# Beach Haven School District

Science Curriculum

Grade 6

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| **Original Adoption: September 12, 2016** |
| **Created By: Kevin Waldron-Brick** |
| **Revised on: June 22, 2022** |
| **Revised by: Deb Harkness, Sara Holleran** |
| **Proposed Revision Date: Summer 2025** |

| **Recommended Pacing Guide** | |
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| **Unit 1: Engineering Design** | **40 days- ongoing** |
| **Unit 2: Life Science** | **50 days- ongoing** |
| **Unit 3: Earth Science** | **40 days- ongoing** |
| **Unit 4: Physical Science** | **50 days- ongoing** |

| **Unit 1: Engineering Design** | **Duration: 40 days- ongoing** |
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**Standards/Learning Targets**

**New Jersey Student Learning Standards:**

- 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.

| **Correlation Chart** |
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| **EDI** |

| **Performance Expectation** |
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| **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. |

| Science and Engineering Practices | Disciplinary Core Ideas |
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| **Asking Questions and Defining Problems-**<br>● Define a design problem that can be solved through the development of an object, tool, process or system and includes multiple criteria and constraints, including scientific knowledge that may limit possible solutions. | **ETS1.A: Defining and Delimiting Engineering Problems-**<br>● The more precisely a design task's criteria and constraints can be defined, the more likely it is that the designed solution will be successful. Specification of constraints includes consideration of scientific principles and other relevant knowledge that are likely to limit possible solutions. |
| **Crosscutting Concepts** | **Learning Objectives** |
| **Influence of Science, Engineering, and Technology on Society and the Natural World-**<br>● All human activity draws on natural resources and has both short and long-term consequences, positive as well as negative, for the health of people and the natural environment. The uses of technologies and 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. | ● Students describe a problem that can be solved through the development of an object, tool, process, or system.<br>● Students identify the system in which the problem is embedded, including the major components and relationships in the system and its boundaries, to clarify what is and is not part of the problem. In their definition of the system, students include: 1. Which individuals or groups need this problem to be solved. 2. The needs that must be met by solving the problem. 3. Scientific issues that are relevant to the problem. 4. Potential societal and environmental impacts of solutions. 5. The relative importance of the various issues and components of the process or system.<br>● Students define criteria that must be taken into account in the solution that: 1. Meet the needs of the individuals or groups who may be affected by the problem (including defining who will be the target of the solution). 2. Enable comparisons among different solutions, including quantitative considerations when appropriate.<br>● Students define constraints that must be taken into account in the solution, including: 1. Time, materials, and costs. 2. Scientific or other issues that are relevant to the problem. 3. Needs and desires of the individuals or groups involved that may limit acceptable solutions. 4. Safety considerations. 5. Potential effect(s) on other individuals or groups. 6. Potential negative environmental effects of possible solutions or failure to solve the problem. |

| Performance Expectation | |
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| **MS-ETS1-2-** Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem. | |
| **Science and Engineering Practices** | **Disciplinary Core Ideas** |
| **Engaging in Argument from Evidence-**<br>● Evaluate competing design solutions based on jointly developed and agreed-upon design criteria. | **ETS1.B: Developing Possible Solutions-**<br>● There are systematic processes for evaluating solutions with respect to how well they meet the criteria and constraints of a problem. |
| **Crosscutting Concepts** | **Learning Objectives** |
| **Cause and Effect-**<br>● Cause and effect relationships may be used to predict phenomena in natural or designed systems. | ● Students identify the given supported design solution.<br>● Students identify scientific knowledge related to the problem and each proposed solution.<br>● Students identify how each solution would solve the problem.<br>● Students identify and describe additional evidence necessary for their evaluation, including: 1. Knowledge of how similar problems have been solved in the past. 2. Evidence of possible societal and environmental impacts of each proposed solution.<br>● Students collaboratively define and describe criteria and constraints for the evaluation of the design solution.<br>● Students use a systematic method (e.g., a decision matrix) to identify the strengths and weaknesses of each solution. In their evaluation, students: 1. Evaluate each solution against each criterion and constraint. 2. Compare solutions based on the results of their performance against the defined criteria and constraints.<br>● Students use the evidence and reasoning to make a claim about the relative effectiveness of each proposed solution based on the strengths and weaknesses of each. |

| Performance Expectation |
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**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.

| Science and Engineering Practices | Disciplinary Core Ideas |
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| **Analyzing and Interpreting Data-**<br>● Analyze and interpret data to determine similarities and differences in findings. | **ETS1.B: Developing Possible Solutions-**<br>● There are systematic processes for evaluating solutions with respect to how well they meet the criteria and constraints of a problem. Sometimes parts of different solutions can be combined to create a solution that is better than any of its predecessors.<br>**ETS1.C: Optimizing the Design Solution-**<br>● Although one design may not perform the best across all tests, identifying the characteristics of the design that performed the best in each test can provide useful information for the redesign process—that is, some of those characteristics may be incorporated into the new design. |
| **Crosscutting Concepts** | **Learning Objectives** |
| ● A system is an organized group of related objects or components: models can be used for understanding and predicting the behavior of systems. | ● Students organize given data (e.g., via tables, charts, or graphs) from tests intended to determine the effectiveness of three or more alternative solutions to a problem.<br>● Students use appropriate analysis techniques (e.g., qualitative or quantitative analysis; basic statistical techniques of data and error analysis) to analyze the data and identify relationships within the datasets, including relationships between the design solutions and the given criteria and constraints.<br>● Students use the analyzed data to identify evidence of similarities and differences in features of the solutions.<br>● Based on the analyzed data, students make a claim for which characteristics of each design best meet the given criteria and constraints<br>● Students use the analyzed data to identify the best features in each design that can be compiled into a new (improved) redesigned solution. |

**Performance Expectation**

**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.

| Science and Engineering Practices | Disciplinary Core Ideas |
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| **Developing and Using Models-**<br>● Develop a model to generate data to test ideas about designed systems, including those representing inputs and outputs. | **ETS1.B: Developing Possible Solutions-**<br>● A solution needs to be tested, and then modified on the basis of the test results, in order to improve it. Models of all kinds are important for testing solutions.<br>**ETS1.C: Optimizing the Design Solution-**<br>● The iterative process of testing the most promising solutions and modifying what is proposed on the basis of the test results leads to greater refinement and ultimately to an optimal solution. |
| **Crosscutting Concepts** | **Learning Objectives** |
| **Systems & Systems Models-**<br>● A system is an organized group of related objects or components: models can be used for understanding and predicting the behavior of systems. | ● Students develop a model in which they identify the components relevant to testing ideas about the designed system, including: 1. The given problem being solved, including criteria and constraints. 2. The components of the given proposed solution (e.g., object, tools, or process), including inputs and outputs of the designed system.<br>● Students identify and describe the relationships between components, including: 1.The relationships between each component of the proposed solution and the functionality of the solution. 2. The relationship between the problem being solved and the proposed solution. 3. The relationship between each of the components of the given proposed solution and the problem being solved. 4. The relationship between the data generated by the model and the functioning of the proposed solution. |

**Primary Interdisciplinary Connections:**

- ELA:
  SL.6.3. Deconstruct a speaker's argument and specific claims, distinguishing claims that are supported by reasons and evidence from claims that are not.

**Technology Standards:**

- 8.1.2.A.1 Identify the basic features of a digital device and explain its purpose.
- 8.1.2.A.4 Demonstrate developmentally appropriate navigation skills in virtual environments (i.e. games, museums).
- 8.2.2.C.1 Brainstorm ideas on how to solve a problem or build a product
- 8.1.2.E.1 Use digital tools and online resources to explore a problem or issue.
- 8.2.2.E.1 List and demonstrate the steps to an everyday task

**Career Ready Practices:**

- CRP1. Act as a responsible and contributing citizen and employee.
- CRP4. Communicate clearly and effectively and with reason.
- CRP12. Work productively in teams while using cultural global competence.

**21st Century Life and Career Standards:**

- 9.1.4.A.1- Explain the difference between a career and a job, and identify various jobs in the community and the related earnings.

## Suggested Accommodations

**English Language Learners:**

- Provide pictures and well labeled models
- Speak slowly and gesture when necessary
- Pre-teach vocabulary words
- Extended time on assessments
- Small group for assessment
- Review Vocabulary
- Allow for alternate responses during activities and assessments

**Special Education/Students with Disabilities:**

- Follow specific IEP accommodations and modifications
- Strategic grouping
- Pre-teach concepts
- Small group for assessments
- Check in's during experiments to help refocus
- Allow alternate assignments and assessments

**504 Plans:**

- Follow specific 504 accommodations and modifications
- Strategic grouping
- Pre-teach concepts
- Small group for assessments
- Check in's during experiments to help refocus
- Allow alternate assignments and assessments

**Gifted and Talented:**

- Open ended questions to activate higher level thinking
- Higher level texts
- Alternative modes of communication
- Student developed extension activities
- Plan self directed inquiry
- Student created rubrics
- Curriculum compacting
- Opportunities to push assessment/activity boundaries

**Students at Risk of Failure:**

- Strategic grouping
- Pre-teach concepts
- Small group for assessments

- Check in's during experiments to help refocus
- Incorporate social/emotional discussions
- Encourage and monitor positive peer collaboration
- Provide academic resources for both home and school use
- Provide incentives to increase motivation and collaboration

**Economically Disadvantaged:**

- Provide clear, achievable expectation, do not lower academic requirements for them.
- Build a safe and nurturing atmosphere
- Be flexible with assignments
- Offer several alternatives from which all students can choose.
- Allow students to finish assignments independently, or give them the opportunity to complete tasks at their own pace.
- Use real-world examples and create mental models for abstract idea
- Provide increased  knowledge base and vocabulary use about real world experiences.
- Share the decision making in class.
- Maintain expectations while offering choice and soliciting input

**Culturally Diverse:**

- Involve families in student learning
- Provide social/emotional support
- Respect cultural traditions
- Build in more group work to encourage interaction with peers
- Show photos, videos, and definitions when possible for culturally unique vocabulary
- Teach study skills
- Provided students with necessary academic resources and materials
- Allow for alternative assignments
- Provide visuals
- Assign peer tutor
- Support verbal explanations with non verbal cues: Gestures/ facial expressions Props, realia, manipulatives, concrete materials Visuals, graphs, pictures, maps
- Provide positive praise to increase motivation
- Provide real world connections and emphasize the value of education
- Communicate high expectations for the success of all students

| **Evidence of Student Learning** | |
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| **Formative Tasks:**<br>● Utilize C-E-R framework & a rubric to assess students' understandings of the following questions:<br>○ Why do engineers and designers strive to improve products used in our daily lives?<br>○ Why do we use the engineering design process to solve design challenges?<br>○ How can the engineering design process benefit us in solving problems in our daily lives? | **Alternative Assessments:**<br>● Utilize C-E-R framework (with talk-to-text) & a rubric (modified) to assess students' understandings of the following questions:<br>○ Why do engineers and designers strive to improve products used in our daily lives?<br>○ Why do we use the engineering design process to solve design challenges?<br>○ How can the engineering design process benefit us in solving problems in our daily lives? |
| **Summative Assessments:** | **Benchmark Assessments:** |

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| • Utilize C-E-R framework & a rubric to assess students' understandings of the following questions:<br>  ○ Why do engineers and designers strive to improve products used in our daily lives?<br>  ○ Why do we use the engineering design process to solve design challenges?<br>  ○ How can the engineering design process benefit us in solving problems in our daily lives? | • Utilize C-E-R framework & a rubric to assess students' understandings of the following questions:<br>  ○ Why do engineers and designers strive to improve products used in our daily lives?<br>  ○ Why do we use the engineering design process to solve design challenges?<br>  ○ How can the engineering design process benefit us in solving problems in our daily lives? |
| **Knowledge & Skills** | |
| **Enduring Understandings:**<br>• Students use the model to generate data representing the functioning of the given proposed solution and each of its iterations as components of the model are modified.<br>• Students identify the limitations of the model with regards to representing the proposed solution. | **Essential Questions:**<br>• Why do engineers and designers strive to improve products used in our daily lives?<br>• Why do we use the engineering design process to solve design challenges?<br>• How can the engineering design process benefit us in solving problems in our daily lives? |
| **Core Instructional & Supplemental Materials** | |
| **Suggested Activities/Resources:**<br>• Gizmos<br>• https://www.sciencebuddies.org/science-fair-projects/engineering-design-process/engineering-design-process-steps#theengineeringdesignprocess<br>• https://www.nasa.gov/audience/foreducators/best/edp.html<br>• https://www.youtube.com/watch?v=bipTWWHya8A<br>• https://static1.squarespace.com/static/540f7597e4b04939fb5b082b/t/564a466de4b0b86bf4313d2c/1447708270367/CER+Image?format=300w<br>• *HMH Dimensions* | **Varied Levels of Text:**<br>• Gizmos resources<br>• Mystery Science<br>• Teacher selected articles & leveled texts<br>• Mistakes that Worked: 40 Familiar Inventions & How they Came to Be by Charlotte Foltz Jones<br>• STEM Lesson Essentials by JoAnne Vasquez, Cary Sneider & Michael Comer<br>• E+S Integrating Engineering and Science in Your Classroom NSTA Press Edited by Eric Brunsell<br>• Ready, Set, Science! By Sarah Michaels, ANdrew W. Shouse & Heidi A. Schweingruber |

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| **Unit 2: From Molecules to Organisms: Structures and Processes** | **Duration: 50 days- ongoing** |
| **Standards/Learning Targets** | |
| **New Jersey Student Learning Standards:**<br>• MS-LS1-1 Conduct an investigation to provide evidence that living things are made of cells; either | |

one cell or many different numbers and types of cells.

- MS-LS1-2 Develop and use a model to describe the function of a cell as a whole and ways parts of cells contribute to the function.
- MS-LS1-3 Use argument supported by evidence for how the body is a system of interacting subsystems composed of groups of cells.
- MS-LS1-4 Use argument based on empirical evidence and scientific reasoning to support an explanation for how characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants respectively.
- MS-LS1-5 Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms.
- MS-LS1-6 Construct a scientific explanation based on evidence for the role of photosynthesis in the cycling of matter and flow of energy into and out of organisms.
- MS-LS1-7 Develop a model to describe how food is rearranged through chemical reactions forming new molecules that support growth and/or release energy as this matter moves through an organism.
- MS-LS1-8 Gather and synthesize information that sensory receptors respond to stimuli by sending messages to the brain for immediate behavior or storage as memories.

| **Performance Expectation** | |
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| • **MS-LS1-1 Conduct an investigation to provide evidence that living things are made of cells; either one cell or many different numbers and types of cells.** | |
| **Science and Engineering Practices** | **Disciplinary Core Ideas** |
| **Engaging in Argument from Evidence -**<br>• Use an oral and written argument supported by empirical evidence and scientific reasoning to support or refute an explanation or a model for a phenomenon or a solution to a problem.<br>• Evaluate competing design solutions based on jointly developed and agreed upon design criteria.<br>**Constructing Explanations and Designing Solutions-**<br>• Construct a scientific explanation based on valid and reliable evidence obtained from sources (including the students' own experiments) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future.<br>**Developing and Using Models-** | **LS1.B: Growth and Development of Organisms-**<br>• Animals engage in characteristic behaviors that increase the odds of reproduction. Plants reproduce in a variety of ways, sometimes depending on animal behavior and specialized features for reproduction.<br>**LS1.B: Growth and Development of Organisms-**<br>• Genetic factors as well as local conditions affect the growth of the adult plant.<br>**LS2.A: Interdependent Relationships in Ecosystems-**<br>• Organisms, and populations of organisms, are dependent on their environmental interactions both with other living things and with nonliving factors. In any ecosystem, organisms and populations with similar requirements for food, water, oxygen, or other resources may compete with each other for limited resources, access to which consequently constrains their growth and reproduction. Growth of organisms and |

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| ● Develop a model to describe phenomena. | population increases are limited by access to resources.<br>**LS2.A: Interdependent Relationships in Ecosystems-**<br>● Similarly, predatory interactions may reduce the number of organisms or eliminate whole populations of organisms. Mutually beneficial interactions, in contrast, may become so interdependent that each organism requires the other for survival. Although the species involved in these competitive, predatory, and mutually beneficial interactions vary across ecosystems, the patterns of interactions of organisms with their environments, both living and nonliving, are shared.<br>**LS2.B: Cycle of Matter and Energy Transfer in Ecosystems-**<br>● Food webs are models that demonstrate how matter and energy is transferred between producers, consumers, and decomposers as the three groups interact within an ecosystem. Transfers of matter into and out of the physical environment occur at every level. Decomposers recycle nutrients from dead plant or animal matter back to the soil in terrestrial environments or to the water in aquatic environments. The atoms that make up the organisms in an ecosystem are cycled repeatedly between the living and nonliving.<br>**LS2.C: Ecosystem Dynamics, Functioning, and Resilience-**<br>● Ecosystems are dynamic in nature; their characteristics can vary over time. Disruptions to any physical or biological component of an ecosystem can lead to shifts in all its populations.<br>**MS-LS2-5-**<br>● Evaluate competing design solutions for maintaining biodiversity and ecosystem services.<br>**LS2.C: Ecosystem Dynamics, Functioning, and Resilience-**<br>● Biodiversity describes the variety of species found in Earth's terrestrial and oceanic |

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| | ecosystems. The completeness or integrity of an ecosystem's biodiversity is often used as a measure of its health.<br>**LS4.D: Biodiversity and Humans-**<br>● Changes in biodiversity can influence humans' resources, such as food, energy, and medicines, as well as ecosystem services that humans rely on—for example, water purification and recycling.(secondary)<br>**ETS1.B: Developing Possible Solutions-**<br>● There are systematic processes for evaluating solutions with respect to how well they meet the criteria and constraints of a problem. (secondary) |
| **Crosscutting Concepts** | **Learning Objectives** |
| **Cause and Effect-**<br>● Phenomena may have more than one cause, and some cause and effect relationships in systems can only be described using probability.<br>● Relationships may be used to predict phenomena in natural or designed systems.<br>**Connections to Nature of Science Scientific-**<br>● Science assumes that objects and events in natural systems occur in consistent patterns that are understandable through measurement and observation.<br>**Stability and Change-**<br>● Small changes in one part of a system might cause large changes in another part. | Students will understand and be able to communicate that:<br>● Characteristic animal behaviors and specialized plant and animal structures affect the probability of reproduction.<br>● Environmental and genetic factors influence the growth of organisms.<br>● Relationships exist between the size of a population, the growth and survival of individual organisms, and resource availability.<br>● Interactions within an ecosystem include competitive relationships, predatory interactions, mutually beneficial interactions, and are affected by resource availability.<br>● Relationships between organisms and the nonliving parts of the system include producers, consumers, and/or decomposers as well as energy transfer into and out of the system.<br>● Changes to physical or biological components of an ecosystem can affect the populations living there.<br>● Biodiversity and/or ecosystem services are necessary to maintaining a healthy ecosystem. |

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| Performance Expectation | |
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| **MS-LS1-2 Develop and use a model to describe the function of a cell as a whole and ways parts of cells contribute to the function.** | |
| **Science and Engineering Practices** | **Disciplinary Core Ideas** |
| **Engaging in Argument from Evidence-**<br>● Use an oral and written argument supported by empirical evidence and scientific reasoning to support or refute an explanation or a model for a phenomenon or a solution to a problem. | **LS1.B: Growth and Development of Organisms-**<br>● Animals engage in characteristic behaviors that increase the odds of reproduction. Plants reproduce in a variety of ways, sometimes depending on animal behavior and specialized features for reproduction. |
| **Crosscutting Concepts** | **Learning Objectives** |
| **Cause and Effect-**<br>● Phenomena may have more than one cause, and some cause and effect relationships in systems can only be described using probability. | TLW identify:<br>● Characteristic animal behaviors that increase the probability of reproduction.<br>● Specialized plant and animal structures that increase the probability of reproduction.<br>● Cause-and-effect relationships between: 1. Specialized plant structures and the probability of successful reproduction of plants that have those structures. 2. Animal behaviors and the probability of successful reproduction of animals that exhibit those behaviors. 3. Plant reproduction and the animal behaviors related to plant reproduction. |

| Performance Expectation | |
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| **MS-LS1-3 Use argument supported by evidence for how the body is a system of interacting subsystems composed of groups of cells.** | |
| **Science and Engineering Practices** | **Disciplinary Core Ideas** |
| **Constructing Explanations and Designing Solutions-**<br>● Construct a scientific explanation based on valid and reliable evidence obtained from sources (including the students' own experiments) and the assumption that theories and laws that describe the natural | **LS1.B: Growth and Development of Organisms-**<br>● Genetic factors as well as local conditions affect the growth of the adult plant. |

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| world operate today as they did in the past and will continue to do so in the future. | |
| **Crosscutting Concepts** | **Learning Objectives** |
| **Cause and Effect-**<br>● Phenomena may have more than one cause, and some cause and effect relationships in systems can only be described using probability. | TLW identify and describe:<br>● Environmental factors and that they can influence growth.<br>● Genetic factors and that they can influence growth.<br>● Changes in the growth of organisms as specific environmental and genetic factors change. |

| **Performance Expectation** | |
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| **MS-LS1-4 Use argument based on empirical evidence and scientific reasoning to support an explanation for how characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants respectively.** | |
| **Science and Engineering Practices** | **Disciplinary Core Ideas** |
| **Analyzing and Interpreting Data-**<br>● Analyze and interpret data to provide evidence for phenomena. | **LS2.A: Interdependent Relationships in Ecosystems-**<br>● Organisms, and populations of organisms, are dependent on their environmental interactions both with other living things and with nonliving factors. In any ecosystem, organisms and populations with similar requirements for food, water, oxygen, or other resources may compete with each other for limited resources, access to which consequently constrains their growth and reproduction. Growth of organisms and population increases are limited by access to resources. |
| **Crosscutting Concepts** | **Learning Objectives** |
| **Cause and Effect-** | **TLW:**<br>● Determine the relationships between the size |

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| • Cause and effect relationships may be used to predict phenomena in natural or designed systems. | of a population, the growth and survival of individual organisms, and resource availability.<br>• Students determine whether the relationships provide evidence of a causal link between these factors. |

| **Performance Expectation** | |
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| **MS-LS1-5 Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms.** | |
| **Science and Engineering Practices** | **Disciplinary Core Ideas** |
| **Constructing Explanations and Designing Solutions-**.<br>• Construct an explanation that includes qualitative or quantitative relationships between variables that predict phenomena. | **LS2.A: Interdependent Relationships in Ecosystems**-<br>• Similarly, predatory interactions may reduce the number of organisms or eliminate whole populations of organisms. Mutually beneficial interactions, in contrast, may become so interdependent that each organism requires the other for survival. Although the species involved in these competitive, predatory, and mutually beneficial interactions vary across ecosystems, the patterns of interactions of organisms with their environments, both living and nonliving, are shared. |
| **Crosscutting Concepts** | **Learning Objectives** |
| **Patterns-**<br>• Patterns can be used to identify cause and effect relationships. | **TLW identify:**<br>• Competitive relationships occur when organisms within an ecosystem compete for shared resources.<br>• Predatory interactions occur between organisms within an ecosystem.<br>Mutually beneficial interactions occur between organisms within an ecosystem. Organisms involved in these mutually beneficial interactions can become so dependent upon one another that they cannot survive alone. Resource availability, or lack thereof, can affect interactions between organisms.<br>• Competitive, predatory, and mutually beneficial interactions occur across multiple, |

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| | different, ecosystems. |

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| **MS-LS1-6 Construct a scientific explanation based on evidence for the role of photosynthesis in the cycling of matter and flow of energy into and out of organisms.** | |
| **Science and Engineering Practices** | **Disciplinary Core Ideas** |
| **Developing and Using Models-**<br>● Develop a model to describe phenomena. | **LS2.B: Cycle of Matter and Energy Transfer in Ecosystems-**<br>● Food webs are models that demonstrate how matter and energy is transferred between producers, consumers, and decomposers as the three groups interact within an ecosystem. Transfers of matter into and out of the physical environment occur at every level. Decomposers recycle nutrients from dead plant or animal matter back to the soil in terrestrial environments or to the water in aquatic environments. The atoms that make up the organisms in an ecosystem are cycled repeatedly between the living and nonliving. |
| **Crosscutting Concepts** | **Learning Objectives** |
| **Energy and Matter -**<br>● The transfer of energy can be tracked as energy flows through a natural system.<br>**Connections to Nature of Science-**<br>● Science assumes that objects and events in natural systems occur in consistent patterns that are understandable through measurement and observation. | ● TLW describe relationships between components within the ecosystem, including:<br>○ Energy transfer into and out of the system.<br>○ Energy transfer and matter cycling (cycling of atoms): 1. Among producers, consumers, and decomposers 2. Between organisms and the nonliving parts of the system |

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**MS-LS1-7 Develop a model to describe how food is rearranged through chemical reactions forming new molecules that support growth and/or release energy as this matter moves through an organism.**

| Science and Engineering Practices | Disciplinary Core Ideas |
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| **Engaging in Argument from Evidence-**<br>● Construct an oral and written argument supported by empirical evidence and scientific reasoning to support or refute an explanation or a model for a phenomenon or a solution to a problem. | **LS2.C: Ecosystem Dynamics, Functioning, and Resilience-**<br>● Ecosystems are dynamic in nature; their characteristics can vary over time. Disruptions to any physical or biological component of an ecosystem can lead to shifts in all its populations.<br>**MS-LS2-5-**<br>● Evaluate competing design solutions for maintaining biodiversity and ecosystem services. |
| **Crosscutting Concepts** | **Learning Objectives** |
| **Stability and Change-**<br>● Small changes in one part of a system might cause large changes in another part. | TLW identify and describe:<br>● Changes in the physical or biological components of an ecosystem, including the magnitude of the changes<br>● Changes in the populations of an ecosystem, including the magnitude of the changes<br>● Evidence of causal and correlational relationships between changes in the components of an ecosystem with the changes in populations. |

| Performance Expectation | |
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| **MS-LS1-8 Gather and synthesize information that sensory receptors respond to stimuli by sending messages to the brain for immediate behavior or storage as memories.** | |
| **Science and Engineering Practices** | **Disciplinary Core Ideas** |
| **Engaging in Argument from Evidence-**<br>● Evaluate competing design solutions based on jointly developed and agreed upon design criteria. | **LS2.C: Ecosystem Dynamics, Functioning, and Resilience-**<br>● Biodiversity describes the variety of species found in Earth's terrestrial and oceanic ecosystems. The completeness or integrity |

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| | of an ecosystem's biodiversity is often used as a measure of its health.<br>**LS4.D: Biodiversity and Humans-**<br>● Changes in biodiversity can influence humans' resources, such as food, energy, and medicines, as well as ecosystem services that humans rely on—for example, water purification and recycling.(secondary)<br>**ETS1.B: Developing Possible Solutions-**<br>● There are systematic processes for evaluating solutions with respect to how well they meet the criteria and constraints of a problem. (secondary) |
| **Crosscutting Concepts** | **Learning Objectives** |
| **Stability and Change-**<br>● Small changes in one part of a system might cause large changes in another part.<br>**Connections to Engineering, Technology, and Applications of Science-**<br>● The use 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.<br>**Connections to Nature of Science-**<br>● Scientific knowledge can describe the consequences of actions but does not necessarily prescribe the decisions that society takes. | TLW identify and describe:<br>● The given competing design solutions for maintaining biodiversity and ecosystem services.<br>● The given problem involving biodiversity and/or ecosystem services that is being solved by the given design solutions, including information about why biodiversity and/or ecosystem services are necessary to maintaining a healthy ecosystem. |

**Primary Interdisciplinary Connections:**

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  SL.6.3. Deconstruct a speaker's argument and specific claims, distinguishing claims that are supported by reasons and evidence from claims that are not.

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- 8.1.2.A.1 Identify the basic features of a digital device and explain its purpose.
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- 9.1.4.A.1- Explain the difference between a career and a job, and identify various jobs in the community and the related earnings.

## Suggested Accommodations

**English Language Learners:**

- Provide pictures and well labeled models
- Speak slowly and gesture when necessary
- Pre-teach vocabulary words
- Extended time on assessments
- Small group for assessment
- Review Vocabulary
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- Provide clear, achievable expectation, do not lower academic requirements for them.
- Build a safe and nurturing atmosphere
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- Use real-world examples and create mental models for abstract idea
- Provide increased knowledge base and vocabulary use about real world experiences.
- Share the decision making in class.
- Maintain expectations while offering choice and soliciting input

**Culturally Diverse:**

- Involve families in student learning
- Provide social/emotional support
- Respect cultural traditions
- Build in more group work to encourage interaction with peers
- Show photos, videos, and definitions when possible for culturally unique vocabulary
- Teach study skills
- Provided students with necessary academic resources and materials
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- Provide visuals
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- Communicate high expectations for the success of all students

| **Evidence of Student Learning** | |
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| **Formative Tasks:**<br>● Utilize C-E-R framework & a rubric to assess students' understandings of the following questions:<br>○ What can cause populations to change?<br>○ What is food for living things?<br>○ How do living things get food from other organisms?<br>○ How do organisms compete?<br>○ Do abiotic factors affect populations? | **Alternative Assessments:**<br>● Teacher created assessments<br>● Utilize C-E-R framework (with talk-to-text) & a rubric (modified) to assess students' understandings of the following questions:<br>○ What can cause populations to change?<br>○ What is food for living things?<br>○ How do living things get food from other organisms?<br>○ How do organisms compete?<br>○ Do abiotic factors affect populations? |
| **Summative Assessments:** | **Benchmark Assessments:** |

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| • Utilize C-E-R framework & a rubric to assess students' understandings of the following questions:<br>  ○ What can cause populations to change?<br>  ○ What is food for living things?<br>  ○ How do living things get food from other organisms?<br>  ○ How do organisms compete?<br>  ○ Do abiotic factors affect populations? | • Utilize C-E-R framework & a rubric to assess students' understandings of the following questions:<br>  ○ What can cause populations to change?<br>  ○ What is food for living things?<br>  ○ How do living things get food from other organisms?<br>  ○ How do organisms compete?<br>  ○ Do abiotic factors affect populations? |
| **Knowledge & Skills** | |
| **Enduring Understandings:**<br>• What can cause populations to change?<br>• What is food for living things?<br>• How do living things get food from other organisms?<br>• How do organisms compete?<br>• Do abiotic factors affect populations? | **Essential Questions:**<br>Students will understand and be able to communicate that:<br>• Characteristic animal behaviors and specialized plant and animal structures affect the probability of reproduction.<br>• Environmental and genetic factors influence the growth of organisms.<br>• Relationships exist between the size of a population, the growth and survival of individual organisms, and resource availability.<br>• Interactions within an ecosystem include competitive relationships, predatory interactions, mutually beneficial interactions, and are affected by resource availability.<br>• Relationships between organisms and the nonliving parts of the system include producers, consumers, and/or decomposers as well as energy transfer into and out of the system.<br>• Changes to physical or biological components of an ecosystem can affect the populations living there.<br>• Biodiversity and/or ecosystem services are necessary to maintaining a healthy ecosystem. |
| **Core Instructional & Supplemental Materials** | |

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| **Suggested Activities/Resources:**<br>https://online.kidsdiscover.com/discover/life-science<br>http://www.pbs.org/wgbh/nova/nature/photosynthesis.html<br>http://www.nj.gov/pinelands/infor/educational/curriculum/pinecur/lp4_6.htm<br>https://vitalnj.pbslearningmedia.org/resource/tdc02.sci.life.oate.energyflow/energy-flow/#.WZWntj6GPIU | **Varied Levels of Text:**<br>● IQWST Life Science Unit "Where Have All the Creatures Gone?"<br>● Gizmos resources<br>● Mystery Science<br>● Teacher selected articles & leveled texts |

| **Unit 3: Earth Science** | **Duration: 40 days- ongoing** |
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| **Standards/Learning Targets** | |
| **New Jersey Student Learning Standards:**<br>● MS-ESS1-1 Develop and use a model of the Earth-sun-moon system to describe the cyclic patterns of lunar phases, eclipses of the sun and moon, and seasons.<br>● • MS-ESS1-2 Develop and use a model to describe the role of gravity in the motions within galaxies and the solar system.<br>● • MS-ESS1-3 Analyze and interpret data to determine scale properties of objects in the solar system.<br>● **MS-ESS2-4-** Develop a model to describe the cycling of water through Earth's systems driven by energy | |

| **Performance Expectation** | |
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| ● **MS-ESS1-1 Develop and use a model of the Earth-sun-moon system to describe the cyclic patterns of lunar phases, eclipses of the sun and moon, and seasons.** | |
| **Science and Engineering Practices** | **Disciplinary Core Ideas** |
| **Developing and Using Models-**<br>● Develop and use a model to describe phenomena<br>● Construct a scientific explanation based on valid and reliable evidence obtained from sources (including the students' own experiments) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future. (MS-ESS1-4) | ● ESS1.A: The Universe and Its Stars Patterns of the apparent motion of the sun, the moon, and stars in the sky can be observed, described, predicted, and explained with models. (MS-ESS1-1)<br>● Earth and its solar system are part of the Milky Way galaxy, which is one of many galaxies in the universe. (MS-ESS1-2)<br>● ESS1.B: Earth and the Solar System The solar system consists of the sun and a collection of objects, including planets, their moons, and asteroids that are held in orbit around the sun by its gravitational pull on the |
| **Crosscutting Concepts** | **Learning Objectives** |
| **Patterns-** | TLW identify the following concepts: |

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| • Patterns can be used to identify cause-and-effect relationships.<br>• Time, space, and energy phenomena can be observed at various scales using models to study systems that are too large or too small.<br>• Science assumes that objects and events in natural systems occur in consistent patterns that are understandable through measurement and observation. | • Science assumes that objects and events in natural systems occur in consistent patterns that are understandable through measurement and observation<br>• Engineering advances have led to important discoveries in virtually every field of science and scientific discoveries have led to the development of entire industries and engineered systems. |

| **Performance Expectation** | |
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| • • MS-ESS1-2 Develop and use a model to describe the role of gravity in the motions within galaxies and the solar system | |
| **Science and Engineering Practices** | **Disciplinary Core Ideas** |
| **Developing and Using Models-**<br>• Develop and use a model to describe phenomena. | **ESS1.A-**<br>• The Universe and Its Stars Earth and its solar system are part of the Milky Way galaxy, which is one of many galaxies in the universe.<br>**ESS1.B-**<br>• Earth and the Solar System The solar system consists of the sun and a collection of objects, including planets, their moons, and asteroids that are held in orbit around the sun by its gravitational pull on them. The solar system appears to have formed from a disk of dust and gas, drawn together by gravity. |
| **Crosscutting Concepts** | **Learning Objectives** |
| **Systems and System Models-**<br>• Models can be used to represent systems and their interactions. | • TLW develop a model to make sense of a given phenomenon in which they identify the relevant components of the system, including:<br>○ Gravity<br>○ The solar system as a collection of bodies, including the sun, planets, moons, and asteroids<br>○ The Milky Way galaxy as a collection of stars (e.g., the sun) and their associated systems of objects.<br>○ Other galaxies in the universe<br>○ Students indicate the relative spatial scales of solar systems and galaxies in the model. |

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| | ● TLW describe the relationships and interactions between components of the solar and galaxy systems, including:<br>○ Gravity as an attractive force between solar system and galaxy objects that: 1. Increases with the mass of the interacting objects increases. 2.Decreases as the distances between objects increases.<br>○ The orbital motion of objects in our solar system (e.g., moons orbit around planets, all objects within the solar system orbit the sun).<br>○ The orbital motion, in the form of a disk, of vast numbers of stars around the center of the Milky Way.<br>○ That our solar system is one of many systems orbiting the center of the larger system of the Milky Way galaxy.<br>○ The Milky Way is one of many galaxy systems in the universe.<br>● TLW use the model they created to describe that gravity is a predominantly inward-pulling force that can keep smaller/less massive objects in orbit around larger/more massive objects.<br>● TLW use the model that they created to describe that gravity causes a pattern of smaller/less massive objects orbiting around larger/more massive objects at all system scales in the universe, including that:<br>○ Gravitational forces from planets cause smaller objects (e.g., moons) to orbit around planets.<br>○ The gravitational force of the sun causes the planets and other bodies to orbit around it, holding the solar system together.<br>○ The gravitational forces from the center of the Milky Way cause stars and stellar systems to orbit around the center of the galaxy.<br>○ The hierarchy pattern of orbiting systems in the solar system was established early in its history as the disk of dust and gas was driven by gravitational forces to form moon-planet and planet-sun orbiting systems.<br>● TLW use the model that they created to |

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| | describe that objects too far away from the sun do not orbit it because the sun's gravitational force on those objects is too weak to pull them into orbit.<br>● TLW use the model to describe what a given phenomenon might look like without gravity. |

| **Performance Expectation** | |
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| **MS-ESS1-3-** Analyze and interpret data to determine scale properties of objects in the solar system. | |
| **Science and Engineering Practices** | **Disciplinary Core Ideas** |
| **Analyzing and Interpreting Data-**<br>● Analyze and interpret data to determine similarities and differences in findings. | **ESS1.B: Earth and the Solar System-**<br>● The solar system consists of the sun and a collection of objects, including planets, their moons, and asteroids that are held in orbit around the sun by its gravitational pull on them. |
| **Crosscutting Concepts** | **Learning Objectives** |
| **Scale, Proportion, and Quantity-**<br>● Time, space, and energy phenomena can be observed at various scales using models to study systems that are too large or too small. | ● TLW organize given data on solar system objects from various Earth- and space-based e.g., transforming tabular data into pictures, diagrams, graphs, or physical models (that illustrate changes in scale).<br>○ Instruments to allow for analysis and interpretation (b Students describe that different representations illustrate different characteristics of objects in the solar system, including differences in scale.<br>○ Identifying relationships a Students use quantitative analyses to describe similarities and differences among solar system objects by describing patterns of features of those objects at different scales, including: i. Distance from the sun. ii. Diameter. iii. Surface features (e.g., sizes of volcanoes). iv. Structure. v. Composition (e.g., ice versus rock versus gas). Students identify advances in solar system science made possible by improved engineering (e.g., knowledge of the evolution of the solar system from lunar exploration and space probes) and new developments in engineering made possible by |

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| | advances in science (e.g., space-based telescopes from advances in optics and aerospace engineering). |

| Performance Expectation | |
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| **MS-ESS2-4-** Develop a model to describe the cycling of water through Earth's systems driven by energy from the sun and the force of gravity. | |
| **Science and Engineering Practices** | **Disciplinary Core Ideas** |
| **Developing and Using Models-**<br>● Develop a model to describe unobservable mechanisms. | **ESS2.C: The Roles of Water in Earth's Surface Processes-**<br>● Water continually cycles among land, ocean, and atmosphere via transpiration, evaporation, condensation and crystallization, and precipitation, as well as downhill flows on land. Global movements of water and its changes in form are propelled by sunlight and gravity. |
| **Crosscutting Concepts** | **Learning Objectives** |
| **Energy and Matter-**<br>● Within a natural or designed system, the transfer of energy drives the motion and/or cycling of matter. | ● TLW develop a model to make sense of a given phenomenon in which they identify the relevant components:<br>○ Water (liquid, solid, and in the atmosphere).<br>○ Energy in the form of sunlight.<br>○ Gravity<br>○ Atmosphere<br>○ Landforms<br>○ Plants and other living things<br>● TLW describe the relevant relationships between components, including:<br>○ Energy transfer from the sun warms water on Earth, which can evaporate into the atmosphere.<br>○ Water vapor in the atmosphere forms clouds, which can cool and condense to produce precipitation that falls to the surface of Earth.<br>○ Gravity causes water on land to move downhill (e.g., rivers and glaciers) and much of it eventually flows into oceans.<br>○ Some liquid and solid water remains on land in the form of bodies of water and ice sheets.<br>○ Some water remains in the tissues of plants and other living organisms, |

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| | and this water is released when the tissues decompose.<br>● TLW use the model they created to account for both energy from light and the force of gravity driving water cycling between oceans, the atmosphere, and land, including that:<br>○ Energy from the sun drives the movement of water from the Earth (e.g., oceans, landforms, plants) into the atmosphere through transpiration and evaporation.<br>○ Water vapor in the atmosphere can cool and condense to form rain or crystallize to form snow or ice, which returns to Earth when pulled down by gravity.<br>○ Some rain falls back into the ocean, and some rain falls on land. Water that falls on land can 1. Be pulled down by gravity to form surface waters such as rivers, which join together and generally flow back into the ocean. 2. Evaporate back into the atmosphere. 3. Be taken up by plants, which release it through transpiration and also eventually through decomposition. 4. Be taken up by animals, which release it through respiration and also eventually through decomposition. 5. Freeze (crystallize) and/or collect in frozen form, in some cases forming glaciers or ice sheets. 6. Be stored on land in bodies of water or below ground in aquifers.<br>● TLW use the model to describe that the transfer of energy between water and its environment drives the phase changes that drive water cycling through evaporation, transpiration, condensation, crystallization, and precipitation.<br>● TLW use the model to describe how gravity interacts with water in different phases and locations to drive water cycling between the Earth's surface and the atmosphere. |

| **Performance Expectation** |
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| **MS-ESS2-5-** Collect data to provide evidence for how the motions and complex interactions of air masses results in changes in weather conditions. |

| Science and Engineering Practices | Disciplinary Core Ideas |
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| **Planning and Carrying Out Investigations-**<br>● Collect data to produce data to serve as the basis for evidence to answer scientific questions or test design solutions under a range of conditions. | **ESS2.C: The Roles of Water in Earth's Surface Processes-**<br>● The complex patterns of the changes and the movement of water in the atmosphere, determined by winds, landforms, and ocean temperatures and currents, are major determinants of local weather patterns.<br>**ESS2.D: Weather and Climate-**<br>● Because these patterns are so complex, weather can only be predicted probabilistically. |
| **Crosscutting Concepts** | **Learning Objectives** |
| **Cause and Effect-**<br>● Cause and effect relationships may be used to predict phenomena in natural or designed systems. | TLW describe the given phenomenon under investigation, which includes the relationships between air mass interactions and weather conditions.<br>TLW identify the purpose of the investigation, which includes providing evidence to answer questions about how motions and complex interactions of air masses result in changes in weather conditions (expectations of students regarding mechanisms are limited to relationships between patterns of activity of air masses and changes in weather).<br>TLW describe the data to be collected and the evidence to be derived from the data that would indicate relationships between air mass movement and changes in weather, including:<br>● Patterns in weather conditions in a specific area (e.g., temperature, air pressure, humidity, wind speed) over time.<br>● The relationship between the distribution and movement of air masses and landforms, ocean temperatures, and currents.<br>● The relationship between observed, large-scale weather patterns and the location or movement of air masses, including patterns that develop between air masses (e.g., cold fronts may be characterized by thunderstorms).<br>TLW describe how the evidence to be collected will be relevant to determining the relationship between patterns of activity of air masses and changes in weather conditions.<br>TLW describe that because weather patterns are so complex and have multiple causes, weather can be predicted only probabilistically.<br>TLW describe the tools and methods used in the investigation, including how they are relevant to the purpose of the investigation. |

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| | TLW make observations and record data, either firsthand and/or from professional weather monitoring services. |

| **Performance Expectation** | |
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| **MS-ESS2-6-** Develop and use a model to describe how unequal heating and rotation of the Earth cause patterns of atmospheric and oceanic circulation that determine regional climates. | |
| **Science and Engineering Practices** | **Disciplinary Core Ideas** |
| **Developing and Using Models-**<br>● Develop and use a model to describe phenomena. | **ESS2.C: The Roles of Water in Earth's Surface Processes-**<br>● Variations in density due to variations in temperature and salinity drive a global pattern of interconnected ocean currents.<br>**ESS2.D: Weather and Climate-**<br>● Weather and climate are influenced by interactions involving sunlight, the ocean, the atmosphere, ice, landforms, and living things. These interactions vary with latitude, altitude, and local and regional geography, all of which can affect oceanic and atmospheric flow patterns. The ocean exerts a major influence on weather and climate by absorbing energy from the sun, releasing it over time, and globally redistributing it through ocean currents. |
| **Crosscutting Concepts** | **Learning Objectives** |
| **Systems and System Models-**<br>● Models can be used to represent systems and their interactions—such as inputs, processes and outputs—and energy, matter, and information flows within systems. | TLW develop a model to make sense of a phenomenon in which they identify the relevant components of the system, with inputs and outputs, including:<br>● The rotating Earth<br>● The atmosphere<br>● The ocean, including the relative rate of thermal energy transfer of water compared to land or air<br>● Continents and the distribution of landforms on the surface of Earth<br>● Global distribution of ice.<br>● Distribution of living things<br>● Energy<br>○ Radiation from the sun as an input.<br>○ Thermal energy that exists in the atmosphere, water, land, and ice (as represented by temperature). |

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| | TLW identify and describe the relationships between components of the system in their model, including motion of ocean waters and air masses (matter), factors affecting the motion of wind and currents, and thermal energy transfer.<br>TLW use the model they created to describe:<br>● The general latitudinal pattern in climate (higher average annual temperatures near the equator and lower average annual temperatures at higher latitudes) caused by more direct light (greater energy per unit of area) at the equator (more solar energy) and less direct light at the poles (less solar energy).<br>● The general latitudinal pattern of drier and wetter climates caused by the shift in the amount of air moisture during precipitation from rising moisture-rich air and the sinking of dry air.<br>● The pattern of differing climates in continental areas as compared to the oceans. Because water can absorb more solar energy for every degree change in temperature compared to land, there is a greater and more rapid temperature change on land than in the ocean. At the centers of landmasses, this leads to conditions typical of continental climate patterns.<br>● The pattern that climates near large water bodies, such as marine coasts, have comparatively smaller changes in temperature relative to the center of the landmass. Land near the oceans can exchange thermal energy through the air, resulting in smaller changes in temperature. At the edges of landmasses, this leads to marine climates.<br>● The pattern that climates at higher altitudes have lower temperatures than climates at lower altitudes. Because of the direct relationship between temperature and pressure, given the same amount of thermal energy, air at lower pressures (higher altitudes) will have lower temperatures than air at higher pressures (lower altitudes).<br>● Regional patterns of climate (e.g., temperature or moisture) related to a specific pattern of water or air circulation, including the role of the following in contributing to the climate pattern:<br>○ Air or water moving from areas of high temperature, density, and/or salinity to areas of low temperature, |

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| | density, and/or salinity.<br>○ The Earth's rotation, which affects atmospheric and oceanic circulation.<br>○ The transfer of thermal energy with the movement of matter.<br>○ The presence of landforms (e.g., the rain shadow effect).<br>TLW use the model to describe the role of each of its components in producing a given regional climate. |

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  SL.6.3. Deconstruct a speaker's argument and specific claims, distinguishing claims that are supported by reasons and evidence from claims that are not.

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- Respect cultural traditions
- Build in more group work to encourage interaction with peers
- Show photos, videos, and definitions when possible for culturally unique vocabulary
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- Provided students with necessary academic resources and materials
- Allow for alternative assignments
- Provide visuals
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- Provide positive praise to increase motivation
- Provide real world connections and emphasize the value of education
- Communicate high expectations for the success of all students

**Evidence of Student Learning**

**Formative Tasks:**

- Utilize C-E-R framework & a rubric to assess students' understandings of the following questions:
  - What is weather?
  - What makes air hot?
  - What happens to the hot air?
  - Where does energy come from in a storm?
  - What can weather maps tell us?
  - Does the storm model fit data from a storm?
  - Why does temperature vary in different locations?
  - What else is affecting temperature?
  - How does the Earth-sun-moon system work ?
  - What causes lunar phases?
  - What causes eclipses of the sun and moon?
  - What causes changes in seasons?

**Alternative Assessments:**

- Utilize C-E-R framework (with talk-to-text) & a rubric (modified) to assess students' understandings of the following questions:
  - What is weather?
  - What makes air hot?
  - What happens to the hot air?
  - Where does energy come from in a storm?
  - What can weather maps tell us?
  - Does the storm model fit data from a storm?
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  - What else is affecting temperature?
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  - What causes lunar phases?
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  - What causes changes in seasons?

**Summative Assessments:**

- Utilize C-E-R framework & a rubric to assess students' understandings of the following questions:
  - What is weather?
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  - What happens to the hot air?
  - Where does energy come from in a storm?
  - What can weather maps tell us?
  - Does the storm model fit data from a storm?
  - Why does temperature vary in different locations?
  - What else is affecting temperature?
  - How does the Earth-sun-moon system work ?
  - What causes lunar phases?
  - What causes eclipses of the sun and moon?
  - What causes changes in seasons?

**Benchmark Assessments:**

- Utilize C-E-R framework & a rubric to assess students' understandings of the following questions:
  - What is weather?
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  - What happens to the hot air?
  - Where does energy come from in a storm?
  - What can weather maps tell us?
  - Does the storm model fit data from a storm?
  - Why does temperature vary in different locations?
  - What else is affecting temperature?
  - How does the Earth-sun-moon system work ?
  - What causes lunar phases?
  - What causes eclipses of the sun and moon?
  - What causes changes in seasons?

**Knowledge & Skills**

**Enduring Understandings:**

Students will understand and be able to communicate that:

- There are relationships between the sun, moon, the Earth and their motion.
- The motion of the moon occurs in a set cycle. This motion creates lunar phases.

**Essential Questions:**

- What is weather?
- What makes air hot?
- What happens to the hot air?
- Where does energy come from in a storm?
- What can weather maps tell us?
- Does the storm model fit data from a storm?

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| • The Earth is tilted on its axis and its motion occurs in a set cycle. This motion and tilt causes the intensity of light to change at different times of the year, creating seasons.<br>• Light energy from the sun is mostly transmitted through the air before reaching the ground, and the ground absorbs some of the light energy that reaches it.<br>• Molecules transfer thermal energy from one end of an object to another and to other objects by collision between molecules that transfer the kinetic energy of one molecule to another (conduction).<br>• The air at the Earth's surface is primarily heated by the transfer of thermal energy from the ground below it.<br>• Less dense air rises when surrounded by more dense things. The more dense air moves in to take its place. The movement of air masses is called *convection*.<br>• Air pressure at a location is related to the total weight of the air above that location. Low-density air columns have low pressure and high-density columns have high pressure.<br>• Large air masses can behave as closed "systems" for long periods of time before reaching equilibrium with the surrounding air masses. A front is the boundary between these large air masses.<br>• Air masses move when high-pressure air pushes into the space of lower-pressure air. At the surface, higher differences in pressure over smaller distances result in stronger winds.<br>• Air masses move when more dense air slides underneath less dense air, causing the less dense air to be lifted upward. This less dense air is unstable as it is forced upward. It transfers energy to the surrounding air and cools as it rises.<br>• Movement of air masses causes changes in weather in predictable ways.<br>• Intensity of light varies depending how far north or south of the equator you are and how long the light shines on a place.<br>• Temperatures vary in a predictable pattern depending on latitude.<br>• Intensity differences explain why temperatures vary in the same pattern. | • Why does temperature vary in different locations?<br>• What else is affecting temperature?<br>• How does the Earth-sun-moon system work ?<br>• What causes lunar phases?<br>• What causes eclipses of the sun and moon?<br>• What causes changes in seasons? |
| **Core Instructional & Supplemental Materials** | |
| **Suggested Activities/Resources:** | **Varied Levels of Text:** |

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| http://www.ces.fau.edu/nasa/module-3/why-does-temperature-vary/angle-of-the-sun.php<br>http://esminfo.prenhall.com/science/geoanimations/animations/01_EarthSun_E2.html<br>http://highered.mheducation.com/sites/007299181x/student_view0/chapter2/seasons_interactive.html | • IQWST Earth Science Unit "What Makes the Weather Change?"<br>• Gizmos resources<br>• Mystery Science<br>• Teacher selected articles & leveled texts |

| **Unit 4: Physical Science** | **Duration: 50 days- ongoing** |
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**Standards/Learning Targets**

**New Jersey Student Learning Standards:**

- MS-PS2-1 Apply Newton's Third Law to design a solution to a problem involving the motion of two colliding objects.
- MS-PS2-2 Plan an investigation to provide evidence that the change in an object's motion depends on the sum of the forces on the object and the mass of the object.
- MS-PS2-3 Ask questions about data to determine the factors that affect the strength of electric and magnetic forces.
- MS-PS2-4 Construct and present arguments using evidence to support the claim that gravitational interactions are attractive and depend on the masses of interacting objects.
- MS-PS2-5 Conduct an investigation and evaluate the experimental design to provide evidence that fields exist between objects exerting forces on each other even though the objects are not in contact.

**Performance Expectation**

**MS-PS2-1 Apply Newton's Third Law to design a solution to a problem involving the motion of two colliding objects.**

| **Science and Engineering Practices** | **Disciplinary Core Ideas** |
|---|---|
| **Constructing Explanations and Designing Solutions-**<br>• Apply scientific ideas or principles to design an object, tool, process or system. | **PS2.A: Forces and Motion-**<br>• For any pair of interacting objects, the force exerted by the first object on the second object is equal in strength to the force that the second object exerts on the first, but in the opposite direction (Newton's third law). |
| **Crosscutting Concepts** | **Learning Objectives** |
| **PS2.A: Forces and Motion-**<br>• For any pair of interacting objects, the force exerted by the first object on the second object is equal in strength to the force that the second object exerts on the first, but in the opposite direction (Newton's third law). | TLW be given a problem to solve involving a collision of two objects, students design a solution (e.g., an object, tool, process, or system). In their designs, students identify and describe:<br>• The components within the system that are involved in the collision. |

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| | • The force that will be exerted by the first object on the second object.<br>• How Newton's third law will be applied to design the solution to the problem.<br>• The technologies (i.e., any human-made material or device) that will be used in the solution. |

| **Performance Expectation** | |
|---|---|
| **MS-PS2-2 Plan an investigation to provide evidence that the change in an object's motion depends on the sum of the forces on the object and the mass of the object.** | |
| **Science and Engineering Practices** | **Disciplinary Core Ideas** |
| **Planning and Carrying Out Investigations-**<br>• Plan an investigation individually and collaboratively, and in the design: 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. | **PS2.A: Forces and Motion-**<br>• The motion of an object is determined by the sum of the forces acting on it; if the total force on the object is not zero, its motion will change. The greater the mass of the object, the greater the force needed to achieve the same change in motion. For any given object, a larger force causes a larger change in motion. All positions of objects and the directions of forces and motions must be described in an arbitrarily chosen reference frame and arbitrarily chosen units of size. In order to share information with other people, these choices must also be shared. |
| **Crosscutting Concepts** | **Learning Objectives** |
| **Stability and Change-**<br>• Explanations of stability and change in natural or designed systems can be constructed by examining the changes over time and forces at different scales. | • TLW identify the phenomenon under investigation, which includes the change in motion of an object.<br>• TLW identify the purpose of the investigation, which includes providing evidence that the change in an object's motion is due to the following factors:<br>  • Balanced or unbalanced forces acting on the object.<br>  • The mass of the object. |

| **Performance Expectation** |
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| **MS-PS2-3 Ask questions about data to determine the factors that affect the strength of electric and** |

**magnetic forces.**

| Science and Engineering Practices | Disciplinary Core Ideas |
|---|---|
| **Asking Questions and Defining Problems-**<br>● Ask questions that can be investigated within the scope of the classroom, outdoor environment, and museums and other public facilities with available resources and, when appropriate, frame a hypothesis based on observations and scientific principles. | **PS2.B: Types of Interactions-**<br>● Electric and magnetic (electromagnetic) forces can be attractive or repulsive, and their sizes depend on the magnitudes of the charges, currents, or magnetic strengths involved and on the distances between the interacting objects. |
| **Crosscutting Concepts** | **Learning Objectives** |
| **Cause and Effect-**<br>● Cause and effect relationships may be used to predict phenomena in natural or designed systems. | TLW formulate questions that arise from examining given data of objects (which can include particles) interacting through electric and magnetic forces, the answers to which would clarify:<br>● The cause-and-effect relationships that affect magnetic forces due to: 1. The magnitude of any electric current present in the interaction, or other factors related to the effect of the electric current (e.g., number of turns of wire in a coil). 2. The distance between the interacting objects. 3. The relative orientation of the interacting objects. 4. The magnitude of the magnetic strength of the interacting objects.<br>● The cause-and-effect relationship that affect electric forces due to: 1. The magnitude and signs of the electric charges on the interacting objects. 2. The distances between the interacting objects. 3. Magnetic forces.<br>TLW frame hypotheses based on scientific principles and given data that:<br>● Can be used to predict the strength of electric and magnetic forces due to cause-and-effect relationships.<br>● Can be used to distinguish between possible outcomes, based on an<br><br>understanding of the cause-and-effect relationships driving the system. |

| Performance Expectation | |
|---|---|
| **MS-PS2-4 Construct and present arguments using evidence to support the claim that gravitational interactions are attractive and depend on the masses of interacting objects.** | |
| **Science and Engineering Practices** | **Disciplinary Core Ideas** |
| **Engaging in Argument from Evidence-**<br>● Construct and present oral and written arguments supported by empirical evidence and scientific reasoning to support or refute an explanation or a model for a phenomenon or a solution to a problem. | **PS2.B: Types of Interactions-**<br>● Gravitational forces are always attractive. There is a gravitational force between any two masses, but it is very small except when one or both of the objects have large mass—e.g., Earth and the sun. |
| **Crosscutting Concepts** | **Learning Objectives** |
| **Systems and System Models-**<br>● Models can be used to represent systems and their interactions—such as inputs, processes and outputs—and energy and matter flows within systems. | TLW make a claim to be supported about a given phenomenon. In their claim, students include the following idea:<br>● Gravitational interactions are attractive and depend on the masses of interacting objects.<br>TLW identify scientific evidence, identify and describe the given evidence that supports the claim, including:<br>● The masses of objects in the relevant system(s).<br>● The relative magnitude and direction of the forces between objects in the relevant system(s).<br>TLW evaluate and critique the evidence and identify its strengths and weaknesses, including:<br>● Types of sources.<br>● Sufficiency, including validity and reliability, of the evidence to make and defend the claim.<br>● Any alternative interpretations of the evidence, and why the evidence supports the given claim as opposed to any other claims. |

| Performance Expectation | |
|---|---|
| **MS-PS2-5 Conduct an investigation and evaluate the experimental design to provide evidence that fields exist between objects exerting forces on each other even though the objects are not in contact.** | |
| **Science and Engineering Practices** | **Disciplinary Core Ideas** |
| **Planning and Carrying Out Investigations-**<br>● Conduct an investigation and evaluate the experimental design to produce data to serve as the basis for evidence that can meet the goals of the investigation. | **PS2.B: Types of Interactions-**<br>● Forces that act at a distance (electric, magnetic, and gravitational) can be explained by fields that extend through space and can be mapped by their effect on a test object (a charged object, or a ball, respectively). |
| **Crosscutting Concepts** | **Learning Objectives** |
| **Cause and Effect-**<br>● Cause and effect relationships may be used to predict phenomena in natural or designed systems. | TLW identify the phenomenon under investigation from the given plan, which includes the idea that objects can interact at a distance and identify the purpose of the investigation, which includes providing evidence that fields exist between objects exerting forces on each other even though the objects are not in contact.<br>TLW identify and describe the data that will be collected to provide evidence for each of the following:<br>● Evidence that two interacting objects can exert forces on each other even though the two interacting objects are not in contact with each other.<br>● Evidence that distinguishes between electric and magnetic forces.<br>● Evidence that the cause of a force on one object is the interaction with the second object (e.g., evidence for the presence of force disappears when the second object is removed from the vicinity of the first).<br>TLW describe the rationale for why the given investigation plan includes:<br>● Changing the distance between objects.<br>● Changing the charge or magnetic orientation of objects.<br>● Changing the magnitude of the charge on an object or the strength of the magnetic field.<br>● A means to indicate or measure the presence of electric or magnetic forces. |

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| | TLW make and record observations according to the given plan. The data recorded may include observations of:<br>● Motion of objects.<br>● Suspension of objects.<br>● Simulations of objects that produce either electric or magnetic fields through space and the effects of moving those objects closer to or farther away from each other.<br>● A push or pull exerted on the hand of an observer holding an object. |

**Primary Interdisciplinary Connections:**

- ELA:
  SL.6.3. Deconstruct a speaker's argument and specific claims, distinguishing claims that are supported by reasons and evidence from claims that are not.

**Technology Standards:**

- 8.1.2.A.1 Identify the basic features of a digital device and explain its purpose.
- 8.1.2.A.4 Demonstrate developmentally appropriate navigation skills in virtual environments (i.e. games, museums).
- 8.2.2.C.1 Brainstorm ideas on how to solve a problem or build a product
- 8.1.2.E.1 Use digital tools and online resources to explore a problem or issue.
- 8.2.2.E.1 List and demonstrate the steps to an everyday task

**Career Ready Practices:**

- CRP1. Act as a responsible and contributing citizen and employee.
- CRP4. Communicate clearly and effectively and with reason.
- CRP12. Work productively in teams while using cultural global competence.

**21st Century Life and Career Standards:**

- 9.1.4.A.1- Explain the difference between a career and a job, and identify various jobs in the community and the related earnings.

**Evidence of Student Learning**

| Formative Tasks: | Alternative Assessments: |
|---|---|
| ● Utilize C-E-R framework & a rubric to assess students' understandings of the following questions:<br>○ What makes things start & stop?<br>○ Which forces act on an object?<br>○ Why does an object start moving?<br>○ How strong is that force?<br>○ Why does an object stop moving?<br>○ Why do things change their speed or direction?<br>○ Forces & Energy- what's the difference? | ● Utilize C-E-R framework (with talk-to-text) & a rubric (modified) to assess students' understandings of the following questions:<br>○ What makes things start & stop?<br>○ Which forces act on an object?<br>○ Why does an object start moving?<br>○ How strong is that force?<br>○ Why does an object stop moving?<br>○ Why do things change their speed or direction?<br>○ Forces & Energy- what's the difference?<br>● Teacher created assessment |

**Summative Assessments:**

- Utilize C-E-R framework & a rubric to assess students' understandings of the following questions:
  - What makes things start & stop?
  - Which forces act on an object?
  - Why does an object start moving?
  - How strong is that force?
  - Why does an object stop moving?
  - Why do things change their speed or direction?
  - Forces & Energy- what's the difference?

**Benchmark Assessments:**

- Utilize C-E-R framework & a rubric to assess students' understandings of the following questions:
  - What makes things start & stop?
  - Which forces act on an object?
  - Why does an object start moving?
  - How strong is that force?
  - Why does an object stop moving?
  - Why do things change their speed or direction?
  - Forces & Energy- what's the difference?

## Knowledge & Skills

**Enduring Understandings:**

Students will understand and be able to communicate that:

- A collision of two objects incorporates the components within the system that are involved in the collision.
- A change in motion is caused by balanced and unbalanced forces acting on the object and the object's mass.
- There are cause and effect relationships in the interactions among electric and magnetic forces.
- Gravitational interactions are attractive and depend on the masses of interacting objects.
- Two interacting objects can exert forces on each other even though the two interacting objects are not in contact with each other.

**Essential Questions:**

- What makes things start & stop?
- Which forces act on an object?
- Why does an object start moving?
- How strong is that force?
- Why does an object stop moving?
- Why do things change their speed or direction?
- Forces & Energy- what's the difference?

## Core Instructional & Supplemental Materials

**Suggested Activities/Resources:**

https://online.kidsdiscover.com/discover/force-and-motion
www.mrcollinson.ca/3%20science/forces/3_science_forces_forces_picture.pdf
https://brainly.com/question/1044740

**Varied Levels of Text:**

- IQWST Physical Science Unit "How Will It Move?"
- Gizmos resources
- Mystery Science
- Teacher selected articles & leveled texts

## Suggested Accommodations

**English Language Learners:**

- Provide pictures and well labeled models
- Speak slowly and gesture when necessary
- Pre-teach vocabulary words
- Extended time on assessments
- Small group for assessment
- Review Vocabulary
- Allow for alternate responses during activities and assessments

**Special Education/Students with Disabilities:**

- Follow specific IEP accommodations and modifications
- Strategic grouping
- Pre-teach concepts
- Small group for assessments
- Check in's during experiments to help refocus
- Allow alternate assignments and assessments

**504 Plans:**

- Follow specific 504 accommodations and modifications
- Strategic grouping
- Pre-teach concepts
- Small group for assessments
- Check in's during experiments to help refocus
- Allow alternate assignments and assessments

**Gifted and Talented:**

- Open ended questions to activate higher level thinking
- Higher level texts
- Alternative modes of communication
- Student developed extension activities
- Plan self directed inquiry
- Student created rubrics
- Curriculum compacting
- Opportunities to push assessment/activity boundaries

**Students at Risk of Failure:**

- Strategic grouping
- Pre-teach concepts
- Small group for assessments
- Check in's during experiments to help refocus
- Incorporate social/emotional discussions
- Encourage and monitor positive peer collaboration
- Provide academic resources for both home and school use
- Provide incentives to increase motivation and collaboration

**Economically Disadvantaged:**

- Provide clear, achievable expectation, do not lower academic requirements for them.
- Build a safe and nurturing atmosphere
- Be flexible with assignments
- Offer several alternatives from which all students can choose.
- Allow students to finish assignments independently, or give them the opportunity to complete tasks at their own pace.
- Use real-world examples and create mental models for abstract idea
- Provide increased  knowledge base and vocabulary use about real world experiences.
- Share the decision making in class.
- Maintain expectations while offering choice and soliciting input

**Culturally Diverse:**

- Involve families in student learning
- Provide social/emotional support
- Respect cultural traditions

- Build in more group work to encourage interaction with peers
- Show photos, videos, and definitions when possible for culturally unique vocabulary
- Teach study skills
- Provided students with necessary academic resources and materials
- Allow for alternative assignments
- Provide visuals
- Assign peer tutor
- Support verbal explanations with non verbal cues: Gestures/ facial expressions Props, realia, manipulatives, concrete materials Visuals, graphs, pictures, maps
- Provide positive praise to increase motivation
- Provide real world connections and emphasize the value of education
- Communicate high expectations for the success of all students

## Evidence of Student Learning

**Formative Tasks:**

- Utilize C-E-R framework & a rubric to assess students' understandings of the following questions:
  - What makes things start & stop?
  - Which forces act on an object?
  - Why does an object start moving?
  - How strong is that force?
  - Why does an object stop moving?
  - Why do things change their speed or direction?
  - Forces & Energy- what's the difference?

**Alternative Assessments:**

- Utilize C-E-R framework (with talk-to-text) & a rubric (modified) to assess students' understandings of the following questions:
  - What makes things start & stop?
  - Which forces act on an object?
  - Why does an object start moving?
  - How strong is that force?
  - Why does an object stop moving?
  - Why do things change their speed or direction?
  - Forces & Energy- what's the difference?
- Teacher created assessment

**Summative Assessments:**

- Utilize C-E-R framework & a rubric to assess students' understandings of the following questions:
  - What makes things start & stop?
  - Which forces act on an object?
  - Why does an object start moving?
  - How strong is that force?
  - Why does an object stop moving?
  - Why do things change their speed or direction?
  - Forces & Energy- what's the difference?

**Benchmark Assessments:**

- Utilize C-E-R framework & a rubric to assess students' understandings of the following questions:
  - What makes things start & stop?
  - Which forces act on an object?
  - Why does an object start moving?
  - How strong is that force?
  - Why does an object stop moving?
  - Why do things change their speed or direction?
  - Forces & Energy- what's the difference?

## Knowledge & Skills

**Enduring Understandings:**

Students will understand and be able to communicate that:

**Essential Questions:**

- What makes things start & stop?
- Which forces act on an object?
- Why does an object start moving?
- How strong is that force?

| | |
|---|---|
| • A collision of two objects incorporates the components within the system that are involved in the collision.<br>• A change in motion is caused by balanced and unbalanced forces acting on the object and the object's mass.<br>• There are cause and effect relationships in the interactions among electric and magnetic forces.<br>• Gravitational interactions are attractive and depend on the masses of interacting objects.<br>• Two interacting objects can exert forces on each other even though the two interacting objects are not in contact with each other. | • Why does an object stop moving?<br>• Why do things change their speed or direction?<br>• Forces & Energy- what's the difference? |
| **Core Instructional & Supplemental Materials** | |
| **Suggested Activities/Resources:**<br><br>https://online.kidsdiscover.com/discover/force-and-motion<br>www.mrcollinson.ca/3%20science/forces/3_science_forces_forces_picture.pdf<br>https://brainly.com/question/1044740 | **Varied Levels of Text:**<br>• IQWST Physical Science Unit "How Will It Move?"<br>• Gizmos resources<br>• Mystery Science<br>• Teacher selected articles & leveled texts |