scientific **ideas** to construct an **explanation** for the anatomical **similarities and differences** among modern **organisms** and between modern and fossil organisms to infer evolutionary **relationships**. • Analyze **displays** of pictorial **data** to compare **patterns** of	• Use graphs, charts, and images to identify patterns within the fossil record. • Analyze and interpret data within the fossil record to determine similarities and differences in findings. • Make logical and conceptual connections between evidence in the fossil record and explanations about the existence, diversity, extinction, and change in many life forms throughout the history of life on Earth. • Apply scientific ideas to construct explanations for evolutionary relationships. • Apply the patterns in gross anatomical structures among modern organisms and between modern organisms and fossil organisms to construct explanations of evolutionary relationships. • Apply scientific ideas about evolutionary history to construct

			similarities in the embryological **development** across multiple **species** to identify **relationships** not evident in the fully formed **anatomy**.	an explanation for evolutionary relationships evidenced by similarities or differences in the gross appearance of anatomical structures. • Use diagrams or pictures to identify patterns in embryological development across multiple species. • Analyze displays of pictorial data to identify where the embryological development is related linearly and where that linear nature ends. • Infer general patterns of relatedness among embryos of different organisms by comparing the macroscopic appearance of diagrams or pictures.
Unit 2: Selection and Adaptation	**20 days**	**MS-LS4-4** **MS-LS4-5** **MS-LS4-6**	● Construct an explanation based on evidence that describes how genetic variations of traits in a population increase some individuals' probability of surviving and reproducing in a specific environment. ● Gather and synthesize **information** about the **technologies** that have changed the way **humans**	● Construct an explanation that includes probability statements regarding variables and proportional reasoning of how genetic variations of traits in a population increase some individuals' probability surviving and reproducing in a specific environment. • Use probability to describe some cause-and-effect relationships that can be used to explain why some individuals survive and reproduce in a specific environment. ● Explain some causes of natural selection and the effect it has on

			influence the **inheritance** of desired **traits** in **organisms**. ● **Use** mathematical **representations** to support **explanations** of how **natural selection** may lead to increases and decreases of specific traits in **populations** over time.	the increase or decrease of specific traits in populations over time. ● Use mathematical representations to support conclusions about how natural selection may lead to increases and decreases of genetic traits in populations over time.
Unit 3: Stability and Change on Earth	**30 days**	**MS-ESS3-1** **MS-ESS3-2** **MS-ESS3-4** **MS-ESS3-5**	● 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**. ● Analyze and interpret **data** on natural **hazards** to forecast future catastrophic **events** and inform the **development** of **technologies** to mitigate their **effects**. ● Apply scientific **principles** to design a **method** for	● Construct a scientific explanation based on valid and reliable evidence of how the uneven distributions of Earth's mineral, energy, and groundwater resources are the result of past and current geosciences processes. ● Obtain evidence from sources, which must include the student's own experiments. ● Construct a scientific explanation based on the assumption that theories and laws that describe the current geosciences process operates today as they did in the past and will continue to do so in the future.

			monitoring and minimizing a human **impact** on the **environment**.* ● Construct an **argument** supported by **evidence** for how **increases** in human **population** and per-capita **consumption** of natural **resources impact Earth's systems.** ● Ask **questions** to clarify **evidence** of the **factors** that have caused the **rise** in global **temperatures** over the past **century**.	
Unit 4: Human Impacts	**25 days**	**MS-ESS3-3** **MS-ETS1-1** **MS-ETS1-2** **MS-ETS1-3**	● 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.	● Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.

			• 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. • Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment • Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking	

			into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions. ● Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem. ● Analyze data from tests to 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.	
Unit 5: Relationships among Forms of Energy	**20 days**	**MS-PS3-1** **MS-PS3-2** **MS-PS3-5**	● Construct and interpret graphical displays of data to describe the relationships of kinetic energy to the mass of an object and to the speed of an object. ● Develop a model to describe that when the arrangement of objects interacting at a distance changes, different amounts of potential energy are stored in the system.	● Construct and interpret graphical displays of data to identify linear and nonlinear relationships of kinetic energy to the mass of an object and to the speed of an object. ● Develop a model to describe what happens to the amount of potential energy stored in the system when the arrangement of objects interacting at a distance

			● 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	changes ● Use models to represent systems and their interactions, such as inputs, processes, and outputs, and energy and matter flows within systems. Models could include representations, diagrams, pictures, and written descriptions. ● Construct, use, and present oral and written arguments supported by empirical evidence and scientific reasoning to support the claim that when the kinetic energy of an object changes, energy is transferred to or from the object. ● Conduct an inventory or other representation of the energy before and after the transfer in the form of temperature changes or motion of an object. Do not include calculations of energy
Unit 6: Thermal Energy	**30 days**	**MS-PS3-3** **MS-PS3-4** **MS-ETS1-1** **MS-ETS1-2** **MS-ETS1-3**	● Apply scientific principles to design, construct, and test a device that either minimizes or maximizes thermal energy transfer.	● Individually and collaboratively plan an investigation to determine the relationships among the energy transferred, the type

		MS-ETS1-4	● 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. ● Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions. ● Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem. ● Analyze data from tests to 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	of matter, the mass, and the change in the average kinetic energy of particles as measured by the temperature of the sample. ● As part of a planned investigation, identify independent and dependent variables and controls, what tools are needed to do the gathering, how measurements will be recorded, and how many data are needed to support a claim. ● Make logical and conceptual connections between evidence and explanations. ● Apply scientific ideas or principles to design, construct, and test a design of a device that either minimizes or maximizes thermal energy transfer. ● Determine design criteria and constraints for a device that either minimizes or maximizes thermal energy transfer. ● Test design solutions and modify them on the basis of the test results in order to improve them. ● Use a systematic process for evaluating solutions with

			success. ● Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.	respect to how well they meet criteria and constraints.
Unit 7: The Electromagnetic	**20 days**	**MS-PS4-1** **MS-PS4-2** **MS-PS4-3**	● 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. ● Develop and use a model to describe that waves are reflected, absorbed, or transmitted through various materials. ● 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.	● 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. ● Use mathematical representations to describe a simple model. ● Develop and use models to describe the movement of waves in various materials. ● Integrate qualitative scientific and technical information in written text with that contained in media and visual displays to clarify claims that digitized signals are a more reliable way to encode and transmit information than analog signals are.

Instructional Unit Map			
Course Title: Science Grade 8			
Unit Title	Unit 1: Evidence of Common Ancestry	**Start Date:**	September
		Length of Unit:	15 days
Content Standards *What do we want them to know, understand , & do?*	**MS-LS4-1** Analyze and interpret data for patterns in the fossil record that document the existence, diversity, extinction, and change of life forms throughout the history of life on Earth under the assumption that natural laws operate today as in the past. [Clarification Statement: Emphasis is on finding patterns of changes in the level of complexity of anatomical structures in organisms and the chronological order of fossil appearance in the rock layers.] [Assessment Boundary: Assessment does not include the names of individual	**Learning Goals**	Students will be able to: ● Analyze and interpret data for patterns in the fossil record that document the existence, diversity, extinction, and change of life forms throughout the history of life on Earth under the assumption that natural laws operate today as in the past. ● Apply scientific ideas to construct an explanation for the anatomical similarities and differences among modern organisms and between modern and fossil organisms to infer evolutionary relationships. ● Analyze displays of pictorial data to compare patterns of similarities in the embryological development across multiple species to identify relationships not evident in the fully formed anatomy.

	species or geological eras in the fossil record.] **MS-LS4-2** Apply scientific ideas to construct an explanation for the anatomical similarities and differences among modern organisms and between modern and fossil organisms to infer evolutionary relationships. [Clarification Statement: Emphasis is on explanations of the evolutionary relationships among organisms in terms of similarity or differences of the gross appearance of anatomical structures.] **MS-LS4-3** Analyze displays of pictorial data to compare patterns of similarities in the embryological development across multiple species to identify relationships not evident in the fully formed anatomy. [Clarification Statement: Emphasis is on inferring general patterns of relatedness among embryos of different organisms by		

	comparing the macroscopic appearance of diagrams or pictures.] [Assessment Boundary: Assessment of comparisons is limited to gross appearance of anatomical structures in embryological development.]		
Essential Questions	● How do we know when an organism (fossil) was alive? ● How do we know that birds and dinosaurs are related? ● Other than bones and structures being similar, what other evidence is there that birds and dinosaurs are related?		
Assessments *How will we know they have gained the knowledge & skills?*	**Formative**	**Summative**	**Alternative**
	● Choral and individual responses to questioning ● Entrance/Exit Tickets ● Quizzes (paper-based and/or Google forms) ● Signals (thumbs up/down, sit/stand, and other answering strategies) ● Graded Classwork/ Homework ● Plickers Assessments ● Gimkit ● Quizlet live ● Kahoot games/reviews ● Individual white boards ● Observations & informal discussions with small groups or individuals	● End of Unit Test ● Extended Constructed Response Questions ● Project ● Lab Analysis/Conclusion Demonstration with explanation & fielding questions	● Student-Taught Lesson (small groups of students will teach the class) ● BrainPop Video (students create their own BrainPop-style video to explain a science phenomena) ● Advice Column (students write advice to an “anonymous friend” to help

	during labs ● Silent classroom polls ● Survivor		solve a scientific problem) ● Trivia Game (students create the questions and answers to be used in a review game)
Unit Pre-Assessment(s) *What do they already know?*	● K-W-L chart ● Simple game (style may vary: kahoot, quizizz, plickers, etc) ● Discussions ● Pre-Test (paper-based, Google Form, Plickers, etc.) ● Teacher-generated warm up questions with class discussion ● Individual Whiteboards (students hold up agree/disagree or short answers in response to questions or statements) ● Blind-Polling with Thumbs Up/Down (teacher asks a question or provides a vocabulary word; students close their eyes and demonstrate their comfort level with the information by indicating a thumbs up or down) ● "Four Corners" (students are given a series of statements, decide for each one the level to which they agree/disagree, and then move to the appropriate area of the classroom identified with one of the options. Students will discuss their positions with the others in their group and present their opinions to the rest of the class)		
Instructional Strategies/ Student Activities	● Direct Instruction ● Scaffolding ● Guided Practice ● Cooperative learning ● Modeling ● Learning Stations ● Graphic organizers ● Note-taking sheets ● Turn and Talk / Think-Pair-Share ● Flexible grouping		

	● Inquiry-based learning ● Self and Peer Review ● Word/picture/object sorts ● Read & Think Alouds ● Writing in the margins			
Instructional/Assessment Scaffolds *(Modifications /Accommodations) – planned for prior to instruction*	**English Language Learners**	**Special Education Learners**	**Struggling Learners**	**Advanced Learners**
	● Preferential seating ● Small group instruction as applicable ● Read directions aloud ● Clarified instruction ● Highlight and discuss key words (notes and verbally) ● Provide key vocabulary prior to lesson and/or assessment ● One-on-one conferencing when needed ● Differentiated grouping ● Allow oral responses ● Use multiple choice format ● Read test aloud ● Provide definitions of key terms in native language ● Use native language for directions (if possible - use	● Tiered assessments ● Limit required material for class presentation ● Differentiated grouping ● Use of visual representations of concepts ● Provide leveled reading material ● Preferential seating ● Small group instruction ● Small group testing ● Allow oral responses ● Use multiple choice format	● flexible grouping ● Digital resources via Google Classroom ● Read directions aloud ● Clarifying directions or conducting check-ins as needed ● Highlight/underline key words ● Concrete examples / examples related to personal interests or background ● Use of mnemonics ● Provide more detailed instructions for analysis tasks ● Provide visuals to accompany instruction ● Provide leveled reading material ● Preferential seating ● Small group instruction ● Additional time ● Allow for test corrections ● Vary test formats ● Provide study guides and study opportunities	● Independent reading choices beyond texts studied with the class as a whole ● Tiered assessments ● Choice of assessment styles/formats ● Independent study ● Learning stations ● Virtual escape rooms (unit specific) ● Current event presentations ● Creation of presentation, video or written

	translator program or person) ● Single step directions ● Additional time ● Allow for tests corrections ● Vary test format ● Chunking ● Accept short answers on assessments ● Provide multiple texts (English and native language translation) ● Use of visual representations of concepts ● Modify writing tasks (provide multiple topics/assignments to choose from) ● Short homework assignments ● Digital resources via Google Classroom ● Provide study guides and study opportunities, preferably in native language ● Small group testing ● Note taking on computer	● Modify assessments, as needed ● Read test aloud ● Read directions aloud ● Single step directions ● Answers to be dictated, as needed ● Additional time ● Allow for test corrections ● Allow retakes ● Provide study guides or study opportunities/class notes ● Read test passages/articles aloud (if assessing reading comprehension) ● Chunk projects or long-term assignments ● Provide schedule/timeline ● Choice of writing topics	● Chunk projects or long-term assignments ● Vary test formats ● Allow retakes ● Rest breaks, as needed ● Preview test procedures ● Pace long-term assignments (keeping calendar/schedule) ● Small group testing ● Collaborate with after-school programs or clubs to extend learning opportunities. ● Note taking on computer	review of a science topic or phenomena to be posted on our classroom website and shared with peers

<table>
<tr><td></td><td></td><td>● Digital resources via Google Classroom
● Note taking on computer</td><td></td><td></td></tr>
<tr><td rowspan="2">Differentiated Instructional Methods: (Multiple means for students to access content and multiple modes for student to express understanding)</td><td colspan="2">Access (Resources and/or Process)</td><td colspan="2">Expression (Products and/or Performance)</td></tr>
<tr><td colspan="2">● Class discussions with questions at varied complexity levels
● Varying collaboration, independence competition
● (work alone or with a partner when possible)
● Assignment checklists/guides
● Mini lessons to reteach, clarify & extend
● Use of small group sharing (Think-Pair-Share)
● D.I. with use of technology
● Interactive Notebook/Note-taking sheet (guided notes, “doodle” notes, Cornell notes, etc.)
● Learning Stations with varied standard-based tasks
● Use of Promethean Board for discussions, visuals, note-taking, interactives, etc.
● Multi-level electronic texts (with audio capability) provided through Google Classroom
● Read & Think Alouds
● Flexible grouping
● Reteaching /Reviewing
● Targeting Different Senses Within the Lesson (verbal, video, hands-on, use of visuals, modeling/acting out, songs/chants, etc)
● Reflection & Goal-setting
● Free Study Time (student choice: reviewing of notes, completion of task cards, watching a video review, small-group game, work completion with teacher-</td><td colspan="2">● Student choice during formal assessment style (eliminate a certain number of questions, answer open-ended option A or B, draw a diagram or explain, etc.)
● Menu Project / Choice Board
● Individual or Small-group presentation
● Rubric/criteria for success generated by teacher and students (may be different for different individuals/groups)
● Problem based learning
● Open ended opportunities</td></tr>
</table>

Vocabulary *Highlight key vocabulary (both Tier II and Tier III words)*	Tier II: observe, claim, evidence, reasoning, analyze, interpret, data, model, design, solution, criteria, constraint, construct, evaluate, change, patterns, fossils, existence, extinction, complexity, diversity, selection Tier III: fossil record, embryos, common ancestor, adaptation, rock layers, strata, natural selection, evolution, homologous, vestigial structure	
Integration of Technology SAMR	Substitution: ● Taking notes via Google Docs ● Typing up responses to questioning and sharing with teacher/peer ● Completing graphic organizers via Google Docs or Slides ● Completing digital worksheets via Google Forms, Docs, or Slides ● Use of online-based texts with dictionary and highlighting features ● Conducting research via Google ● Use of Google Classroom for providing and organizing materials Augmentation: ● Completing quizzes/tests via Google Forms ● Researching within Google Docs to add information and graphics to enhance notes ● Use of online-based texts with embedded videos and links to enhance understanding ● Using Gizmos, Phet, and other virtual labs/simulations ● Creation of scientific diagrams/models using Google Drawings ● Sharing videos, simulations, and other "extras" via Google Classroom to supplement notes and understanding ● Posting student created material via Padlet for sharing with peers ● Use of Quizizz or Kahoot! to review before a test Modification:	

	● Collaboration of students on a multimedia/slides project ● Peer-editing multimedia work ● Using Gizmos, Phet, and other virtual labs/simulations ● Creation of presentation, video, or written review of a science topic or phenomena posted on our classroom website ● Student completion of WebQuests ● Student participation in Digital Escape Rooms ● Plickers assessments Redefinition: ● Collaboration of students on a multimedia/slides project ● Posting, reviewing, and commenting on student created material via Padlet ● Student-Created and Student-Taught Lesson with multimedia presentation ● Use of Quizizz or Kahoot! to review before a test ● Plickers assessments
Interdisciplinary Connections NJ Student Learning Standards	**English Language Arts** ● Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. (MS-LS4-1),(MS- LS4-2),(MS-LS4-3) **RST.6-8.1** ● Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table). (MS-LS4-1),(MS-LS4-3) **RST.6-8.7** ● Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic. (MS-LS4-3) **RST.6-8.9** ● Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content. (MS-LS4-2) **WHST.6-8.2** ● Draw evidence from informational texts to support analysis, reflection, and research. (MS-LS4-2) **WHST.6-8.9** ● Engage effectively in a range of collaborative discussions (one-on-one, in groups, teacher-led) with diverse partners on grade 6 topics, texts, and issues, building on others' ideas and expressing their own clearly. (MS-LS4-2) **SL.8.1**

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- Present claims and findings, emphasizing salient points in a focused, coherent manner with relevant evidence, sound valid reasoning, and well-chosen details; use appropriate eye contact, adequate volume, and clear pronunciation. (MS- LS4-2) **SL.8.4**

Mathematics

- Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set. (MS-LS4-1),(MS-LS4-2) 6.EE.B.6
- Use variables to represent numbers and write expressions when solving a real- world or mathematical problem; understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set. (MS-LS4-1),(MS-LS4-2) 6.EE.B.6

</td></tr>
<tr><td rowspan="2">21st Century Themes/Skills
P21 Framework</td><td>Themes</td><td>Skills</td></tr>
<tr><td>

- Global Awareness

</td><td>

- Creativity and innovation
- Critical thinking and problem solving
- Communication and collaboration
- Flexibility and adaptability
- Information Literacy

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<tr><td>Resources/ Materials</td><td colspan="2">

Gizmos:
Human Evolution - Skull Analysis (MS-LS4-1 & MS-LS4-2)
Cladograms (MS-LS4-2)
Embryo Development (MS-LS4-2 & MS-LS4-3)

Mammals vs. Fish case study
Cladograms

- Drawing and interpreting cladograms (Google doc)
- Create a cladogram
- teacher created clips (instruction)

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	Molecule Evidence DNA spells evolution (NOVA video clip) Determining Relationships by DNA evidence (Google doc) Common Ancestry with Anatomy evidence (padlet and Google doc) Analyzing HIstory through fossil evidence Embryology (padlet) ● PhET Simulations ● Discovery Education (https://www.discoveryeducation.com/) ● ReadWorks (https://www.readworks.org) ● PBS Learning Media (https://www.pbslearningmedia.org/) ● CK-12 (https://www.ck12.org/) ● BrainPop (https://www.brainpop.com/) ● CrashCourseKids (https://www.youtube.com/user/crashcoursekids) ● StudyJams! (https://studyjams.scholastic.com/studyjams/) ● Teacher Generated Materials ● Learning Stations ● Task Cards

<table>
<tr><th colspan="5">Instructional Unit Map</th></tr>
<tr><td colspan="5">Course Title: Science Grade 8</td></tr>
<tr><td>Unit Title</td><td colspan="2">Unit 2: Selection and Adaptation</td><td>Start Date:</td><td>Oct. 3</td></tr>
<tr><td></td><td colspan="2"></td><td>Length of Unit:</td><td>20 days</td></tr>
<tr><td>Content Standards
What do we want them to know, understand , & do?</td><td colspan="2">MS-LS4-4 Construct an explanation based on evidence that describes how genetic variations of traits in a population increase some individuals’ probability of surviving and reproducing in a specific environment. [Clarification Statement: Emphasis is on using simple probability statements and proportional reasoning to construct explanations]

MS-LS4-5 Gather and synthesize information about the technologies that have changed the way humans influence the inheritance of desired traits in organisms. [Clarification Statement: Emphasis is on synthesizing</td><td>Learning Goals</td><td colspan="2">Students will be able to:
Construct an explanation based on evidence that describes how genetic variations of traits in a population increase some individuals’ probability of surviving and reproducing in a specific environment.
Gather and synthesize information about the technologies that have changed the way humans influence the inheritance of desired traits in organisms.
Use mathematical representations to support explanations of how natural selection may lead to increases and decreases of specific traits in populations over time.</td></tr>
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	information from reliable sources about the influence of humans on genetic outcomes in artificial selection (such as genetic modification, animal husbandry, gene therapy); and, on the impacts these technologies have on society as well as the technologies leading to these scientific discoveries.] **MS-LS4-6** Use mathematical representations to support explanations of how natural selection may lead to increases and decreases of specific traits in populations over time. [Clarification Statement: Emphasis is on using mathematical models, probability statements, and proportional reasoning to support explanations of trends in changes to populations over time.] [Assessment Boundary: Assessment does not include Hardy Weinberg calculations.]		
Essential Questions	Are Genetically Modified Organisms (GMO) safe to eat? How can changes to the genetic code increase or decrease an individual's chances of survival?		

	How can the environment affect natural selection?		
Assessments *How will we know they have gained the knowledge & skills?*	**Formative**	**Summative**	**Alternative**
	• Choral and individual responses to questioning • Entrance/Exit Tickets • Quizzes (paper-based and/or Google forms) • Signals (thumbs up/down, sit/stand, and other answering strategies) • Graded Classwork/ Homework • Plickers Assessments • Gimkit • Quizlet live • Kahoot games/reviews • Individual white boards • Observations & informal discussions with small groups or individuals during labs • Silent classroom polls • Survivor	• End of Unit Test • Extended Constructed Response Questions • Project • Lab Analysis/Conclusion • Demonstration with explanation & fielding questions	• Student-Taught Lesson (small groups of students will teach the class) • BrainPop Video (students create their own BrainPop-style video to explain a science phenomena) • Advice Column (students write advice to an “anonymous friend” to help solve a scientific problem) • Trivia Game (students create the questions and answers to be used in a review game)

Unit Pre-Assessment(s) *What do they already know?*	● K-W-L chart ● Simple game (style may vary: kahoot, quizizz, plickers, etc) ● Discussions ● Pre-Test (paper-based, Google Form, Plickers, etc.) ● Teacher-generated warm up questions with class discussion ● Individual Whiteboards (students hold up agree/disagree or short answers in response to questions or statements) ● Blind-Polling with Thumbs Up/Down (teacher asks a question or provides a vocabulary word; students close their eyes and demonstrate their comfort level with the information by indicating a thumbs up or down) ● "Four Corners" (students are given a series of statements, decide for each one the level to which they agree/disagree, and then move to the appropriate area of the classroom identified with one of the options. Students will discuss their positions with the others in their group and present their opinions to the rest of the class)			
Instructional Strategies/ Student Activities	● Direct Instruction ● Scaffolding ● Guided Practice ● Cooperative learning ● Modeling ● Learning Stations ● Graphic organizers ● Note-taking sheets ● Turn and Talk / Think-Pair-Share ● Flexible grouping ● Inquiry-based learning ● Self and Peer Review ● Word/picture/object sorts ● Read & Think Alouds ● Writing in the margins			
Instructional/Assessment Scaffolds	**English Language Learners**	**Special Education Learners**	**Struggling Learners**	**Advanced Learners**

(Modifications /Accommodations) – planned for prior to instruction	• Preferential seating • Small group instruction as applicable • Read directions aloud • Clarified instruction • Highlight and discuss key words (notes and verbally) • Provide key vocabulary prior to lesson and/or assessment • One-on-one conferencing when needed • Differentiated grouping • Allow oral responses • Use multiple choice format • Read test aloud • Provide definitions of key terms in native language • Use native language for directions (if possible - use translator program or person) • Single step directions • Additional time	• Tiered assessments • Limit required material for class presentation • Differentiated grouping • Use of visual representations of concepts • Provide leveled reading material • Preferential seating • Small group instruction • Small group testing • Allow oral responses • Use multiple choice format • Modify assessments, as needed • Read test aloud	• flexible grouping • Digital resources via Google Classroom • Read directions aloud • Clarifying directions or conducting check-ins as needed • Highlight/underline key words • Concrete examples / examples related to personal interests or background • Use of mnemonics • Provide more detailed instructions for analysis tasks • Provide visuals to accompany instruction • Provide leveled reading material • Preferential seating • Small group instruction • Additional time • Allow for test corrections • Vary test formats • Provide study guides and study opportunities • Chunk projects or long-term assignments • Vary test formats • Allow retakes • Rest breaks, as needed • Preview test procedures • Pace long-term assignments (keeping calendar/schedule)	• Independent reading choices beyond texts studied with the class as a whole • Tiered assessments • Choice of assessment styles/formats • Independent study • Learning stations • Virtual escape rooms (unit specific) • Current event presentations • Creation of presentation, video or written

	• Allow for tests corrections • Vary test format • Chunking • Accept short answers on assessments • Provide multiple texts (English and native language translation) • Use of visual representations of concepts • Modify writing tasks (provide multiple topics/assignments to choose from) • Short homework assignments • Digital resources via Google Classroom • Provide study guides and study opportunities, preferably in native language • Small group testing • Note taking on computer	• Read directions aloud • Single step directions • Answers to be dictated, as needed • Additional time • Allow for test corrections • Allow retakes • Provide study guides or study opportunities/class notes • Read test passages/articles aloud (if assessing reading comprehension) • Chunk projects or long-term assignments • Provide schedule/timeline • Choice of writing topics	• Small group testing • Collaborate with after-school programs or clubs to extend learning opportunities. • Note taking on computer	review of a science topic or phenomena to be posted on our classroom website and shared with peers

<table>
<tr><td></td><td></td><td>Digital resources via Google Classroom
Note taking on computer</td><td></td><td></td></tr>
<tr><td rowspan="2">Differentiated Instructional Methods: (Multiple means for students to access content and multiple modes for student to express understanding)</td><td colspan="2">Access (Resources and/or Process)</td><td colspan="2">Expression (Products and/or Performance)</td></tr>
<tr><td colspan="2">Chromebooks
Assignment checklists/guides
Text to speech technology (Electronic texts/audio texts - access through Media Center)
Notes
Flexible grouping
Smaller groupings for more individualized instruction
One-on-one conferencing
Class discussions with questions at varied complexity levels
Varying collaboration, independence competition
(work alone or with a partner when possible)
Assignment checklists/guides
Mini lessons to reteach, clarify & extend
Use of small group sharing (Think-Pair-Share)
D.I. with use of technology
Interactive Notebook/Note-taking sheet (guided notes, “doodle” notes, Cornell notes, etc.)
Learning Stations with varied standard-based tasks
Use of Promethean Board for discussions, visuals, note-taking, interactives, etc.
Multi-level electronic texts (with audio capability)</td><td colspan="2">Final projects
Conferencing conversations and progress
Peer group conversations/notes/evidence of discussions
Modified tests- expectations, delivery, format
Student choice during formal assessment style (eliminate a certain number of questions, answer open-ended option A or B, draw a diagram or explain, etc.)
Menu Project / Choice Board
Individual or Small-group presentation
Rubric/criteria for success generated by teacher and students (may be different for different individuals/groups)
Problem based learning
Open ended opportunities</td></tr>
</table>

	provided through Google Classroom ● Read & Think Alouds ● Flexible grouping ● Reteaching /Reviewing ● Targeting Different Senses Within the Lesson (verbal, video, hands-on, use of visuals, modeling/acting out, songs/chants, etc) ● Reflection & Goal-setting ● Free Study Time (student choice: reviewing of notes, completion of task cards, watching a video review, small-group game, work completion with teacher-	
Vocabulary *Highlight key vocabulary (both Tier II and Tier III words)*	Tier II: observe, claim, evidence, reasoning, analyze, interpret, data, model, design, solution, criteria, constraint, construct, evaluate, pattern, variation, competition, inherit, theory, characteristic, Tier III: adaptation, natural selection, fitness, survival of the fittest, evolution, species, mutation, carrying capacity, endangered species, limiting factors, Darwin, acquired trait, Lamarck	
Integration of Technology SAMR	Substitution: ● Taking notes via Google Docs ● Typing up responses to questioning and sharing with teacher/peer ● Completing graphic organizers via Google Docs or Slides ● Completing digital worksheets via Google Forms, Docs, or Slides ● Use of online-based texts with dictionary and highlighting features ● Conducting research via Google ● Use of Google Classroom for providing and organizing materials Augmentation: ● Completing quizzes/tests via Google Forms	

	● Researching within Google Docs to add information and graphics to enhance notes ● Use of online-based texts with embedded videos and links to enhance understanding ● Using Gizmos, Phet, and other virtual labs/simulations ● Creation of scientific diagrams/models using Google Drawings ● Sharing videos, simulations, and other "extras" via Google Classroom to supplement notes and understanding ● Posting student created material via Padlet for sharing with peers ● Use of Quizizz or Kahoot! to review before a test Modification: ● Collaboration of students on a multimedia/slides project ● Peer-editing multimedia work ● Using Gizmos, Phet, and other virtual labs/simulations ● Creation of presentation, video, or written review of a science topic or phenomena posted on our classroom website ● Student completion of WebQuests ● Student participation in Digital Escape Rooms ● Plickers assessments Redefinition: ● Collaboration of students on a multimedia/slides project ● Posting, reviewing, and commenting on student created material via Padlet ● Student-Created and Student-Taught Lesson with multimedia presentation ● Use of Quizizz or Kahoot! to review before a test ● Plickers assessments
Interdisciplinary Connections NJ Student Learning Standards	**English Language Arts** ● Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. (MS-LS4-4),(MS-LS4-5) RST.6-8.1 ● Compare and contrast the information gained from experiments, simulations, videos, or multimedia sources with that gained from reading a text on the same topic. (MS-LS4-4) RST.6-8.9 ● Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content. (MS-LS4-4) WHST.6-8.2

<table>
<tr><td></td><td colspan="2">

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. (MS-LS4-5) WHST.6-8.8
Draw evidence from informational texts to support analysis, reflection, and research. (MS-LS4-4) WHST.6-8.9
Engage effectively in a range of collaborative discussions (one-on-one, in groups, teacher-led) with diverse partners on grade 6 topics, texts, and issues, building on others' ideas and expressing their own clearly. (MS-LS4-4) SL.8.1
Present claims and findings, emphasizing salient points in a focused, coherent manner with relevant evidence, sound valid reasoning, and well-chosen details; use appropriate eye contact, adequate volume, and clear pronunciation. (MS-LS4-4) SL.8.4

Mathematics

Model with mathematics. (MS-LS4-6) MP.4
Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities. (MS-LS4-4),(MS-LS4-6) 6.RP.A.1
Summarize numerical data sets in relation to their context. (MS-LS4-4),(MS-LS4-6) 6.SP.B.5
Recognize and represent proportional relationships between quantities. (MS-LS4-4),(MS-LS4-6) 7.RP.A.2

</td></tr>
<tr><td rowspan="2">21st Century Themes/Skills
P21 Framework</td><td>Themes</td><td>Skills</td></tr>
<tr><td>

Global Awareness
Environmental Literacy

</td><td>

Creativity and innovation
Critical thinking and problem solving
Communication and collaboration
Flexibility and adaptability

</td></tr>
<tr><td>Resources/ Materials</td><td colspan="2">Gizmos:
Evolution: Mutation and Selection (MS-LS4-4; MS-LS4-6)
Evolution: Natural and Artificial Selection (MS-LS4-4; MS-LS4-5; MS-LS4-6)
Microevolution (MS-LS4-4; MS-LS4-6)
Natural Selection (MS-LS4-4)
Rainfall and Bird Beaks - Metric (MS-LS4-4)
Genetic Engineering (MS-LS4-5)</td></tr>
</table>

	Peppered Moth ● PhET Simulations ● Discovery Education (https://www.discoveryeducation.com/) ● ReadWorks (https://www.readworks.org) ● PBS Learning Media (https://www.pbslearningmedia.org/) https://www.pbs.org/wgbh/nova/labs/lab/energy/1/2/ ● CK-12 (https://www.ck12.org/) ● BrainPop (https://www.brainpop.com/) ● CrashCourseKids (https://www.youtube.com/user/crashcoursekids) ● StudyJams! (https://studyjams.scholastic.com/studyjams/) ● Teacher Generated Materials ● Learning Stations ● Task Cards

Instructional Unit Map					
Course Title: Science Grade 8					
Unit Title	Unit 3: Stability & Change on Earth & Human Impact (3&4 from state)			**Start Date:**	Nov. 10
				Length of Unit:	45 days
Content Standards *What do we want them to know,*	**(MS-ESS3-1) Construct a scientific explanation based on evidence for how the uneven distributions of Earth's mineral, energy, and groundwater resources are**	**Learning Goals**	Students will be able to: ● 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.		

understand , & do?	**the result of past and current geoscience processes.** [Clarification Statement: Emphasis is on how these resources are limited and typically nonrenewable, and how their distributions are significantly changing as a result of removal by humans. Examples of uneven distributions of resources as a result of past processes include but are not limited to petroleum (locations of the burial of organic marine sediments and subsequent geologic traps), metal ores (locations of past volcanic and hydrothermal activity associated with subduction zones), and soil (locations of active weathering and/or deposition of rock).] **MS-ESS3-2. Analyze and interpret data on natural hazards to forecast future catastrophic events and inform the development of technologies to mitigate their**		• Analyze and interpret data on natural hazards to forecast future catastrophic events and inform the development of technologies to mitigate their effects. • Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems. • Ask questions to clarify evidence of the factors that have caused the rise in global temperatures over the past century. • Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment. • Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions. • Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem. • Analyze data from tests to 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.

	effects. [Clarification Statement: Emphasis is on how some natural hazards, such as volcanic eruptions and severe weather, are preceded by phenomena that allow for reliable predictions, but others, such as earthquakes, occur suddenly and with no notice, and thus are not yet predictable. Examples of natural hazards can be taken from interior processes (such as earthquakes and volcanic eruptions), surface processes (such as mass wasting and tsunamis), or severe weather events (such as hurricanes, tornadoes, and floods). Examples of data can include the locations, magnitudes, and frequencies of the natural hazards. Examples of technologies can be global (such as satellite systems to monitor hurricanes or forest fires) or local (such as building basements in tornado-prone regions or reservoirs to mitigate droughts).]		

	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. [Clarification Statement: Examples of evidence include grade-appropriate databases on human populations and the rates of consumption of food and natural resources (such as freshwater, mineral, and energy). Examples of impacts can include changes to the appearance, composition, and structure of Earth's systems as well as the rates at which they change. The consequences of increases in human populations and consumption of natural resources are described by science, but science does not make the decisions for the actions society takes.]		

	MS-LS4-5. Gather and synthesize information about the technologies that have changed the way humans influence the inheritance of desired traits in organisms. [Clarification Statement: Emphasis is on synthesizing information from reliable sources about the influence of humans on genetic outcomes in artificial selection (such as genetic modification, animal husbandry, gene therapy); and, on the impacts these technologies have on society as well as the technologies leading to these scientific discoveries.] **MS-ESS3-3.** Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.*[Clarification Statement: Examples of the design process include examining human environmental impacts, assessing the kinds of		

	solutions that are feasible, and designing and evaluating solutions that could reduce that impact. Examples of human impacts can include water usage (such as the withdrawal of water from streams and aquifers or the construction of dams and levees), land usage (such as urban development, agriculture, or the removal of wetlands), and pollution (such as of the air, water, or land).] MS-ETS1-1. Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions. MS-ETS1-2. Evaluate competing design solutions using a systematic process to determine how well they		

	meet the criteria and constraints of the problem. MS-ETS1-3. Analyze data from tests to 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. The performance expectation above was developed		

Essential Questions	Why aren't minerals and groundwater distributed evenly across the world? How do we monitor the health of the environment (our life support system)? Is it possible to predict and protect ourselves from natural hazards? How might we treat resources if we thought about the Earth as a spaceship on an extended survey of the solar system? (How would astronauts manage their resources?)		
Assessments *How will we know they have gained the knowledge & skills?*	**Formative**	**Summative**	**Alternative**
	● Choral and individual responses to questioning ● Entrance/Exit Tickets ● Quizzes (paper-based and/or Google forms) ● Signals (thumbs up/down, sit/stand, and other answering strategies) ● Graded Classwork/	● End of Unit Test ● Extended Constructed Response Questions ● Project ● Lab Analysis/Conclusion Demonstration with explanation & fielding questions	● Student-Taught Lesson (small groups of students will teach the class) ● BrainPop Video (students create their own BrainPop-style

	Homework ● Plickers Assessments ● Gimkit ● Quizlet live ● Kahoot games/reviews ● Individual white boards ● Observations & informal discussions with small groups or individuals during labs ● Silent classroom polls ● Survivor		video to explain a science phenomena) ● Advice Column (students write advice to an "anonymous friend" to help solve a scientific problem) ● Trivia Game (students create the questions and answers to be used in a review game)
Unit Pre-Assessment(s) *What do they already know?*	● K-W-L chart ● Simple game (style may vary: kahoot, quizizz, plickers, etc) ● Discussions ● Pre-Test (paper-based, Google Form, Plickers, etc.) ● Teacher-generated warm up questions with class discussion ● Individual Whiteboards (students hold up agree/disagree or short answers in response to questions or statements) ● Blind-Polling with Thumbs Up/Down (teacher asks a question or provides a vocabulary word; students close their eyes and demonstrate their comfort level with the information by indicating a thumbs up or down) ● "Four Corners" (students are given a series of statements, decide for each one the level to which they agree/disagree, and then move to the appropriate area of the classroom identified with one of the options. Students will discuss their positions with the others in their group and present their opinions to the rest of the class)		
Instructional	● Direct Instruction ● Scaffolding		

<table>
<tr><td>Strategies/ Student Activities</td><td colspan="4">● Guided Practice
● Cooperative learning
● Modeling
● Learning Stations
● Graphic organizers
● Note-taking sheets
● Turn and Talk / Think-Pair-Share
● Flexible grouping
● Inquiry-based learning
● Self and Peer Review
● Word/picture/object sorts
● Read & Think Alouds
● Writing in the margins</td></tr>
<tr><td rowspan="2">Instructional/Assessment Scaffolds (Modifications /Accommodations) – planned for prior to instruction</td><td>English Language Learners</td><td>Special Education Learners</td><td>Struggling Learners</td><td>Advanced Learners</td></tr>
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● Read directions aloud
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	• One-on-one conferencing when needed • Differentiated grouping • Allow oral responses • Use multiple choice format • Read test aloud • Provide definitions of key terms in native language • Use native language for directions (if possible - use translator program or person) • Single step directions • Additional time • Allow for tests corrections • Vary test format • Chunking • Accept short answers on assessments • Provide multiple texts (English and native language translation) • Use of visual representations of concepts	• Provide leveled reading material • Preferential seating • Small group instruction • Small group testing • Allow oral responses • Use multiple choice format • Modify assessments, as needed • Read test aloud • Read directions aloud • Single step directions • Answers to be dictated, as needed • Additional time • Allow for test corrections • Allow retakes • Provide study guides or study	• Provide leveled reading material • Preferential seating • Small group instruction • Additional time • Allow for test corrections • Vary test formats • Provide study guides and study opportunities • Chunk projects or long-term assignments • Vary test formats • Allow retakes • Rest breaks, as needed • Preview test procedures • Pace long-term assignments (keeping calendar/schedule) • Small group testing • Collaborate with after-school programs or clubs to extend learning opportunities. • Note taking on computer	• Virtual escape rooms (unit specific) • Current event presentations • Creation of presentation, video or written review of a science topic or phenomena to be posted on our classroom website and shared with peers

	• Modify writing tasks (provide multiple topics/assignments to choose from) • Short homework assignments • Digital resources via Google Classroom • Provide study guides and study opportunities, preferably in native language • Small group testing • Note taking on computer	opportunities/class notes • Read test passages/articles aloud (if assessing reading comprehension) • Chunk projects or long-term assignments • Provide schedule/timeline • Choice of writing topics • Digital resources via Google Classroom • Note taking on computer		
Differentiated Instructional Methods: *(Multiple means for*	**Access** (Resources and/or Process)		**Expression** (Products and/or Performance)	
	• Class discussions with questions at varied complexity levels • Varying collaboration, independence competition • (work alone or with a partner when possible) • Assignment checklists/guides • Mini lessons to reteach, clarify & extend		• Student choice during formal assessment style (eliminate a certain number of questions, answer open-ended option A or B, draw a diagram or explain, etc.) • Menu Project / Choice Board • Individual or Small-group presentation • Rubric/criteria for success generated by teacher and students	

students to access content and multiple modes for student to express understanding)	• Use of small group sharing (Think-Pair-Share) • D.I. with use of technology • Interactive Notebook/Note-taking sheet (guided notes, "doodle" notes, Cornell notes, etc.) • Learning Stations with varied standard-based tasks • Use of Promethean Board for discussions, visuals, note-taking, interactives, etc. • Multi-level electronic texts (with audio capability) provided through Google Classroom • Read & Think Alouds • Flexible grouping • Reteaching /Reviewing • Targeting Different Senses Within the Lesson (verbal, video, hands-on, use of visuals, modeling/acting out, songs/chants, etc) • Reflection & Goal-setting • Free Study Time (student choice: reviewing of notes, completion of task cards, watching a video review, small-group game, work completion with teacher-	(may be different for different individuals/groups) • Problem based learning • Open ended opportunities
Vocabulary *Highlight key vocabulary (both Tier II and Tier III words)*	Tier II: observe, claim, evidence, reasoning, analyze, interpret, data, model, design, solution, criteria, constraint, construct, evaluate, pattern, wind Tier III: Renewable resources, nonrenewable resources, Fossil fuel, tidal energy, Global warming, greenhouse effect,	

Integration of Technology SAMR	Substitution: ● Taking notes via Google Docs ● Typing up responses to questioning and sharing with teacher/peer ● Completing graphic organizers via Google Docs or Slides ● Completing digital worksheets via Google Forms, Docs, or Slides ● Use of online-based texts with dictionary and highlighting features ● Conducting research via Google ● Use of Google Classroom for providing and organizing materials Augmentation: ● Completing quizzes/tests via Google Forms ● Researching within Google Docs to add information and graphics to enhance notes ● Use of online-based texts with embedded videos and links to enhance understanding ● Using Gizmos, Phet, and other virtual labs/simulations ● Creation of scientific diagrams/models using Google Drawings ● Sharing videos, simulations, and other "extras" via Google Classroom to supplement notes and understanding ● Posting student created material via Padlet for sharing with peers ● Use of Quizizz or Kahoot! to review before a test Modification: ● Collaboration of students on a multimedia/slides project ● Peer-editing multimedia work ● Using Gizmos, Phet, and other virtual labs/simulations ● Creation of presentation, video, or written review of a science topic or phenomena posted on our classroom website ● Student completion of WebQuests ● Student participation in Digital Escape Rooms ● Plickers assessments Redefinition: ● Collaboration of students on a multimedia/slides project

	• Posting, reviewing, and commenting on student created material via Padlet • Student-Created and Student-Taught Lesson with multimedia presentation • Use of Quizizz or Kahoot! to review before a test • Plickers assessments
Interdisciplinary Connections NJ Student Learning Standards	**Mathematics** • Reason abstractly and quantitatively. (MS-ESS3-2) MP.2 • Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set. (MS-ESS3-1),(MS-ESS3-2) 6.EE.B.6 • Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities. (MS-ESS3-1),(MS-ESS3-2) 7.EE.B.4 • Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set. (MS-ESS3-3) **6.EE.B.6** • Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities. (MS-ESS3-3) **7.EE.B.4** • Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities. (MS-ESS3-3) **6.RP.A.1** • Recognize and represent proportional relationships between quantities. (MS-ESS3-3) **7.RP.A.2** • Reason abstractly and quantitatively. (MS-ETS1-1),(MS-ETS1-2),(MS-ETS1-3) **MP.2** • Solve multi-step real-life and 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; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies. (MS-ETS1-1),(MS-ETS1-2),(MS-ETS1-3) **7.EE.3** **English Language Arts** • Cite specific textual evidence to support analysis of science and technical texts. (MS-ESS3-1),(MS-ESS3-2) **RST.6-8.1** • Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table). (MS-ESS3-2) **RST.6-8.7**

<table>
<tr><td></td><td colspan="2">

Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content. (MS-ESS3-1) WHST.6-8.2
Draw evidence from informational texts to support analysis, reflection, and research. (MS-ESS3-1) WHST.6-8.9
Cite specific textual evidence to support analysis of science and technical texts. (MS-ETS1-1),(MS-ETS1-2),(MS-ETS1-3) RST.6-8.1
Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table). (MS-ESS3-3),(MS-ETS1-3) RST.6-8.7
Compare and contrast the information gained from experiments, simulations, videos, or multimedia sources with that gained from reading a text on the same topic. (MS-ETS1-2),(MS-ETS1-3) RST.6-8.9
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. (MS-ETS1-2) WHST.6-8.7
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. (MS-ESS3-3),(MS-ETS1-1) WHST.6-8.8
Draw evidence from informational texts to support analysis, reflection, and research. (MS-ETS1-2) WHST.6-8.9
Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest. (MS-ETS1-4) SL.8.5

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Global Awareness
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Creativity and innovation
Critical thinking and problem solving
Communication and collaboration
Flexibility and adaptability

</td></tr>
<tr><td>Resources/ Materials</td><td colspan="2">Gizmo
Carbon Cycle (MS-ESS3-1; MS-ESS3-4; MS-ESS3-5)
Hurricane Motion - Metric (MS-ESS3-2)
Coral Reefs 2 - Biotic Factors (MS-ESS3-4)
Greenhouse Effect (MS-ESS3-5)
Greenhouse Effect - Metric (MS-ESS3-5)</td></tr>
</table>

	GMOs and the Environment (MS-ESS3-3; MS-ETS1-1; MS-ETS1-2; MS-ETS1-3) Feel the Heat (MS-PS3-3; MS-ETS1-1; MS-ETS1-2; MS-ETS1-3; MS-ETS1-4) Genetic Engineering (MS-ETS1-1, MS-ETS1-2; MS-ETS1-3) Pendulum Clock (MS-ETS1-1; MS-ETS1-2) Trebuchet (MS-ETS1-1; MS-ETS1-2) ● PhET Simulations ● Discovery Education (https://www.discoveryeducation.com/) ● ReadWorks (https://www.readworks.org) ● PBS Learning Media (https://www.pbslearningmedia.org/) ● CK-12 (https://www.ck12.org/) ● BrainPop (https://www.brainpop.com/) ● CrashCourseKids (https://www.youtube.com/user/crashcoursekids) ● StudyJams! (https://studyjams.scholastic.com/studyjams/) ● Teacher Generated Materials ● Learning Stations ● Task Card

Instructional Unit Map			
Course Title: Science Grade 8			
Unit Title	Unit 4: Energy - Relationships Among Forms of Energy	**Start Date:**	November

	- Thermal Energy (5&6 from state)	**Length of Unit:**	45 days

Content Standards *What do we want them to know, understand, & do?*	MS-PS3-1. Construct and interpret graphical displays of data to describe the relationships of kinetic energy to the mass of an object and to the speed of an object. [Clarification Statement: Emphasis is on descriptive relationships between kinetic energy and mass separately from kinetic energy and speed. Examples could include riding a bicycle at different speeds, rolling different sizes of rocks downhill, and getting hit by a wiffle ball versus a tennis ball.] The performance expectation above was developed using the following elements from the NRC document A Framework for K-12 Science Education: Science and Engineering Practices Analyzing and Interpreting Data Analyzing data in 6–8 builds on K–5 and progresses to extending quantitative analysis to	**Learning Goals**	Students will be able to: ● Construct and interpret graphical displays of data to describe the relationships of kinetic energy to the mass of an object and to the speed of an object. ● Develop a model to describe that when the arrangement of objects interacting at a distance changes, different amounts of potential energy are stored in the system. ● 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. ● Apply scientific principles to design, construct, and test a device that either minimizes or maximizes thermal energy transfer. ● 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. ● Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions. ● Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem. ● Analyze data from tests to 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.

	investigations, distinguishing between correlation and causation, and basic statistical techniques of data and error analysis. Construct and interpret graphical displays of data to identify linear and nonlinear relationships. Disciplinary Core Id MS-PS3-2. Develop a model to describe that when the arrangement of objects interacting at a distance changes, different amounts of potential energy are stored in the system. [Clarification Statement: Emphasis is on relative amounts of potential energy, not on calculations of potential energy. Examples of objects within systems interacting at varying distances could include: the Earth and either a roller coaster cart at varying positions on a hill or objects at varying heights on shelves, changing the direction/orientation of a		• Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.

	magnet, and a balloon with static electrical charge being brought closer to a classmate's hair. Examples of models could include representations, diagrams, pictures, and written descriptions of systems.] [Assessment Boundary: Assessment is limited to two objects and electric, magnetic, and gravitational interactions.] 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. [Clarification Statement: Examples of empirical evidence used in arguments could include an inventory or other representation of the energy before and after the transfer in the form of temperature changes or motion of object.] [Assessment Boundary:		

	Assessment does not include calculations of energy.] MS-PS3-3. Apply scientific principles to design, construct, and test a device that either minimizes or maximizes thermal energy transfer.* [Clarification Statement: Examples of devices could include an insulated box, a solar cooker, and a Styrofoam cup.] [Assessment Boundary: Assessment does not include calculating the total amount of thermal energy transferred.] 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. [Clarification Statement: Examples of experiments could include comparing final water		

	temperatures after different masses of ice melted in the same volume of water with the same initial temperature, the temperature change of samples of different materials with the same mass as they cool or heat in the environment, or the same material with different masses when a specific amount of energy is added.] [Assessment Boundary: Assessment does not include calculating the total amount of thermal energy transferred.] MS-ETS1-1. Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions. MS-ETS1-2. Evaluate competing design solutions		

	using a systematic process to determine how well they meet the criteria and constraints of the problem. MS-ETS1-3. Analyze data from tests to 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. MS-ETS1-4. Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.		
Essential Questions	How can physics explain sports? How can a standard thermometer be used to tell you how particles are behaving? Is it better to have an aluminum (baseball/softball) bat or a wooden bat? What would give you a better chance of winning a bowling match, using a basketball that you can roll really fast, or a bowling bowl that you can only roll slowly? Who can design the best roller coaster?		
Assessments *How will we know*	**Formative**	**Summative**	**Alternative**

they have gained the knowledge & skills?	• Choral and individual responses to questioning • Entrance/Exit Tickets • Quizzes (paper-based and/or Google forms) • Signals (thumbs up/down, sit/stand, and other answering strategies) • Graded Classwork/ Homework • Plickers Assessments • Gimkit • Quizlet live • Kahoot games/reviews • Individual white boards • Observations & informal discussions with small groups or individuals during labs • Silent classroom polls • Survivor	• End of Unit Test • Extended Constructed Response Questions • Project • Lab Analysis/Conclusion Demonstration with explanation & fielding questions	• Student-Taught Lesson (small groups of students will teach the class) • BrainPop Video (students create their own BrainPop-style video to explain a science phenomena) • Advice Column (students write advice to an "anonymous friend" to help solve a scientific problem) • Trivia Game (students create the questions and answers to be used in a review game)
Unit Pre-Assessment(s) *What do they*	• K-W-L chart • Simple game (style may vary: kahoot, quizizz, plickers, etc) • Discussions • Pre-Test (paper-based, Google Form, Plickers, etc.) • Teacher-generated warm up questions with class discussion		

<table>
<tr><td>already know?</td><td colspan="4">● Individual Whiteboards (students hold up agree/disagree or short answers in response to questions or statements)
● Blind-Polling with Thumbs Up/Down (teacher asks a question or provides a vocabulary word; students close their eyes and demonstrate their comfort level with the information by indicating a thumbs up or down)
● “Four Corners” (students are given a series of statements, decide for each one the level to which they agree/disagree, and then move to the appropriate area of the classroom identified with one of the options. Students will discuss their positions with the others in their group and present their opinions to the rest of the class)</td></tr>
<tr><td>Instructional Strategies/ Student Activities</td><td colspan="4">● Direct Instruction
● Scaffolding
● Guided Practice
● Cooperative learning
● Modeling
● Learning Stations
● Graphic organizers
● Note-taking sheets
● Turn and Talk / Think-Pair-Share
● Flexible grouping
● Inquiry-based learning
● Self and Peer Review
● Word/picture/object sorts
● Read & Think Alouds
● Writing in the margins</td></tr>
<tr><td rowspan="2">Instructional/Assessment Scaffolds (Modifications /Accommodations) – planned for</td><td>English Language Learners</td><td>Special Education Learners</td><td>Struggling Learners</td><td>Advanced Learners</td></tr>
<tr><td>● Preferential seating
● Small group instruction as applicable
● Read directions aloud
● Clarified instruction</td><td>● Tiered assessments
● Limit required material for</td><td>● flexible grouping
● Digital resources via Google Classroom
● Read directions aloud
● Clarifying directions or conducting check-ins as needed</td><td>● Independent reading choices beyond texts studied with</td></tr>
</table>

prior to instruction	• Highlight and discuss key words (notes and verbally) • Provide key vocabulary prior to lesson and/or assessment • One-on-one conferencing when needed • Differentiated grouping • Allow oral responses • Use multiple choice format • Read test aloud • Provide definitions of key terms in native language • Use native language for directions (if possible - use translator program or person) • Single step directions • Additional time • Allow for tests corrections • Vary test format • Chunking • Accept short answers on assessments	class presentation • Differentiated grouping • Use of visual representations of concepts • Provide leveled reading material • Preferential seating • Small group instruction • Small group testing • Allow oral responses • Use multiple choice format • Modify assessments, as needed • Read test aloud • Read directions aloud • Single step directions	• Highlight/underline key words • Concrete examples / examples related to personal interests or background • Use of mnemonics • Provide more detailed instructions for analysis tasks • Provide visuals to accompany instruction • Provide leveled reading material • Preferential seating • Small group instruction • Additional time • Allow for test corrections • Vary test formats • Provide study guides and study opportunities • Chunk projects or long-term assignments • Vary test formats • Allow retakes • Rest breaks, as needed • Preview test procedures • Pace long-term assignments (keeping calendar/schedule) • Small group testing • Collaborate with after-school programs or clubs to extend learning opportunities. • Note taking on computer	the class as a whole • Tiered assessments • Choice of assessment styles/formats • Independent study • Learning stations • Virtual escape rooms (unit specific) • Current event presentations • Creation of presentation, video or written review of a science topic or phenomena to be posted on our

	● Provide multiple texts (English and native language translation) ● Use of visual representations of concepts ● Modify writing tasks (provide multiple topics/assignments to choose from) ● Short homework assignments ● Digital resources via Google Classroom ● Provide study guides and study opportunities, preferably in native language ● Small group testing ● Note taking on computer	● Answers to be dictated, as needed ● Additional time ● Allow for test corrections ● Allow retakes ● Provide study guides or study opportunities/class notes ● Read test passages/articles aloud (if assessing reading comprehension) ● Chunk projects or long-term assignments ● Provide schedule/timeline ● Choice of writing topics ● Digital resources via Google Classroom		classroom website and shared with peers

		● Note taking on computer		
Differentiated Instructional Methods: *(Multiple means for students to access content and multiple modes for student to express understanding)*	**Access** (Resources and/or Process)		**Expression** (Products and/or Performance)	
	● Class discussions with questions at varied complexity levels ● Varying collaboration, independence competition ● (work alone or with a partner when possible) ● Assignment checklists/guides ● Mini lessons to reteach, clarify & extend ● Use of small group sharing (Think-Pair-Share) ● D.I. with use of technology ● Interactive Notebook/Note-taking sheet (guided notes, “doodle” notes, Cornell notes, etc.) ● Learning Stations with varied standard-based tasks ● Use of Promethean Board for discussions, visuals, note-taking, interactives, etc. ● Multi-level electronic texts (with audio capability) provided through Google Classroom ● Read & Think Alouds ● Flexible grouping ● Reteaching /Reviewing ● Targeting Different Senses Within the Lesson (verbal, video, hands-on, use of visuals, modeling/acting out, songs/chants, etc) ● Reflection & Goal-setting ● Free Study Time (student choice: reviewing of notes, completion of task cards, watching a video review, small-group game, work completion with teacher-		● Student choice during formal assessment style (eliminate a certain number of questions, answer open-ended option A or B, draw a diagram or explain, etc.) ● Menu Project / Choice Board ● Individual or Small-group presentation ● Rubric/criteria for success generated by teacher and students (may be different for different individuals/groups) ● Problem based learning ● Open ended opportunities	

Vocabulary *Highlight key vocabulary (both Tier II and Tier III words)*	Tier II: observe, claim, evidence, reasoning, analyze, interpret, data, model, design, solution, criteria, constraint, construct, evaluate, pattern, energy, heat, temperature Tier III: Potential energy, Kinetic energy, light energy, nuclear energy, Hydroelectric energy, Electrical energy, Chemical energy, geothermal energy, thermal energy, heat transfer, Combustion, Conduction, convection, Conserving energy, wave	
Integration of Technology SAMR	Substitution: ● Taking notes via Google Docs ● Typing up responses to questioning and sharing with teacher/peer ● Completing graphic organizers via Google Docs or Slides ● Completing digital worksheets via Google Forms, Docs, or Slides ● Use of online-based texts with dictionary and highlighting features ● Conducting research via Google ● Use of Google Classroom for providing and organizing materials Augmentation: ● Completing quizzes/tests via Google Forms ● Researching within Google Docs to add information and graphics to enhance notes ● Use of online-based texts with embedded videos and links to enhance understanding ● Using Gizmos, Phet, and other virtual labs/simulations ● Creation of scientific diagrams/models using Google Drawings ● Sharing videos, simulations, and other "extras" via Google Classroom to supplement notes and understanding ● Posting student created material via Padlet for sharing with peers ● Use of Quizizz or Kahoot! to review before a test Modification: ● Collaboration of students on a multimedia/slides project ● Peer-editing multimedia work	

	● Using Gizmos, Phet, and other virtual labs/simulations ● Creation of presentation, video, or written review of a science topic or phenomena posted on our classroom website ● Student completion of WebQuests ● Student participation in Digital Escape Rooms ● Plickers assessments Redefinition: ● Collaboration of students on a multimedia/slides project ● Posting, reviewing, and commenting on student created material via Padlet ● Student-Created and Student-Taught Lesson with multimedia presentation ● Use of Quizizz or Kahoot! to review before a test ● Plickers assessments
Interdisciplinary Connections NJ Student Learning Standards	**English Language Arts** ● Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. *(MS-PS3-1),(MS-PS3-5)* RST.6-8.1 ● Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table). (MS-PS3-1) RST.6-8.7 ● Write arguments focused on discipline content. *(MS-PS3-5)* WHST.6-8.1 ● 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. (MS-PS3-3) WHST.6-8.7 ● Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest. *(MS-PS3-2)* SL.8.5 ● Cite specific textual evidence to support analysis of science and technical texts. (MS-PS3-5),MS-ETS1-1),(MS-ETS1-2),(MS-ETS1-3) **RST.6-8.1** ● Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks. (MS-PS3-3),(MS-PS3-4) **RST.6-8.3** ● Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table). (MS-PS3-3),(MS-PS3-4),(MS-ETS1-3) **RST.6-8.7** ● Compare and contrast the information gained from experiments, simulations, videos, or multimedia sources with that gained from reading a text on the same topic. (MS-ETS1-2),(MS-ETS1-3) **RST.6-8.9**

	● 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. (MS-ETS1-2) **WHST.6-8.7** ● 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. (MS-ETS1-1) **WHST.6-8.8** ● Draw evidence from informational texts to support analysis, reflection, and research. (MS-ETS1-2) **WHST.6-8.9** ● Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest. (MS-ETS1-4) **SL.8.5** **Mathematics** ● Reason abstractly and quantitatively. (MS-PS3-1),(MS-PS3-5) MP.2 ● Understand the concept of ratio and use ratio language to describe a ratio relationship between two quantities. (MS-PS3-1),(MS-PS3-5) 6.RP.A.1 ● Understand the concept of a unit rate a/b associated with a ratio a:b with b ≠ 0, and use rate language in the context of a ratio relationship. (MS-PS3-1) 6.RP.A.2 ● Recognize and represent proportional relationships between quantities. (MS-PS3-1),(MS-PS3-5) 7.RP.A.2 ● Know and apply the properties of integer exponents to generate equivalent numerical expressions. (MS-PS3-1) 8.EE.A.1 ● Use square root and cube root symbols to represent solutions to equations of the form $x^2 = p$ and $x^3 = p$, where p is a positive rational number. Evaluate square roots of small perfect squares and cube roots of small perfect cubes. Know that $\sqrt{2}$ is irrational. (MS-PS3-1) 8.EE.A.2 ● Interpret the equation y = mx + b as defining a linear function, whose graph is a straight line; give examples of functions that are not linear. (MS-PS3-1),(MS-PS3-5) 8.F.A.3 ● Reason abstractly and quantitatively. (MS-PS3-4)**,**(MS-ETS1-1),(MS-ETS1-2),(MS-ETS1-3),(MS-ETS1-4) **MP.2** ● Summarize numerical data sets in relation to their context. (MS-PS3-4) **6.SP.B.5** ● Solve multi-step real-life and 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; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies. (MS-ETS1-1),(MS-ETS1-2),(MS-ETS1-3) **7.EE.3** ● Develop a probability model and use it to find probabilities of events. Compare probabilities from a model to observed frequencies; if the agreement is not good, explain possible sources of the discrepancy. (MS-ETS1-4) **7.SP**

<table>
<tr><td></td><td colspan="2"></td></tr>
<tr><td rowspan="2">21st Century Themes/Skills
P21 Framework</td><td>Themes</td><td>Skills</td></tr>
<tr><td>• Global Awareness
• Environmental Literacy</td><td>• Creativity and innovation
• Critical thinking and problem solving
• Communication and collaboration
• Flexibility and adaptability</td></tr>
<tr><td>Resources/ Materials</td><td colspan="2">• Waves notes
• Electromagnetic spectrum graphic organizer
• Waves unit study guides
• Electromagnetic spectrum Reading
• Touring the Electromagnetic Spectrum Reading with Google Form (reflection questions)
• Three Cheers for Ears! ReadWorks with teacher generated Google Form)
• Science vocabulary Activity book by Mark Twain Media (teacher resource)
• Gizmos (various to choose from to meet the needs) options
○ Air Track (MS-PS3-1; MS-PS3-5)
○ Energy of a Pendulum (MS-PS3-1)
○ Inclined Plane - Sliding Objects (MS-PS3-1; MS-PS3-2)
○ Roller Coaster Physics (MS-PS3-1; MS-PS3-2)
○ Sled Wars (MS-PS3-1; MS-PS3-5)
○ Energy Conversion in a System (MS-PS3-2; MS-PS3-5; MS-PS3-4)
○ Energy of a Pendulum (MS-PS3-2)
○ Potential Energy on Shelves (MS-PS3-2)
○ Feel the Heat (MS-PS3-3; MS-ETS1-1; MS-ETS1-2; MS-ETS1-3; MS-ETS1-4)
○ Calorimetry Lab (MS-PS3-4)
○ Phase Changes (MS-PS3-4)
○ Heat Transfer by Conduction (MS-PS3-4)</td></tr>
</table>

	• PhET Simulations: Sound • Tuning forks and resonance boxes • Sound waves powerpoint • Properties of waves powerpoint • Bill Nye Science Waves with focus worksheet • Discovery Education (https://www.discoveryeducation.com/) • ReadWorks (https://www.readworks.org) • PBS Learning Media (https://www.pbslearningmedia.org/) https://www.pbs.org/wgbh/nova/labs/lab/energy/1/2/ • CK-12 (https://www.ck12.org/) • BrainPop: waves (https://www.brainpop.com/) • CrashCourseKids (https://www.youtube.com/user/crashcoursekids) • StudyJams! (https://studyjams.scholastic.com/studyjams/) • Teacher Generated Materials • Property of waves Learning Stations • Task Cards • Ducksters - review site • https://www.childrensuniversity.manchester.ac.uk/learning-activities/science/energy-and-the-environment/what-is-energy/ • https://sciencewiz.com/portals/energy/ -Heat Transfer by Conduction - Conduction and Convection - Heat Absorption -Household Energy Usage Khan Academy: Introduction to Energy Energy 101

<table>
<tr><th colspan="5">Instructional Unit Map</th></tr>
<tr><td colspan="5">Course Title: Science Grade 8</td></tr>
<tr><td>Unit Title</td><td colspan="2">Unit 5: Electromagnetic Spectrum</td><td>Start Date:</td><td>January</td></tr>
<tr><td></td><td colspan="2"></td><td>Length of Unit:</td><td>20 days</td></tr>
<tr><td>Content Standards
What do we want them to know, understand, & do?</td><td colspan="2">MS-ETS1-4. Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.

MS-PS4-2. Develop and use a model to describe that waves are reflected, absorbed, or transmitted through various</td><td>Learning Goals</td><td colspan="2">Students will be able to:
● 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.
● Develop and use a model to describe that waves are reflected, absorbed, or transmitted through various materials.
● 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.</td></tr>
</table>

	materials. [Clarification Statement: Emphasis is on both light and mechanical waves. Examples of models could include drawings, simulations, and written descriptions.] [Assessment Boundary: Assessment is limited to qualitative applications pertaining to light and mechanical waves.] 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. [Clarification Statement: Emphasis is on a basic understanding that waves can be used for communication purposes. Examples could include using fiber optic cable to transmit light pulses, radio wave pulses in wifi devices, and conversion of stored binary patterns to make sound or text on a		

	computer screen.] [Assessment Boundary: Assessment does not include binary counting. Assessment does not include the specific mechanism of any given device.]		
Essential Questions	How do cell phones work? Why do surfers love physics? How do the light and sound systems in the auditorium work? If rotary phones worked for my grandparents, why did they invent phones?		
Assessments *How will we know they have gained the knowledge & skills?*	**Formative**	**Summative**	**Alternative**
	● Choral and individual responses to questioning ● Entrance/Exit Tickets ● Quizzes (paper-based and/or Google forms) ● Signals (thumbs up/down, sit/stand, and other answering strategies) ● Graded Classwork/ Homework ● Plickers Assessments ● Gimkit ● Quizlet live ● Kahoot games/reviews ● Individual white boards ● Observations & informal discussions with small groups or individuals	● End of Unit Test ● Extended Constructed Response Questions ● Project ● Lab Analysis/Conclusion ● Demonstration with explanation & fielding questions	● Student-Taught Lesson (small groups of students will teach the class) ● BrainPop Video (students create their own BrainPop-style video to explain a science phenomena) ● Advice Column (students write advice to an “anonymous friend” to help

	during labs ● Silent classroom polls ● Survivor		solve a scientific problem) ● Trivia Game (students create the questions and answers to be used in a review game)
Unit Pre-Assessment(s) *What do they already know?*	● K-W-L chart ● Simple game (style may vary: kahoot, quizizz, plickers, etc) ● Discussions ● Pre-Test (paper-based, Google Form, Plickers, etc.) ● Teacher-generated warm up questions with class discussion ● Individual Whiteboards (students hold up agree/disagree or short answers in response to questions or statements) ● Blind-Polling with Thumbs Up/Down (teacher asks a question or provides a vocabulary word; students close their eyes and demonstrate their comfort level with the information by indicating a thumbs up or down) ● "Four Corners" (students are given a series of statements, decide for each one the level to which they agree/disagree, and then move to the appropriate area of the classroom identified with one of the options. Students will discuss their positions with the others in their group and present their opinions to the rest of the class)		
Instructional Strategies/ Student Activities	● Direct Instruction ● Scaffolding ● Guided Practice ● Cooperative learning ● Modeling ● Learning Stations ● Graphic organizers ● Note-taking sheets ● Turn and Talk / Think-Pair-Share ● Flexible grouping		

	● Inquiry-based learning ● Self and Peer Review ● Word/picture/object sorts ● Read & Think Alouds ● Writing in the margins			
Instructional/Assessment Scaffolds *(Modifications /Accommodations) – planned for prior to instruction*	**English Language Learners**	**Special Education Learners**	**Struggling Learners**	**Advanced Learners**
	● Preferential seating ● Small group instruction as applicable ● Read directions aloud ● Clarified instruction ● Highlight and discuss key words (notes and verbally) ● Provide key vocabulary prior to lesson and/or assessment ● One-on-one conferencing when needed ● Differentiated grouping ● Allow oral responses ● Use multiple choice format ● Read test aloud	● Tiered assessments ● Limit required material for class presentation ● Differentiated grouping ● Use of visual representations of concepts ● Provide leveled reading material ● Preferential seating ● Small group instruction ● Small group testing	● flexible grouping ● Digital resources via Google Classroom ● Read directions aloud ● Clarifying directions or conducting check-ins as needed ● Highlight/underline key words ● Concrete examples / examples related to personal interests or background ● Use of mnemonics ● Provide more detailed instructions for analysis tasks ● Provide visuals to accompany instruction ● Provide leveled reading material ● Preferential seating ● Small group instruction ● Additional time ● Allow for test corrections ● Vary test formats ● Provide study guides and study opportunities	● Independent reading choices beyond texts studied with the class as a whole ● Tiered assessments ● Choice of assessment styles/formats ● Independent study ● Learning stations ● Virtual escape rooms (unit specific)

	• Provide definitions of key terms in native language • Use native language for directions (if possible - use translator program or person) • Single step directions • Additional time • Allow for tests corrections • Vary test format • Chunking • Accept short answers on assessments • Provide multiple texts (English and native language translation) • Use of visual representations of concepts • Modify writing tasks (provide multiple topics/assignments to choose from) • Short homework assignments • Digital resources via Google Classroom	• Allow oral responses • Use multiple choice format • Modify assessments, as needed • Read test aloud • Read directions aloud • Single step directions • Answers to be dictated, as needed • Additional time • Allow for test corrections • Allow retakes • Provide study guides or study opportunities/class notes • Read test passages/articles aloud (if assessing reading comprehension)	• Chunk projects or long-term assignments • Vary test formats • Allow retakes • Rest breaks, as needed • Preview test procedures • Pace long-term assignments (keeping calendar/schedule) • Small group testing • Collaborate with after-school programs or clubs to extend learning opportunities. • Note taking on computer	• Current event presentations • Creation of presentation, video or written review of a science topic or phenomena to be posted on our classroom website and shared with peers

<table>
<tr><td></td><td>Provide study guides and study opportunities, preferably in native language
Small group testing
Note taking on computer</td><td>Chunk projects or long-term assignments
Provide schedule/timeline
Choice of writing topics
Digital resources via Google Classroom
Note taking on computer</td><td></td><td></td></tr>
<tr><td rowspan="2">Differentiated Instructional Methods: (Multiple means for students to access content and multiple modes for student to express understanding)</td><td colspan="2">Access (Resources and/or Process)</td><td colspan="2">Expression (Products and/or Performance)</td></tr>
<tr><td colspan="2">Class discussions with questions at varied complexity levels
Varying collaboration, independence competition
(work alone or with a partner when possible)
Assignment checklists/guides
Mini lessons to reteach, clarify & extend
Use of small group sharing (Think-Pair-Share)
D.I. with use of technology
Interactive Notebook/Note-taking sheet (guided notes, “doodle” notes, Cornell notes, etc.)
Learning Stations with varied standard-based tasks
Use of Promethean Board for discussions, visuals, note-taking, interactives, etc.
Multi-level electronic texts (with audio capability) provided through Google Classroom</td><td colspan="2">Student choice during formal assessment style (eliminate a certain number of questions, answer open-ended option A or B, draw a diagram or explain, etc.)
Menu Project / Choice Board
Individual or Small-group presentation
Rubric/criteria for success generated by teacher and students (may be different for different individuals/groups)
Problem based learning
Open ended opportunities</td></tr>
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	● Read & Think Alouds ● Flexible grouping ● Reteaching /Reviewing ● Targeting Different Senses Within the Lesson (verbal, video, hands-on, use of visuals, modeling/acting out, songs/chants, etc) ● Reflection & Goal-setting ● Free Study Time (student choice: reviewing of notes, completion of task cards, watching a video review, small-group game, work completion with teacher-	
Vocabulary *Highlight key vocabulary (both Tier II and Tier III words)*	Tier II: observe, claim, evidence, reasoning, analyze, interpret, data, model, design, solution, criteria, constraint, construct, evaluate, pattern, color, sound, lens Tier III: Wave, amplitude, crest, trough, wavelength, compressed wave, transverse wave, mechanical wave, electromagnetic wave, electromagnetic spectrum, decibel, diffraction, refraction, rarefaction, reflection, doppler effect, loudness, pitch, frequency, Hertz, prism, vibration	
Integration of Technology SAMR	Substitution: ● Taking notes via Google Docs ● Typing up responses to questioning and sharing with teacher/peer ● Completing graphic organizers via Google Docs or Slides ● Completing digital worksheets via Google Forms, Docs, or Slides ● Use of online-based texts with dictionary and highlighting features ● Conducting research via Google ● Use of Google Classroom for providing and organizing materials Augmentation:	

	● Completing quizzes/tests via Google Forms ● Researching within Google Docs to add information and graphics to enhance notes ● Use of online-based texts with embedded videos and links to enhance understanding ● Using Gizmos, Phet, and other virtual labs/simulations ● Creation of scientific diagrams/models using Google Drawings ● Sharing videos, simulations, and other "extras" via Google Classroom to supplement notes and understanding ● Posting student created material via Padlet for sharing with peers ● Use of Quizizz or Kahoot! to review before a test Modification: ● Collaboration of students on a multimedia/slides project ● Peer-editing multimedia work ● Using Gizmos, Phet, and other virtual labs/simulations ● Creation of presentation, video, or written review of a science topic or phenomena posted on our classroom website ● Student completion of WebQuests ● Student participation in Digital Escape Rooms ● Plickers assessments Redefinition: ● Collaboration of students on a multimedia/slides project ● Posting, reviewing, and commenting on student created material via Padlet ● Student-Created and Student-Taught Lesson with multimedia presentation ● Use of Quizizz or Kahoot! to review before a test ● Plickers assessments
Interdisciplinary Connections	**Mathematics** ● Reason abstractly and quantitatively. (MS-PS4-1) MP.2 ● Model with mathematics. (MS-PS4-1) MP.4 ● Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities. (MS-PS4-1) 6.RP.A.1 ● Use ratio and rate reasoning to solve real-world and mathematical problems. (MS-PS4-1) 6.RP.A.3

<table>
<tr><td>NJ Student Learning Standards</td><td colspan="2">

Recognize and represent proportional relationships between quantities. (MS-PS4-1) 7.RP.A.2
Interpret the equation y = mx + b as defining a linear function, whose graph is a straight line; give examples of functions that are not linear. (MS-PS4-1) 8.F.A.3

English Language Arts

Cite specific textual evidence to support analysis of science and technical texts. (MS-PS4-3) RST.6-8.1
Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions. (MS-PS4-3) RST.6-8.2
Compare and contrast the information gained from experiments, simulations, videos, or multimedia sources with that gained from reading a text on the same topic. (MS-PS4-3) RST.6-8.9
Draw evidence from informational texts to support analysis, reflection, and research. (MS-PS4-3) WHST.6-8.9
Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest. (MS-PS4-1),(MS-PS4-2) SL.8.5

</td></tr>
<tr><td rowspan="2">21st Century Themes/Skills
P21 Framework</td><td>Themes</td><td>Skills</td></tr>
<tr><td>

Global Awareness
Environmental Literacy

</td><td>

Creativity and innovation
Critical thinking and problem solving
Communication and collaboration
Flexibility and adaptability

</td></tr>
<tr><td>Resources/ Materials</td><td colspan="2">Gizmo options to meet the needs of students
Waves (MS-PS4-1; MS-PS4-2)
Basic Prism (MS-PS4-2)
Color Absorption (MS-PS4-2)
Earthquakes 1 - Recording Station (MS-PS4-2)
Heat Absorption (MS-PS4-2)
Laser Reflection (MS-PS4-2)
Longitudinal Waves (MS-PS4-2)
Radiation (MS-PS4-2)
Refraction (MS-PS4-2)</td></tr>
</table>

	Ripple Tank (MS-PS4-2) ● PhET Simulations ● Discovery Education (https://www.discoveryeducation.com/) ● ReadWorks (https://www.readworks.org) ● PBS Learning Media (https://www.pbslearningmedia.org/) https://www.pbs.org/wgbh/nova/labs/lab/energy/1/2/ ● CK-12 (https://www.ck12.org/) ● BrainPop (https://www.brainpop.com/) ● CrashCourseKids (https://www.youtube.com/user/crashcoursekids) ● StudyJams! (https://studyjams.scholastic.com/studyjams/) ● Teacher Generated Materials ● Learning Stations ● Task Cards

Instructional Unit Map					
Course Title: Science Grade 8					
Unit Title	Unit 6: Engineering Design: Greek Fair Based			**Start Date:**	May
				Length of Unit:	Approx 30 days
Content Standards *What do we want them to know,*	MS-ETS1-1 Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific	**Learning Goals**	Students will be able to: ● Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.		

understand , & do?	principles and potential impacts on people and the natural environment that may limit possible solutions. MS-ETS1-2. Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem. MS-ETS1-3. Analyze data from tests to 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. MS-ETS1-4. Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.		● Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem. ● Analyze data from tests to 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.
Essential Questions	What makes an effective catapult? How can you use your scientific knowledge to create the most efficient catapult?		

Assessments *How will we know they have gained the knowledge & skills?*	**Formative**	**Summative**	**Alternative**
	• Choral and individual responses to questioning • Entrance/Exit Tickets • Quizzes (paper-based and/or Google forms) • Signals (thumbs up/down, sit/stand, and other answering strategies) • Graded Classwork/ Homework • Plickers Assessments • Gimkit • Quizlet live • Kahoot games/reviews • Individual white boards • Observations & informal discussions with small groups or individuals during labs • Silent classroom polls • Survivor	• End of Unit Test • Extended Constructed Response Questions • Project • Lab Analysis/Conclusion • Demonstration with explanation & fielding questions	• Student-Taught Lesson (small groups of students will teach the class) • BrainPop Video (students create their own BrainPop-style video to explain a science phenomena) • Advice Column (students write advice to an "anonymous friend" to help solve a scientific problem) • Trivia Game (students create the questions and answers to be used in a review game)
Unit Pre-Assessment(s)	• K-W-L chart • Simple game (style may vary: kahoot, quizizz, plickers, etc) • Discussions		

<table>
<tr><td>What do they already know?</td><td colspan="4">

Pre-Test (paper-based, Google Form, Plickers, etc.)
Teacher-generated warm up questions with class discussion
Individual Whiteboards (students hold up agree/disagree or short answers in response to questions or statements)
Blind-Polling with Thumbs Up/Down (teacher asks a question or provides a vocabulary word; students close their eyes and demonstrate their comfort level with the information by indicating a thumbs up or down)
“Four Corners” (students are given a series of statements, decide for each one the level to which they agree/disagree, and then move to the appropriate area of the classroom identified with one of the options. Students will discuss their positions with the others in their group and present their opinions to the rest of the class)

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<tr><td>Instructional Strategies/ Student Activities</td><td colspan="4">

Direct Instruction
Scaffolding
Guided Practice
Cooperative learning
Modeling
Learning Stations
Graphic organizers
Note-taking sheets
Turn and Talk / Think-Pair-Share
Flexible grouping
Inquiry-based learning
Self and Peer Review
Word/picture/object sorts
Read & Think Alouds
Writing in the margins

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<tr><td rowspan="2">Instructional/Assessment Scaffolds (Modifications /Accommo</td><td>English Language Learners</td><td>Special Education Learners</td><td>Struggling Learners</td><td>Advanced Learners</td></tr>
<tr><td>

Preferential seating
Small group instruction as applicable

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Tiered assessments

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flexible grouping
Digital resources via Google Classroom
Read directions aloud

</td><td>

Independent reading choices

</td></tr>
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dations) – planned for prior to instruction	• Read directions aloud • Clarified instruction • Highlight and discuss key words (notes and verbally) • Provide key vocabulary prior to lesson and/or assessment • One-on-one conferencing when needed • Differentiated grouping • Allow oral responses • Use multiple choice format • Read test aloud • Provide definitions of key terms in native language • Use native language for directions (if possible - use translator program or person) • Single step directions • Additional time • Allow for tests corrections • Vary test format • Chunking	• Limit required material for class presentation • Differentiated grouping • Use of visual representations of concepts • Provide leveled reading material • Preferential seating • Small group instruction • Small group testing • Allow oral responses • Use multiple choice format • Modify assessments, as needed • Read test aloud • Read directions aloud • Single step directions	• Clarifying directions or conducting check-ins as needed • Highlight/underline key words • Concrete examples / examples related to personal interests or background • Use of mnemonics • Provide more detailed instructions for analysis tasks • Provide visuals to accompany instruction • Provide leveled reading material • Preferential seating • Small group instruction • Additional time • Allow for test corrections • Vary test formats • Provide study guides and study opportunities • Chunk projects or long-term assignments • Vary test formats • Allow retakes • Rest breaks, as needed • Preview test procedures • Pace long-term assignments (keeping calendar/schedule) • Small group testing • Collaborate with after-school programs or clubs to extend learning opportunities.	beyond texts studied with the class as a whole • Tiered assessments • Choice of assessment styles/formats • Independent study • Learning stations • Virtual escape rooms (unit specific) • Current event presentations • Creation of presentation, video or written review of a science topic or phenomena

	• Accept short answers on assessments • Provide multiple texts (English and native language translation) • Use of visual representations of concepts • Modify writing tasks (provide multiple topics/assignments to choose from) • Short homework assignments • Digital resources via Google Classroom • Provide study guides and study opportunities, preferably in native language • Small group testing • Note taking on computer	• Answers to be dictated, as needed • Additional time • Allow for test corrections • Allow retakes • Provide study guides or study opportunities/class notes • Read test passages/articles aloud (if assessing reading comprehension) • Chunk projects or long-term assignments • Provide schedule/timeline • Choice of writing topics • Digital resources via Google Classroom	• Note taking on computer	to be posted on our classroom website and shared with peers

		● Note taking on computer		
Differentiated Instructional Methods: *(Multiple means for students to access content and multiple modes for student to express understanding)*	**Access** (Resources and/or Process)		**Expression** (Products and/or Performance)	
	● Class discussions with questions at varied complexity levels ● Varying collaboration, independence competition ● (work alone or with a partner when possible) ● Assignment checklists/guides ● Mini lessons to reteach, clarify & extend ● Use of small group sharing (Think-Pair-Share) ● D.I. with use of technology ● Interactive Notebook/Note-taking sheet (guided notes, “doodle” notes, Cornell notes, etc.) ● Learning Stations with varied standard-based tasks ● Use of Promethean Board for discussions, visuals, note-taking, interactives, etc. ● Multi-level electronic texts (with audio capability) provided through Google Classroom ● Read & Think Alouds ● Flexible grouping ● Reteaching /Reviewing ● Targeting Different Senses Within the Lesson (verbal, video, hands-on, use of visuals, modeling/acting out, songs/chants, etc) ● Reflection & Goal-setting ● Free Study Time (student choice: reviewing of notes, completion of task cards, watching a video review, small-group game, work completion with teacher-		● Student choice during formal assessment style (eliminate a certain number of questions, answer open-ended option A or B, draw a diagram or explain, etc.) ● Menu Project / Choice Board ● Individual or Small-group presentation ● Rubric/criteria for success generated by teacher and students (may be different for different individuals/groups) ● Problem based learning ● Open ended opportunities	

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Plickers assessments

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PhET Simulations
Discovery Education (https://www.discoveryeducation.com/)

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