MIDLAND PARK PUBLIC SCHOOLS
Midland Park, New Jersey
CURRICULUM

Science
Grade 5

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CCCS born on 9/2012
NJSLS born on 8/2017

Grade 5 Science Curriculum Overview

Grade 5 science is taught in six units throughout the school year. The science curriculum is a hands-on, open-ended and sequential process of investigating the biological and physical world. As part of the spiraling curriculum, aspects of physical science, life science, earth & space science, and engineering; technology & applications of science are taught throughout the year. A guided inquiry program gives students the opportunity to explore topics and concepts though investigations. Participating in this hands-on program helps students:

1. To foster a life-long enjoyment of learning science.
2. To observe science in the world around them.
3. To meet the science standards for New Jersey Public Schools.

Suggested Course Sequence*:

Unit 1: Properties of Matter: 15 days
Unit 2: Changes to Matter: 15 days
Unit 3: Energy and Matter in Ecosystems: 15 days
Unit 4: Water on the Earth: 15 days
Unit 5: Earth Systems: 20 days
Unit 6: Interactions Within the Earth, Sun, and Moon System: 20 days

Pre-Requisite: Grade 4 Science

**The number of instructional days is an estimate based on the information available at this time. 1 day equals approximately 42 minutes of seat time. Teachers are strongly encouraged to review the entire unit of study carefully and collaboratively to determine whether adjustments to this estimate need to be made.*

Content Area: Science

Unit Title: Properties of Matter

Grade Level: 5th

Unit Summary:

In this unit of study, students describe that matter is made of particles too small to be seen by developing a model. The crosscutting concept of *scale, proportion, and quantity* is called out as an organizing concept for these disciplinary core ideas. Students demonstrate grade-appropriate proficiency in *developing and using models*, *planning and carrying out investigations*, and use these practices to demonstrate understanding of the core ideas.

Interdisciplinary Connections:

English Language Arts

In order to integrate literacy into this unit of study, students can conduct research by using text and media resources to build their knowledge of the physical properties of matter. In researching this topic, students can recall and gather information by summarizing or paraphrasing their research as they take notes in their science journals. Students can also draw evidence from informational texts to support their design choices as they build and share their models of matter at the particle level. They can also create foldables, charts, or PowerPoint presentations to accompany their models. In addition, if students use research to support their work, they should provide a list of the sources used.

Mathematics

Mathematics is integrated into this unit when students use appropriate tools, such as balances, thermometers, and graduated cylinders, to measure properties of matter like mass, temperature, and volume. In addition, students reason quantitatively and abstractly when analyzing and interpreting data collected when measuring physical properties of matter. Students also model with mathematics as they attempt to understand that matter exists even though it is made of particles too small to be seen. They interpret mathematical data in the context of the situation, reflect on how the data helps explain the particle nature of matter, and modify or improve their models if they do not adequately represent the phenomenon they are meant to represent.

21st Century Themes and Skills:

CRP2. Apply appropriate academic and technical skills.
CRP4. Communicate clearly and effectively and with reason.
CRP6. Demonstrate creativity and innovation.
CRP7. Employ valid and reliable research strategies.
CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.
CRP11. Use technology to enhance productivity.

Standards (Content and Technology):

CPI#:	Statement:
NJSLS 5-PS1-3	Make observations and measurements to identify materials based on their properties.
NJSLS 5-PS1-1	Develop a model to describe that matter is made of particles too small to be seen.
8.1.5.A.1	Select and use the appropriate digital tools and resources to accomplish a variety of tasks including solving problems.
8.2.5.C.4	Collaborate and brainstorm with peers to solve a problem evaluating all solutions to provide the best results with supporting sketches or models.

Unit Essential Question(s):	Unit Enduring Understandings:
• How can properties be used to identify materials?	

• **What kind of model would best represent/describe matter as made of particles that are too small to be seen?**	• Standard units are used to measure and describe physical quantities such as weight, time, temperature, and volume. • Measurements of a variety of properties can be used to identify materials. (At this grade level, mass and weight are not distinguished, and no attempt is made to define the unseen particles or explain the atomic-scale mechanism of evaporation and condensation.) • Natural objects exist from the very small to the immensely large. • Matter of any type can be subdivided into particles that are too small to see, but even then the matter still exists and can be detected by means other than seeing. • A model showing that gases are made from matter particles that are too small to see and are moving freely around in space can explain many observations, including the inflation and shape of a balloon and the effects of air on larger particles or objects.

Unit Learning Targets/Objectives:

Students will...

- **Make observations and measurements to identify materials based on their properties.**
- **Develop a model to describe that matter is made of particles too small to be seen.**

Formative Assessments:

- **Measure and describe physical quantities such as weight, time, temperature, and volume.**
- **Make observations and measurements to produce data that can serve as the basis for evidence for an explanation of a phenomenon.**
- **Make observations and measurements to identify materials based on their properties. Examples of materials to be identified could include:**
  - **Baking soda and other powders**
  - **Metals**
  - **Minerals**
  - **Liquids**

  Examples of properties could include:
  - **Color**
  - **Hardness**
  - **Reflectivity**
  - **Electrical conductivity**
  - **Thermal conductivity**
  - **Response to magnetic forces**
  - **Solubility**

- **Develop a model to describe phenomena.**
- **Develop a model to describe that matter is made of particles too small to be seen. (Assessment does not include the atomic-scale mechanism of evaporation and condensation or defining the unseen particles.)**
  Examples of evidence could include:
  - **Adding air to expand a basketball**
  - **Compressing air in a syringe**
  - **Dissolving sugar in water**
  - **Evaporating salt water**

Summative/Benchmark Assessment(s):

- **Make observations and measurements to identify materials based on their properties.**
- **Develop a model to describe that matter is made of particles too small to be seen.**

Resources/Materials (copy hyperlinks for digital resources):
http://www.bbc.co.uk/bitesize/ks2/science/materials/material_properties/play/

Modifications:

Special Education Students:

- Allow errors
- Rephrase questions, directions, and explanations
- Allow extended time to answer questions, and permit drawing, as an explanation
- Accept participation at any level, even one word
- Consult with Case Managers and follow IEP accommodations/modifications

At-Risk Students:

- Provide extended time to complete tasks
- Consult with Guidance Counselors and follow I&RS procedures/action plans
- Consult with classroom teacher(s) for specific behavior interventions
- Provide rewards as necessary

English Language Learners:

- Assign a buddy, same language or English speaking
- Allow errors in speaking
- Rephrase questions, directions, and explanations
- Allow extended time to answer questions
- Accept participation at any level, even one word

Gifted and Talented Students:

- Provide extension activities
- Build on students' intrinsic motivations
- Consult with parents to accommodate students' interests in completing tasks at their level of engagement

Lesson Name/Topic	Lesson Objective(s)	Time frame (day(s) to complete) Entire Unit: 15 Days
1	**Make observations and measurements**	8 Days
2	**Develop a model**	7 Days

Teacher Notes:

Additional Resources
Click links below to access additional resources used to design this unit:

Content Area: Science

Unit Title: Changes to Matter

Grade Level: 5th

Unit Summary:

In this unit of study, students develop an understanding of the idea that regardless of the type of change that matter undergoes, the total weight of matter is conserved. Students determine whether the mixing of two or more substances results in new substances. The crosscutting concepts of *cause and effect* and *scale, proportion, and quantity* are called out as organizing concepts for these disciplinary core ideas. Students are expected to demonstrate grade-appropriate proficiency in *planning and carrying out investigations* and *using mathematics and computational thinking*. Students are expected to use these practices to demonstrate understanding of the core ideas.

Interdisciplinary Connections:

English Language/Arts

Students can conduct short research projects, using both print and digital sources, to build their understanding of physical changes to matter. While reading, they should take notes of relevant information, and summarize that information so that it can be used as evidence to explain the changes that occur as substances are heated, cooled, dissolved, or mixed. When drawing evidence from texts to support analysis, reflection, and research, students should provide a list of sources.

Mathematics

- Use appropriate tools in strategic ways when measuring physical properties of substances, such as weight or volume.
- Model with mathematics when organizing data into tables or charts, and using the data as evidence to explain changes that occur.
- Convert among different-sized standard measurement units within a given measurement system and use these conversions to explain changes that occur.

21st Century Themes and Skills:

CRP2. Apply appropriate academic and technical skills.
CRP4. Communicate clearly and effectively and with reason.
CRP6. Demonstrate creativity and innovation.
CRP7. Employ valid and reliable research strategies.
CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.
CRP11. Use technology to enhance productivity.

Standards (Content and Technology):

CPI#:	Statement:
NJSLS 5-PS1-4	Conduct an investigation to determine whether the mixing of two or more substances results in new substances.
NJSLS 5-PS1-2	Measure and graph quantities to provide evidence that regardless of the type of change that occurs when heating, cooling, or mixing substances, the total weight of matter is conserved.
8.1.5.A.1	Select and use the appropriate digital tools and resources to accomplish a variety of tasks including solving problems.
8.2.5.C.4	Collaborate and brainstorm with peers to solve a problem evaluating all solutions to provide the best results with supporting sketches or models.

Unit Essential Question(s):	Unit Enduring Understandings:

• **How can we make slime?** • **How can baking soda and vinegar burst a zip-lock bag?**	• Cause-and-effect relationships are routinely identified, tested, and used to explain change. • When two or more different substances are mixed, a new substance with different properties may be formed. • Standard units are used to measure and describe physical quantities such as weight, time, temperature, and volume. • The amount (weight) of matter is conserved when it changes form, even in transitions in which it seems to vanish. • No matter what reaction or change in properties occurs, the total weight of the substances does not change. (Note: Mass and weight are not distinguished at this grade level.) • Science assumes consistent patterns in natural systems.

Unit Learning Targets/Objectives:

Students will...

- **Conduct an investigation to determine whether the mixing of two or more substances results in new substances.**
- **Measure and graph quantities to provide evidence that regardless of the type of change that occurs when heating, cooling, or mixing substances, the total weight of matter is conserved.**

Formative Assessments:

- **Identify, test, and use cause-and-effect relationships to explain change.**
- **Conduct an investigation collaboratively to produce data that can serve as the basis for evidence, using fair tests in which variables are controlled and the number of trials is considered.**
- **Conduct an investigation to determine whether the mixing of two or more substances results in new substances.**
- **Measure and describe physical quantities such as weight, time, temperature, and volume.**
- **Measure and graph quantities such as weight to address scientific and engineering questions and problems.**
- **Measure and graph quantities to provide evidence that regardless of the type of change that occurs when substances are heated, cooled, or mixed, the total weight is conserved. (Note: Assessment does not include distinguishing between mass and weight.)**
- **Examples of reactions or changes could include:**
  - **Phase changes**
  - **Dissolving**
  - **Mixing**

Summative/Benchmark Assessment(s):

- **Conduct an investigation to determine whether the mixing of two or more substances results in new substances.**
- **Measure and graph quantities to provide evidence that regardless of the type of change that occurs when heating, cooling, or mixing substances, the total weight of matter is conserved.**

Resources/Materials (copy hyperlinks for digital resources):

http://www.acs.org/content/dam/acsorg/education/whatischemistry/adventuresinchemistry/experiments/timeforslime/slime-activity.pdf
http://www.exploratorium.edu/science_explorer/bubblebomb.html
http://www.acs.org/content/dam/acsorg/education/whatischemistry/adventuresinchemistry/experiments/flameout/flame-experiment.pdf

Modifications:

Special Education Students:

- Allow errors
- Rephrase questions, directions, and explanations
- Allow extended time to answer questions, and permit drawing, as an explanation
- Accept participation at any level, even one word
- Consult with Case Managers and follow IEP accommodations/modifications

At-Risk Students:

- Provide extended time to complete tasks
- Consult with Guidance Counselors and follow I&RS procedures/action plans
- Consult with classroom teacher(s) for specific behavior interventions
- Provide rewards as necessary

English Language Learners:

- Assign a buddy, same language or English speaking
- Allow errors in speaking
- Rephrase questions, directions, and explanations
- Allow extended time to answer questions
- Accept participation at any level, even one word

Gifted and Talented Students:

- Provide extension activities
- Build on students' intrinsic motivations
- Consult with parents to accommodate students' interests in completing tasks at their level of engagement

Lesson Name/Topic	Lesson Objective(s)	Time frame (day(s) to complete) Entire Unit: 15 Days
1	**Conduct an investigation**	8 Days
2	**Measure and graph quantities to provide evidence**	7 Days

Teacher Notes:

Additional Resources

Click links below to access additional resources used to design this unit:

Content Area: Science

Unit Title: Energy and Matter in Ecosystems

Grade Level: 5th

Unit Summary:

In this unit of study, students develop an understanding of the idea that plants get the materials they need for growth chiefly from air and water. Using models, students can describe the movement of matter among plants, animals, decomposers, and the environment, and they can explain that energy in animals' food was once energy from the sun. The crosscutting concepts of *energy and matter* and *systems and system models* are called out as organizing concepts for these disciplinary core ideas. Students are expected to demonstrate grade-appropriate proficiency in *developing and using models* and *engaging in argument from evidence*. Students are also expected to use these practices to demonstrate understanding of the core ideas.

Interdisciplinary Connections:

English Language Arts

Students should use information from print and digital sources to build their understanding of energy and matter in ecosystems. As students read, they should use the information to answer questions, participate in discussions, solve problems, and support their thinking about movement of matter and the flow of energy through the organisms in an ecosystem. In this unit of study, students are also required to build models to describe the cycling of matter and the flow of energy in ecosystems. They can enhance their models using multimedia components, such as graphics and sound, and visual displays.

Mathematics

In this unit students should:

- Use appropriate tools in strategic ways when making and recording observations of the living and nonliving components of an ecosystem.
- Model with mathematics when using tables, charts, or graphs to organize observational data.
- Reason abstractly and quantitatively when analyzing data that can be used as evidence for explaining how matter cycles and energy flows in systems.
- Convert among different-sized standard measurement units within a given measurement system and use these conversions to help explain what happens to matter and energy in ecosystems.

21st Century Themes and Skills:

CRP2. Apply appropriate academic and technical skills.
CRP4. Communicate clearly and effectively and with reason.
CRP6. Demonstrate creativity and innovation.
CRP7. Employ valid and reliable research strategies.
CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.
CRP11. Use technology to enhance productivity.

Standards (Content and Technology):

CPI#:	Statement:
NJSLS 5-LS1-1	Support an argument that plants get the materials they need for growth chiefly from air and water.
NJSLS 5-LS2-1	Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment.
NJSLS 5-PS3-1	Use models to describe that energy in animals' food (used for body repair, growth, motion, and to maintain body warmth) was once energy from the sun.

8.1.5.A.1	Select and use the appropriate digital tools and resources to accomplish a variety of tasks including solving problems.
8.2.5.C.4	Collaborate and brainstorm with peers to solve a problem evaluating all solutions to provide the best results with supporting sketches or models.

Unit Essential Question(s):

- **Where do plants get the materials they need for growth?**
- **How does matter move among plants, animals, decomposers, and the environment?**
- **How can energy in animals' food be traced to the sun?**

Unit Enduring Understandings:

- Matter is transported into, out of, and within systems.
- Plants acquire their material for growth chiefly from air and water.
- • Science explanations describe the mechanisms for natural events.
- A system can be described in terms of its components and their interactions.
- The food of almost any kind of animal can be traced back to plants.
- Organisms are related in food webs in which some animals eat plants for food and other animals eat the animals that eat plants.
- Some organisms, such as fungi and bacteria, break down dead organisms (both plants or plants parts and animals) and therefore operate as decomposers.
- Decomposition eventually restores (recycles) some materials back to the soil.
- Organisms can survive only in environments in which their particular needs are met.
- Energy can be transferred in various ways and between objects.
- The energy released from food was once energy from the sun, which was captured by plants in the chemical process that forms plant matter (from air and water).
- Food provides animals with the materials they need for body repair and growth and the energy they need for motion and to maintain body warmth.

Unit Learning Targets/Objectives:

Students will...

- **Support an argument that plants get the materials they need for growth chiefly from air and water.**
- **Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment.**
- **Use models to describe that energy in animals' food (used for body repair, growth, motion, and to maintain body warmth) was once energy from the sun.**

Formative Assessments:

- **Describe how matter is transported into, out of, and within systems.**
- **Support an argument with evidence, data, or a model.**
- **Support an argument that plants get the materials they need for growth chiefly from air and water. (Emphasis is on the idea that plant matter comes mostly from air and water, not from the soil.)**
- **Describe a system in terms of its components and interactions.**
- **Develop a model to describe phenomena.**
- **Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment. (Assessment does not include molecular explanations.)**
- **Emphasis is on the idea that matter that is not food—such as air, water, decomposed materials in soil—is changed into matter that is food. Examples of systems could include: Organisms, Ecosystems, Earth**
- **Describe how energy can be transferred in various ways and between objects.**
- **Use models to describe phenomena.**
- **Use models to describe that energy in animals' food (used for body repair, growth, motion, and to maintain body warmth) was once energy from the sun.**
- **Examples of models could include: Diagrams, Flowcharts**

Summative/Benchmark Assessment(s):

- **Support an argument that plants get the materials they need for growth chiefly from air and water.**
- **Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment.**
- **Use models to describe that energy in animals' food (used for body repair, growth, motion, and to maintain body warmth) was once energy from the sun.**

Resources/Materials (copy hyperlinks for digital resources):
http://ngss.nsta.org/Resource.aspx?ResourceID=94
http://ngss.nsta.org/Resource.aspx?ResourceID=288

Modifications:

Special Education Students:

- Allow errors
- Rephrase questions, directions, and explanations
- Allow extended time to answer questions, and permit drawing, as an explanation
- Accept participation at any level, even one word
- Consult with Case Managers and follow IEP accommodations/modifications

English Language Learners:

- Assign a buddy, same language or English speaking
- Allow errors in speaking
- Rephrase questions, directions, and explanations
- Allow extended time to answer questions
- Accept participation at any level, even one word

At-Risk Students:

- Provide extended time to complete tasks
- Consult with Guidance Counselors and follow I&RS procedures/action plans
- Consult with classroom teacher(s) for specific behavior interventions
- Provide rewards as necessary

Gifted and Talented Students:

- Provide extension activities
- Build on students' intrinsic motivations
- Consult with parents to accommodate students' interests in completing tasks at their level of engagement

Lesson Name/Topic	Lesson Objective(s)	Time frame (day(s) to complete) Entire Unit: 15 Days
1	**Support an argument**	5 Days
2	**Develop a model**	5 Days
3	**Use models to describe**	5 Days

Teacher Notes:

Additional Resources

Click links below to access additional resources used to design this unit:

Content Area: Science

Unit Title: Water on the Earth

Grade Level: 5th

Unit Summary:

In this unit of study, students describe and graph data to provide evidence about the distribution of water on Earth. The crosscutting concepts of *scale, proportion, quantity* and *systems, and systems models* are called out as organizing concepts for these disciplinary core ideas. Students are expected to demonstrate grade-appropriate proficiency in *using mathematics and computational thinking* and in *obtaining, evaluating, and communicating information*. Students are also expected to use these practices to demonstrate understanding of the core ideas.

Interdisciplinary Connections:

English Language Arts

Students use print and digital sources to gather information and data that describe the amount of fresh water and salt water on the Earth and where it is found. As students gather information, they should organize the information into graphs, analyze and interpret the information to answer questions, and summarize the information in order to describe the amounts and percentages of fresh water and salt water on the Earth and to provide evidence about the distribution of water in oceans, lakes, streams, and reservoirs. Students also use several print and digital resources to find examples of:

- The effects of human activities in agriculture, industry, and everyday life on Earth's resources and environments
- Ways in which communities are using science ideas to protect Earth's resources and environments.

Students summarize and paraphrase the information and use it when creating presentations that describe ways in which communities are using science ideas to protect Earth's resources and environments. The presentation should include both oral and written components, and a list of sources should be included with the presentation.

Mathematics

Students model with mathematics by using tables, charts, and/or graphs to organize data and information they collect. This includes the amount of fresh and salt water on Earth, the locations of both fresh and salt water on Earth, how human activities affect Earth's resources, and ways in which communities protect the Earth's resources and environments. Students also reason abstractly and quantitatively when analyzing these data to use as evidence to support their thinking.

21st Century Themes and Skills:

CRP2. Apply appropriate academic and technical skills.
CRP4. Communicate clearly and effectively and with reason.
CRP6. Demonstrate creativity and innovation.
CRP7. Employ valid and reliable research strategies.
CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.
CRP11. Use technology to enhance productivity.

Standards (Content and Technology):

CPI#:	Statement:
NJSLS 5-ESS2-2	Describe and graph the amounts and percentages of water and fresh water in various reservoirs to provide evidence about the distribution of water on Earth.
NJSLS 5-ESS3-1	Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment.

8.1.5.A.1	Select and use the appropriate digital tools and resources to accomplish a variety of tasks including solving problems.
8.2.5.C.4	Collaborate and brainstorm with peers to solve a problem evaluating all solutions to provide the best results with supporting sketches or models.

Unit Essential Question(s):

- **Where is water found on the Earth? What percentage of the Earth's water is fresh water?**
- **How do individual communities use science ideas to protect Earth's resources and environment?**

Unit Enduring Understandings:

- Standard units are used to measure and describe physical quantities such as weight and volume.
- Nearly all of Earth's available water is in the ocean.
- Most fresh water is in glaciers or underground; only a tiny fraction is in streams, lakes, wetlands, and the atmosphere.
- A system can be described in terms of its components and their interactions.
- Science findings are limited to questions that can be answered with empirical evidence.
- Human activities in agriculture, industry, and everyday life have had major effects on the land, vegetation, streams, ocean, air, and even outer space.
- Individuals and communities are doing things to help protect Earth's resources and environments.

Unit Learning Targets/Objectives:

Students will...

- **Describe and graph the amounts and percentages of water and fresh water in various reservoirs to provide evidence about the distribution of water on Earth.**
- **Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment.**

Formative Assessments:

- **Describe physical quantities, such as weight and volume, in standard units.**
- **Describe and graph quantities such as area and volume to address scientific questions.**
- **Describe and graph the amounts and percentages of water and fresh water in various reservoirs to provide evidence about the distribution of water on Earth. (Assessment is limited to oceans, lakes, rivers, glaciers, ground water, and polar ice caps, and does not include the atmosphere.).**
- **Describe a system in terms of its components and interactions.**
- **Obtain and combine information from books and/or other reliable media to explain phenomena or solutions to a design problem.**
- **Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment.**

Summative/Benchmark Assessment(s):

- **Describe and graph the amounts and percentages of water and fresh water in various reservoirs to provide evidence about the distribution of water on Earth.**
- **Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment.**

Resources/Materials (copy hyperlinks for digital resources):
http://ngss.nsta.org/Resource.aspx?ResourceID=37
http://ngss.nsta.org/Resource.aspx?ResourceID=65

Modifications:

Special Education Students:

- Allow errors
- Rephrase questions, directions, and explanations
- Allow extended time to answer questions, and permit drawing, as an explanation
- Accept participation at any level, even one word
- Consult with Case Managers and follow IEP accommodations/modifications

At-Risk Students:

- Provide extended time to complete tasks
- Consult with Guidance Counselors and follow I&RS procedures/action plans
- Consult with classroom teacher(s) for specific behavior interventions
- Provide rewards as necessary

English Language Learners:

- Assign a buddy, same language or English speaking
- Allow errors in speaking
- Rephrase questions, directions, and explanations
- Allow extended time to answer questions
- Accept participation at any level, even one word

Gifted and Talented Students:

- Provide extension activities
- Build on students' intrinsic motivations
- Consult with parents to accommodate students' interests in completing tasks at their level of engagement

Lesson Name/Topic	Lesson Objective(s)	Time frame (day(s) to complete) Entire Unit: 15 Days
1	**Describe and graph**	8 Days
2	**Obtain and combine information**	7 Days

Teacher Notes:

Additional Resources
Click links below to access additional resources used to design this unit:

Content Area: Science

Unit Title: Earth Systems

Grade Level: 5th

Unit Summary:

In this unit of study, students are able to describe ways in which the geosphere, biosphere, hydrosphere, and atmosphere interact. The crosscutting concept of *systems and system models* is called out as an organizing concept for this disciplinary core idea. Students are expected to demonstrate grade-appropriate proficiency in *developing and using models*, *obtaining, evaluating, and communicating information*. Students are also expected to use these practices to demonstrate understanding of the core ideas.

Interdisciplinary Connections:

English Language Arts

In this unit, students can use information from print and digital sources to build their understanding of Earth's major systems and the interactions that occur within and between them. As students read and gather information from multiple print or digital sources, they should use the information to make inferences, answer questions, participate in discussions, solve problems, and support their thinking about the interactions that occur among Earth's systems and the impact that humans have on Earth's resources and environments. As students build models to explain the interactions between the systems and research ways in which individual communities use science ideas to protect the Earth's resources and environments, they can enhance their work with multimedia components, such as graphics and sound and visual displays.

Mathematics

In this unit, students should:

- **Reason abstractly and quantitatively when analyzing data used as evidence to explain how Earth's major systems interact and how human activities affect Earth's resources.**
- **Model with mathematics by using tables, charts, or graphs to organize data and information they collect to support explanations about the interactions that occur within and between Earth's systems.**
- **Represent real-world and mathematical relationships through graphing. For example, students can graph data to show the relationship between the amount of rainfall that occurs and changes in air temperature or pressure or the relationship between the types or number of organisms living at various altitudes.**

21st Century Themes and Skills:

CRP2. Apply appropriate academic and technical skills.
CRP4. Communicate clearly and effectively and with reason.
CRP6. Demonstrate creativity and innovation.
CRP7. Employ valid and reliable research strategies.
CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.
CRP11. Use technology to enhance productivity.

Standards (Content and Technology):

CPI#:	Statement:
NJSLS 5-ESS2-1	Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact.
NJSLS 5-ESS3-1	Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment.
8.1.5.A.1	Select and use the appropriate digital tools and resources to accomplish a variety of tasks including solving problems.

8.2.5.C.4	Collaborate and brainstorm with peers to solve a problem evaluating all solutions to provide the best results with supporting sketches or models.

Unit Essential Question(s):

- In what ways do the geosphere, biosphere, hydrosphere, and/or atmosphere interact?
- How do individual communities use science ideas to protect Earth's resources and environment?

Unit Enduring Understandings:

- A system can be described in terms of its components and their interactions.
- Earth's major systems are the geosphere (solid and molten rock, soil, and sediments), the hydrosphere (water and ice), the atmosphere (air), and the biosphere (living things, including humans).
- The Earth's major systems interact in multiple ways to affect Earth's surface materials and processes.
- The ocean supports a variety of ecosystems and organisms, shapes landforms, and influences climate.
- Winds and clouds in the atmosphere interact with landforms to determine patterns of weather.
- A system can be described in terms of its components and their interactions.
- Science findings are limited to questions that can be answered with empirical evidence.
- Human activities in agriculture, industry, and everyday life have had major effects on the land, vegetation, streams, ocean, air, and even outer space.
- Individuals and communities are doing things to help protect Earth's resources and environments.

Unit Learning Targets/Objectives:

Students will…

- Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact.
- Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment.

Formative Assessments:

- Describe a system in terms of its components and interactions.
- Develop a model using an example to describe a scientific principle.
- Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact. (The geosphere, hydrosphere, atmosphere, and biosphere are each a system. Assessment is limited to the interactions of two systems at a time.)
- Examples could include:
  - The influence of oceans on ecosystems, landform shape, and climate.
  - The influence of the atmosphere on landforms and ecosystems through weather and climate.
  - The influence of mountain ranges on the wind and clouds in the atmosphere.
- Describe a system in terms of its components and interactions.

- Obtain and combine information from books and/or other reliable media to explain phenomena or solutions to a design problem.
- Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment.

Summative/Benchmark Assessment(s):

- Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact.
- Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment.

Resources/Materials (copy hyperlinks for digital resources):
http://ngss.nsta.org/Resource.aspx?ResourceID=13
http://ngss.nsta.org/Resource.aspx?ResourceID=64

Modifications:

Special Education Students:

- Allow errors
- Rephrase questions, directions, and explanations
- Allow extended time to answer questions, and permit drawing, as an explanation
- Accept participation at any level, even one word
- Consult with Case Managers and follow IEP accommodations/modifications

At-Risk Students:

- Provide extended time to complete tasks
- Consult with Guidance Counselors and follow I&RS procedures/action plans
- Consult with classroom teacher(s) for specific behavior interventions
- Provide rewards as necessary

English Language Learners:

- Assign a buddy, same language or English speaking
- Allow errors in speaking
- Rephrase questions, directions, and explanations
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Gifted and Talented Students:

- Provide extension activities
- Build on students' intrinsic motivations
- Consult with parents to accommodate students' interests in completing tasks at their level of engagement

Lesson Name/Topic	Lesson Objective(s)	Time frame (day(s) to complete) Entire Unit: 20 Days
1	Develop a model	10 Days
2	Obtain and combine information	10 Days

Teacher Notes:

Additional Resources
Click links below to access additional resources used to design this unit:

Content Area: Science

Unit Title: Interactions within the Earth, Sun, and Moon System

Grade Level: 5th

Unit Summary:

In this unit of study, students develop an understanding of patterns of daily changes in length and direction of shadows, day and night, and the seasonal appearance of some stars in the night sky. The crosscutting concepts of *patterns, cause and effect*, and *scale, proportion, and quantity* are called out as organizing concepts for these disciplinary core ideas. Students are expected to demonstrate grade-appropriate proficiency in *analyzing and interpreting data* and *engaging in argument from evidence*. Students are also expected to use these practices to demonstrate an understanding of the core ideas.

Interdisciplinary Connections:

English Language Arts

Students should use information from print and digital sources to build their understanding of:

- The Earth's gravitational force on objects.
- The differences in the apparent brightness of the sun compared to that of other stars due to their relative distances from Earth.
- Patterns of change that occur due to the position and motion of the Earth, sun, moon, and stars. As students read and gather information from multiple sources, they should integrate and use the information to answer questions and support their thinking during discussions and in their writing.

Mathematics

Students reason abstractly and quantitatively when analyzing and using data as evidence to describe phenomena, including:

- The Earth's gravitational force pulls objects "down" (toward the center of the Earth).
- The differences in the apparent brightness of the stars are due to their relative distances from Earth.
- Patterns of change, such as the day/night cycle, the change in length and direction of shadows during the day, the apparent motion of the sun across the daytime sky and the moon across the nighttime sky, the changes in the appearance of the moon over a period of four weeks, and the seasonal changes in the position of the stars in the night sky.

Students will model with mathematics as they graphically represent data collected from direct observations and from multiple resources throughout the unit, and as they describe relative distances of the sun and other stars from the Earth. Students might also express relative distances between the Earth and stars using numbers that can be expressed using powers of 10.

21st Century Themes and Skills:

CRP2. Apply appropriate academic and technical skills.
CRP4. Communicate clearly and effectively and with reason.
CRP6. Demonstrate creativity and innovation.
CRP7. Employ valid and reliable research strategies.
CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.
CRP11. Use technology to enhance productivity.

Standards (Content and Technology):

CPI#:	Statement:
NJSLS 5-PS2-1	Support an argument that the gravitational force exerted by Earth on objects is directed down.

NJSLS 5-ESS1-1	Support an argument that the apparent brightness of the sun and stars is due to their relative distances from the Earth.
NJSLS 5-ESS1-2	Represent data in graphical displays to reveal patterns of daily changes in length and direction of shadows, day and night, and the seasonal appearance of some stars in the night sky.
8.1.5.A.1	Select and use the appropriate digital tools and resources to accomplish a variety of tasks including solving problems.
8.2.5.C.4	Collaborate and brainstorm with peers to solve a problem evaluating all solutions to provide the best results with supporting sketches or models.

Unit Essential Question(s):

- **What effect does Earth's gravitational force have on objects?**
- **What effect does the relative distance from Earth have on the apparent brightness of the sun and other stars?**
- **What patterns do we notice when observing the sky?**

Unit Enduring Understandings:

- Cause-and-effect relationships are routinely identified and used to explain change.
- The gravitational force of Earth acting on an object near Earth's surface pulls that object toward the planet's center.
- Natural objects exist from the very small to the immensely large.
- The sun is a star that appears larger and brighter than other stars because it is closer.
- Stars range greatly in their distance from Earth.
- Similarities and differences in patterns can be used to sort, classify, communicate, and analyze simple rates of change for natural phenomena.
- The orbits of Earth around the sun and of the moon around Earth, together with the rotation of Earth about an axis between its north and south poles, cause observable patterns. These include:
  - Day and night
  - Daily changes in the length and direction of shadows
  - Different positions of the sun, moon, and stars at different times of the day, month, and year.

Unit Learning Targets/Objectives:

Students will...

- **Support an argument that the gravitational force exerted by Earth on objects is directed down.**
- **Support an argument that the apparent brightness of the sun and stars is due to their relative distances from the Earth.**
- **Represent data in graphical displays to reveal patterns of daily changes in length and direction of shadows, day and night, and the seasonal appearance of some stars in the night sky.**

Formative Assessments:

- **Identify cause-and-effect relationships in order to explain change.**
- **Support an argument with evidence, data, or a model.**
- **Support an argument that the gravitational force exerted by Earth on objects is directed down. ("Down" is a local description of the direction that points toward the center of the spherical Earth.) (Assessment does not include mathematical representation of gravitational force.).**
- **Support an argument with evidence, data, or a model.**
- **Support an argument that differences in the apparent brightness of the sun compared to that of other stars is due to their relative distances from Earth. (Assessment is limited to relative distances, not sizes, of stars, and does not include other factors that affect apparent brightness, such as stellar masses, age, or stage.)**
- **Sort, classify, communicate, and analyze simple rates of change for natural phenomena using similarities and differences in patterns.**
- **Represent data in graphical displays (bar graphs, pictographs and/or pie charts) to reveal patterns that indicate relationships.**
- **Represent data in graphical displays to reveal patterns of daily changes in length and direction of shadows, day and night, and the seasonal appearance of some stars in the night sky. (Assessment does not include causes of seasons.) Examples of patterns could include:**
  - **The position and motion of Earth with respect to the sun.**
  - **Selected stars that are visible only in particular months.**

Summative/Benchmark Assessment(s):

- **Support an argument that the gravitational force exerted by Earth on objects is directed down.**
- **Support an argument that the apparent brightness of the sun and stars is due to their relative distances from the Earth.**
- **Represent data in graphical displays to reveal patterns of daily changes in length and direction of shadows, day and night, and the seasonal appearance of some stars in the night sky.**

Resources/Materials (copy hyperlinks for digital resources):
http://www.pbslearningmedia.org/resource/phy03.sci.phys.mfe.lp_gravity/gravity-and-falling-objects/
http://solarsystem.nasa.gov/planets/solarsystem
http://www.pbslearningmedia.org/resource/ess05.sci.ess.eiu.lp_superstar/our-super-star/

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Lesson Name/Topic	Lesson Objective(s)	Time frame (day(s) to complete) Entire Unit: 20 Days
1	**Support an argument that the gravitational force exerted by Earth on objects is directed down.**	7 Days
2	**Support an argument that the apparent brightness of the sun and stars is due to their relative distances from the Earth.**	7 Days
3	**Represent data in graphical displays to reveal patterns**	6 Days

Teacher Notes:

Additional Resources

Click links below to access additional resources used to design this unit: