Science Curriculum

Grade 5

Curriculum Writers: Erica Bulk, Susan Cunnigham, Deb O’Bryan, Stephanie Sims, Tara Sweeney, and Jacqueline Zahm

6/1/2015
The Middletown Public Schools Curriculum for grades K-12 was completed June 2015 by a team of K-12 teachers. The team, identified as the Science Curriculum Writers referenced extensive resources to design the document that included but are not limited to:

- Next Generation Science Standards (NGSS)
- Next Generation Science Standards (NGSS) Appendices A-M
- A Framework for K-12 Science Education
- Common Core State Standards for English Language Arts and Literacy in History/Social Studies, Science and Technical Subjects (CCSS)
- Common Core State Standards for Mathematics (CCSS)
- University of Texas, Dana Center (science units of study)
- Best Practice, New Standards for Teaching and Learning in America’s Schools
- Classroom Instruction That Works
- Differentiated Instructional Strategies
- Model curriculum documents from several states
- Educational websites
- Webb’s Depth of Knowledge

The K-12 Curriculum identifies what all students should know and be able to do in science education. Each grade or course draws from The Next Generation Science Standards, Common Core English Language Arts and Mathematics Standards, research-based instructional strategies, resources, map (or suggested timeline), rubrics, and checklists.

The curriculum provides learners with a sequential comprehensive education in Science through the study of Next Generation Standards that includes:

- **Disciplinary Core Ideas:**
  - Physical Science
  - Life Science
  - Earth and Space Science
  - Engineering and Technology

- **Science and Engineering Practices:**
  - Asking questions and defining problems.
  - Developing and using models.
  - Planning and carrying out investigations.
  - Analyzing and interpreting data.
  - Using mathematics and computational thinking.
  - Constructing explanations and designing solutions.
  - Engaging in argument from evidence.
  - Obtaining, evaluating and communicating information.

- **Crosscutting Concepts**
  - Patterns
  - Cause and Effect: Mechanism and Explanation
  - Scale, Proportion, and Quantity
  - Systems and System Models
  - Energy and Matter: Flows, Cycles, and Conservation
  - Structure and Function
  - Stability and Change

**Common Core State Standards** for English Language Arts that includes:

- **College and Career Readiness Anchor Standards for Reading**
  - Key Ideas and Details
  - Craft and Structure
  - Integration of Knowledge
  - Range of Reading

- **College and Career Readiness Anchor Standards for Writing**
  - Text Types and Purposes
  - Production and Distribution of Writing
  - Research to Build and Present Knowledge
  - Range of Writing

Mission Statement

Our mission is to engage all students in a challenging, sequential, and differentiated science curriculum that will develop critical thinkers, problem solvers, and effective communicators.

The curriculum provides a list of research-based best practice instructional strategies that the teacher may model and/or facilitate, e.g.

- Employs strategies of “best practice” (student-centered, experiential, holistic, authentic, expressive, reflective, social, collaborative, democratic, cognitive, developmental, constructivist/heuristic, and challenging).

- Differentiates instruction by varying the content, process, and product and implementing
  - Anchoring
  - Cubing
  - Jig-sawing
  - Pre/post assessments
  - Think/pair/share
  - Tiered assignments

- Analyzes formative assessment to direct instruction.

- Provides exemplars and rubrics.

- Provides opportunities for independent, partner and collaborative group work.

- Addresses multiple intelligences and brain dominance (spatial, bodily kinesthetic, musical, linguistic, intrapersonal, interpersonal, mathematical/logical, and naturalist).

- Models the use of graphic organizers: sequence organizers (chains, cycle), concept development (mind map), compare/contrast organizers (Venn diagrams, comparison charts), organizers (word web, concept map), evaluation organizers (charts, scales), categorize/classify organizers (categories, tree) relational organizers (fish bone, pie chart).

- Provides science practices opportunities such as:
  - Facilitating the science and engineering practices: Appendix F
    1. Asking questions (for science) and defining problems (for engineering)
    2. Developing and using models
    3. Planning and carrying out investigations
    4. Analyzing and interpreting data
    5. Using mathematics and computational thinking
    6. Constructing explanations (for science) and designing solutions (for engineering)
    7. Engaging in argument from evidence
    8. Obtaining, evaluating, and communicating information
  - Modeling Cross-cutting concepts: Appendix G
    1. Patterns.
    2. Cause and effect
    3. Scale, proportion, and quantity.
    4. Systems and system models.
    5. Energy and matter.
    7. Stability and change.
  - Implementing equitable learning opportunities
    1. Value and respect the experiences that all students bring from their backgrounds
    2. Articulate students’ background knowledge with disciplinary knowledge of science
    3. Offer sufficient school resources to support student learning
### COMMON and SUGGESTED ASSESSMENTS

#### REQUIRED COMMON ASSESSMENTS
- Common Formative Assessments
- Common Summative Assessments

#### SUGGESTED ASSESSMENTS
- Anecdotal records
- Compiling data
- Conferencing
- Collaboration
- Exhibits
- Interpret data
- Interviews
- Investigations
- Graphs
- Graphic organizers
- Journals
- Labs
- Models
- Multiple Intelligences assessments, e.g.
  - Graphic organizing - visual
  - Collaboration - interpersonal
  - Role playing - bodily kinesthetic
- Oral presentations
- Predictions
- Research
- Rubrics/checklists
- Summarizing and note taking
- Tests and quizzes
- Technology
- Think-alouds
- Writing genres
  - Argument/opinion
  - Informative
- Vocabulary

The section entitled "Disciplinary Core Ideas" is reproduced verbatim from A Framework for K-12 Science Education: Practices, Cross-Cutting Concepts, and Core Ideas. Integrated and reprinted with permission from the National Academy of Sciences.
RESOURCES FOR GRADE 5

Textbook
- Exploring Science National Geographic (2015)

Science Kits:
- National Geographic, Life, Physical and Space Science Kits
- Models and Designs

Supplementary Books, Teacher (T) Student (S)
- "National Geographic For Kids Magazine"
- The Next Generation Science Standards
- A Framework for K-12 Science Education Practices, Cross Cutting Concepts, and Core Ideas
- Sciencesaurus
- Magic School Bus Series

Technology
- Computers
- LCD projectors
- Interactive boards

Videos and DVDs

Materials
- plants
- seeds
- plastic bags
- paper towels
- light meter
- Stellar Magnitude chart apparent brightness chart

Websites
- http://dsc.discovery.com/
- http://sciencenewsforkids.com/
- http://sciencespot.net/index.html
- http://www.howstuffworks.com/
- www.brainpop.com
- www.Chem4kids.com
- www.childrensuniversity.manchester.ac.uk (day and night shadows, data, charts
- www.concord.org/ngss/
- www.explorelearning.com (Gizmos)
- www.geography4kids.com
- www.Googledocs.com
- www.sciencenetlinks.com (benchmarks and lessons)
- NGSS http://www.nextgenscience.org/ Next Generation Science Standards
- RiDE & NGSS https://www.ride.ri.gov/InstructionAssessment/Science/NextGenerationScienceStandards.aspx
- http://www.lewiscenter.org-AAE/Departments/Science/Teaching-the-Next-Generations-Science/ Explains each standard and demonstrates what it looks like at each grade
- www.utdanacenter.org Log-in: Rhode; Password: Island (RI Science units)
- https://www.pltw.org/our-programs/pltw-launch K-5 PLTW STEM Presentation (Project Lead the Way)
- http://www.nextgenscience.org/ngss-high-school-evidence-statements NGSS Evidence Tables (HS only)

Community
- The Krupowicz Planetarium
- Khan Academy
### Physical Science

#### 5-PS1 Matter and Its Interactions

**Performance Expectations**

Students who demonstrate understanding can:

5-PS1-1. **Develop a model to describe that matter is made of particles too small to be seen.**

[Clarification Statement: Examples of evidence could include adding air to expand a basketball, compressing air in a syringe, dissolving sugar in water, and evaporating salt water.]

[Assessment Boundary: Assessment does not include the atomic-scale mechanism of evaporation and condensation or defining the unseen particles.]

**Essential knowledge and skills**

- Explain that matter is the “stuff” that makes up all objects and substances in the Universe.
- Explain that mass is the amount of matter in an object.
- Explain volume as the amount of space that an object takes up.
- Describe gasses as having no definite shape and no definite volume.
- Classify that substances exist in three states:
  - solid
  - liquid
  - gas
- Describe solids as having a definite shape and definite volume.
- Describe liquids as having a definite volume, but no shape of its own.
- Understand that a model is a simplified representation to understand a concept, e.g. world maps, sculpture, cut-away engine, mobile for the solar system, etc.
- Develop a visual model to explain, e.g.
  - Visual model of particle arrangement within a solid, liquid, and gas (*Sciencesaurus*, p 262)
  - Jar with Ping-Pong balls
  - Picture showing circles of equal sizes
- Demonstrate that matter exists even if it cannot be seen.

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### Science and Engineering Practices

**Developing and Using Models**

Modeling in 3–5 builds on K–2 experiences and progresses to building and revising simple models and using models to represent events and design solutions.

- Develop a model to describe phenomena. (5-PS1-1)

**Disciplinary Core Ideas**

**PS1.A: Structure and Properties of Matter**

- 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 other means. A model shows 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; the effects of air on larger particles or objects.

**Cross Cutting Concepts**

**Scale, Proportion, and Quantity**

- Natural objects exist from the very small to the immensely large.
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<tr>
<th>DOMAIN</th>
<th>Middletown Public Schools and The Next Generations Science Standards</th>
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</thead>
<tbody>
<tr>
<td></td>
<td><strong>Connections to</strong></td>
</tr>
<tr>
<td></td>
<td>Articulation of DCI across grade-bands: 2.PS1.A; MS.PS1.A</td>
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<td><strong>Common Core State Standards Connections:</strong></td>
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<td>ELA/Literacy –</td>
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<td>RI.5.7 Draw on information from multiple print or digital sources, demonstrating the ability to locate an answer to a question quickly or to solve a problem efficiently. (5-PS1-1)</td>
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<td>Mathematics –</td>
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<td>MP.2 Reason abstractly and quantitatively. (5-PS1-1)</td>
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<td>MP.4 Model with mathematics. (5-PS1-1)</td>
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<td>5.NBT.A.1 Explain patterns in the number of zeros of the product when multiplying a number by powers of 10, and explain patterns in the placement of the decimal point when a decimal is multiplied or divided by a power of 10. Use whole-number exponents to denote powers of 10. (5-PS1-1)</td>
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<td>5.NF.B.7 Apply and extend previous understandings of division to divide unit fractions by whole numbers and whole numbers by unit fractions. (5-PS1-1)</td>
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<td>5.MD.C.2 Recognize volume as an attribute of solid figures and understand concepts of volume measurement. (5-PS1-1)</td>
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<td>5.MD.C.4 Measure volumes by counting unit cubes, using cubic cm, cubic in, cubic ft, and improvised units. (5-PS1-1)</td>
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<td>• <a href="http://www.scienccenetlinks.com">www.scienccenetlinks.com</a>  (benchmarks and lessons)</td>
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<td><strong>Academic Vocabulary</strong></td>
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<th>PHYSICAL SCIENCE</th>
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<tr>
<td>5-PS1 Matter and Its Interactions</td>
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**Performance Expectations**

Students who demonstrate understanding can:

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. (Clarification Statement: Examples of reactions or changes could include phase changes, dissolving, and mixing that forms new substances.)

[Assessment Boundary: Assessment does not include distinguishing mass and weight.]

**TEACHER NOTES**

See complete instructional strategies list in the introduction

**RESOURCE NOTES**

See complete resource list in the introduction

**ASSESSMENT NOTES**

See complete assessment list in the introduction
## Essential knowledge and skills
- Understand that matter is not gained or lost with any change; particles are rearranged
- Understand that conserve means to keep the same
- Understand phase changes, e.g. melting, boiling, condensing, freezing
  - Heating – spreads particles out, but weighs the same
  - Cooling – brings particle together, but weighs the same
  - Mixing – rearranges particles, but weighs the same
- Model changes, e.g. use students to represent particles, dissolve salt in water, melt ice cubes, baking soda and vinegar
- Measure, record, graph (bar graph) the weight of substance before and after changes.

### Science and Engineering Practices
- **Using Mathematics and Computational Thinking**
  - Mathematical and computational thinking in 3-5 builds on K-2 experiences and progresses to extending quantitative measurements to a variety of physical properties and using computation and mathematics to analyze data and compare alternative design solutions.
  - Measure and graph quantities such as weight to address scientific and engineering questions and problems. (5-PS1-2)

### Disciplinary Core Ideas
- **PS1.A: Structure and Properties of Matter**
  - The amount (weight) of matter is conserved when it changes form, even in transitions in which it seems to vanish. (5-PS1-2)
- **PS1.B: Chemical Reactions**
  - No matter what reaction or change in properties occurs, the total weight of the substances does not change. (Boundary: Mass and weight are not distinguished at this grade level.) (5-PS1-2)

### Cross Cutting Concepts
- **Scale, Proportion, and Quantity**
  - Standard units are used to measure and describe physical quantities such as weight, time, temperature, and volume. (5-PS1-2, 5-PS1-3)

### Connections to Nature of Science
- **Scientific Knowledge Assumes an Order and Consistency in Natural Systems**
  - Science assumes consistent patterns in natural systems. (5-PS1-2)

### Articulation of DCIs across grade-bands:

### Common Core State Standards Connections:
- **W.5.7** Conduct short research projects that use several sources to build knowledge through investigation of different aspects of a topic. (5-PS1-2)
- **W.5.8** Recall relevant information from experiences or gather relevant information from print and digital sources; summarize or paraphrase information in notes and finished work, and provide a list of sources. (5-PS1-2)
- **W.5.9** Draw evidence from literary or informational texts to support analysis, reflection, and research. (5-PS1-2)

### Mathematics –
- **MP.2** Reason abstractly and quantitatively. 5-PS1-2)
- **MP.4** Model with mathematics. 5-PS1-2)
- **MP.5** Use appropriate tools strategically. (PS1-2)
- **5.MD.A.1** Convert among different-sized standard measurement units within a given measurement system (e.g., convert 5 cm to 0.05 m), and use these conversions in solving multi-step, real-world problems. (5-PS1-2)

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8/14/2015

The section entitled "Disciplinary Core Ideas" is reproduced verbatim from A Framework for K-12 Science Education: Practices, Cross-Cutting Concepts, and Core Ideas. Integrated and reprinted with permission from the National Academy of Sciences.
## PHYSICAL SCIENCE
### 5-PS1 Matter and Its Interactions

#### Performance Expectations

Students who demonstrate understanding can:

5-PS1-3. **Make observations and measurements** to identify materials based on their properties.

(Clarification Statement: Examples of materials to be identified could include baking soda and other powders, metals, minerals, and liquids. Examples of properties could include color, hardness, reflectivity, electrical conductivity, thermal conductivity, response to magnetic forces, and solubility; density is not intended as an identifiable property.)

[Assessment Boundary: Assessment does not include density or distinguishing mass and weight.]

**Essential knowledge and skills**

- Define a property of matter as a characteristic that scientists use to tell the difference between two types of matter, e.g.
  - color
  - texture
  - smell
  - phase of matter at room temperature
- Make observations and measurements to differentiate between similar substances, e.g.
  - white powder could be powdered sugar, granular sugar
  - wood could be cedar, oak, mahogany
  - plastics 1,2,3,4 coding on recycling (see through, breakable, soft)

#### Websites

- [http://sciencespot.net/index.html](http://sciencespot.net/index.html)
- [www.brainpop.com](http://www.brainpop.com)
- [www.chem4kids.com](http://www.chem4kids.com)
- [www.concord.org/ngss/](http://www.concord.org/ngss/)
- [www.explorelarning.com](http://www.explorelarning.com) (Gizmos)
- [www.googledocs.com](http://www.googledocs.com)
- [www.sciencenetlinks.com](http://www.sciencenetlinks.com) (benchmarks and lessons)

#### Academic Vocabulary

- boil
- condense
- conserve
- cooling
- dissolve
- freeze
- heat
- measure
- melt
- mixture
- particles
- phase change
- weight

#### TEACHER NOTES

See complete instructional strategies list in the introduction

#### RESOURCE NOTES

See complete resource list in the introduction

#### ASSESSMENT NOTES

See complete assessment list in the introduction

#### REQUIRED COMMON ASSESSMENTS

- [www.mpsri.net/science](http://www.mpsri.net/science)
- [www.sciencenetlinks.com](http://www.sciencenetlinks.com) (benchmarks and lessons)
- [www.concord.org/ngss/](http://www.concord.org/ngss/)
- [www.sciencelinks.com](http://www.sciencelinks.com)
## SCIENCE CURRICULUM Grade 5

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### Middletown Public Schools and The Next Generation Science Standards

<table>
<thead>
<tr>
<th>DOMAIN</th>
<th>Science and Engineering Practices</th>
<th>Disciplinary Core Ideas</th>
<th>Cross Cutting Concepts</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Planning and Carrying Out</td>
<td>PS1.A: Structure and</td>
<td>Scale, Proportion, and</td>
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<td>Investigations</td>
<td>Properties of Matter</td>
<td>Quantity</td>
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<td>Measurements of a variety of properties can be used to identify materials. (Boundary: 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.) (S-PS1-3)</td>
<td>Standard units are used to measure and describe physical quantities such as weight, time, temperature, and volume. (S-PS1-3)</td>
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### Connections to

Articulation of DCIs across grade-bands: 2.PS1.A; MS.PS1.A

### Common Core State Standards Connections:

**ELA/Literacy –**
- **W.5.7** Conduct short research projects that use several sources to build knowledge through investigation of different aspects of a topic. (S-PS1-3)
- **W.5.8** Recall relevant information from experiences or gather relevant information from print and digital sources; summarize or paraphrase information in notes and finished work, and provide a list of sources. (S-PS1-3)
- **W.5.9** Draw evidence from literary or informational texts to support analysis, reflection, and research. (S-PS1-3)

**Mathematics –**
- **MP.2** Reason abstractly and quantitatively. (S-PS1-3)
- **MP.4** Model with mathematics. (S-PS1-3)
- **MP.5** Use appropriate tools strategically. (PS1-2)

### Websites
- [http://sciencespot.net/index.html](http://sciencespot.net/index.html)
- [www.brainpop.com](http://www.brainpop.com)
- [www.concord.org/ngss/](http://www.concord.org/ngss/)
- [www.explorelearning.com](http://www.explorelearning.com) (Gizmos)
- [www.sciencenetlinks.com](http://www.sciencenetlinks.com) (benchmarks and lessons)

### Academic Vocabulary
- characteristic properties
- identify
- matter
- measurement
- observation
- physical properties
- properties

### Resources
- [Sciencesaurus](http://www.sciencesaurus.com)
- [Models and Design Kit](http://www.modelsanddesignkit.com)
### DOMAIN

#### PHYSICAL SCIENCE

### Middletown Public Schools and *The Next Generation Science Standards*

**Performance Expectations**

Students who demonstrate understanding can:

**5-PS1-4. Conduct an investigation to determine whether the mixing of two or more substances results in new substances.**

**Essential knowledge and skills**

- Define a mixture as a combination of two or more substances together in the same place that are not chemically combined, e.g. sand at the beach (sand, shells, seaweed, bottle caps, etc.) salt and pepper
- Understand that a substance is a physical material
- Recognize that a new substance has new properties, e.g. liquid and solid make a gas (vinegar and baking soda)
- Distinguish between physical and chemical changes
- Recognize signs of chemical change, e.g.
  - color change
  - temperature change
  - produces a gas
- Understand that sometimes when mixing two substances together a new substance is created and other times mixing two substances does not result in a new substance
- Understand that when two substances are mixed something new is created, e.g.
  - mixing red paint and blue paint make purple
  - combining different white powders together with a liquid yields a new substances (dissolve, bubble)

### Science and Engineering Practices

- **Planning and Carrying Out Investigations**
  - Planning and carrying out investigations to answer questions or test solutions to problems in 3-5 builds on K-2 experiences and progresses to include investigations that control variables and provide evidence to support explanations or design solutions.
  - Conduct an investigation collaboratively to produce data to serve as the basis for evidence, using fair tests in which variables are controlled and the number of trials considered. (5-PS1-4)

### Disciplinary Core Ideas

- **PS1.B: Chemical Reactions**
  - When two or more different substances are mixed, a new substance with different properties may be formed. (5-PS1-4)

### Cross Cutting Concepts

- **Cause and Effect**
  - Cause and effect relationships are routinely identified, tested, and used to explain change. (5-PS1-4)
### PHYSICAL SCIENCE

#### 5-PS2 Motion and Stability: Forces and Interactions

**Performance Expectations**

**5-PS2-1. Support an argument that the gravitational force exerted by Earth on objects is directed down.**

(Clarification Statement: “Down” is a local description of the direction that points toward the center of the spherical Earth.)

[Assessment Boundary: Assessment does not include mathematical representation of gravitational force.]

**Essential knowledge and skills**

- Define a force as a push or pull.
- Identify gravity as a force that exists in nature that pulls objects toward each other.
- Understands that the pull between objects and Earth is very strong because Earth has a lot of mass.
- Understand that “down” points toward the center of the spherical Earth.
- Provide multiple pieces of evidence of a force that pulls objects to the center of the Earth, e.g. dropping something at different heights or locations, etc.
- Recognize that some things push against the force of gravity, e.g. carry things.
- Support an argument with evidence, data or a model that gravitational force directs things down.

#### TEACHER NOTES

See complete instructional strategies list in the introduction

#### RESOURCE NOTES

See complete resource list in the introduction

#### ASSESSMENT NOTES

See complete assessment list in the introduction

**Generic Websites**

- NGSS http://www.nextgenstandards.org/
- RIDE & NGSS https://www.ride.ri.gov/InstructionAssessment/Science/NextGenerationScienceStandards.aspx
- www.mpsri.net/science
- www.sciencenetlinks.com (benchmarks and lessons)
### Science and Engineering Practices

**Engaging in Argument from Evidence**

Engaging in argument from evidence in 3–5 builds on K–2 experiences and progresses to critiquing the scientific explanations or solutions proposed by peers by citing relevant evidence about the natural and designed world(s).

- Support an argument with evidence, data, or a model. (5-PS2-1)

**PS2.B: Types of Interactions**

- The gravitational force of Earth acting on an object near Earth’s surface pulls that object toward the planet’s center. (5-PS2-1)

**Cause and Effect**

- Cause and effect relationships are routinely identified and used to explain change. (5-PS2-1)

### Connections to

Articulation of DCIs across grade-bands: 3.PS2.A (5-PS2-1); 3.PS2.B (5-PS2-1); MS.PS2.B (5-PS2-1); MS.ESS1.B (5-PS2-1); MS.ESS2.C (5-PS2-1)

**Common Core State Standards Connections**

- ELA/Literacy – RI.5.1 Quote accurately from a text when explaining what the text says explicitly and when drawing inferences from the text. (5-PS2-1)
- RI.5.9 Integrate information from several texts on the same topic in order to write or speak about the subject knowledgeably. (5-PS2-1)
- W.5.1 Write opinion pieces on topics or texts, supporting a point of view with reasons and information. (5-PS2-1)

### Websites

- [http://sciencespot.net/index.html](http://sciencespot.net/index.html)
- [www.braingop.com](http://www.braingop.com)
- [www.chem4kids.com](http://www.chem4kids.com)
- [www.concord.org/ness](http://www.concord.org/ness)
- [www.explorel earning.com](http://www.explorel earning.com) (Gizmos)
- [www.googledocs.com](http://www.googledocs.com)
- [www.sciencenetlinks.com](http://www.sciencenetlinks.com) (benchmarks and lessons)

### Academic Vocabulary

- force
- gravitational force
- gravity
- mass
- pull
- pull

### Resources

- Magic School Bus Series
- Sciencesaurus
- Models and Design Kit
## Domain: Physical Science
### 5-PS3 Energy

**Performance Expectations**

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.  

**Clarification Statement:** Examples of models could include diagrams, and flow charts.

**Essential knowledge and skills**

- Describe the sun as the major source of energy for life on Earth.
- Create diagrams and models, e.g. food web and energy transfer.
- Trace a pathway of energy from the sun to an animal in a way that they are using energy.
- Understands that energy is the ability to cause movement or create change.
- Recognize that the energy released from food was once energy from the sun that was captured by plants in the chemical process that forms plant matter (from air and water).
- Know that energy transformations are changes in the types of energy.
- Recognize that the sun's light energy is transformed to chemical energy.
- Classify the kinds of energy as:
  - Chemical energy
  - Light energy
  - Heat energy
- Identify the different uses of energy by organisms (plants and animals)

### Science and Engineering Practices

**Developing and Using Models**
- Modeling in 3–5 builds on K–2 experiences and progresses to building and revising simple models and using models to represent events and design solutions.
- Use models to describe phenomena. (5-PS3-1)

### Disciplinary Core Ideas

**PS3.D: Energy in Chemical Processes and Everyday Life**
- The energy released from food was once energy from the sun that was captured by plants in the chemical process that forms plant matter (from air and water). (5-PS3-1)
  - Food provides animals with the materials they need for body repair and growth and the energy they need to maintain body warmth and for motion. (secondary to 5-PS3-1)

### Cross Cutting Concepts

**Energy and Matter**
- Energy can be transferred in various ways and between objects. (5-PS3-1)

### Connections to

**Articulation of DCIs across grade-bands:** K.LS1.C (5-PS3-1); 2.LS2.A (5-PS3-1); 4.PS3.A (5-PS3-1); 4.PS3.B (5-PS3-1); 4.PS3.D (5-PS3-1); MS.PS3.D (5-PS3-1); MS.PS4.B (5-PS3-1); MS.LS1.C (5-PS3-1); MS.LS2.B (5-PS3-1)

**Common Core State Standards Connections:**
- ELA/Literacy – \( R1.5.7 \) Draw on information from multiple print or digital sources, demonstrating the ability to locate an answer to a question quickly or to solve a problem efficiently. (5-PS3-1)

---

*The section entitled "Disciplinary Core Ideas" is reproduced verbatim from A Framework for K-12 Science Education: Practices, Cross-Cutting Concepts, and Core Ideas. Integrated and reprinted with permission from the National Academy of Sciences.*
## LIFE SCIENCE

### 5-LS1 From Molecules to Organisms: Structures and Processes

#### Performance Expectations

Students who demonstrate understanding can:

**5-LS1-1. Support an argument** that plants get the materials they need for growth chiefly from air and water.

[Clarification Statement: Emphasis is on the idea that plant matter comes mostly from air and water, not from the soil.]

**Essential knowledge and skills**

- Understand that air is a mixture of gasses (nitrogen, oxygen, carbon dioxide)
- Understand that plants can make their own food (photosynthesis)
  - sunlight (energy) + Water + Carbon Dioxide \(\rightarrow\) Glucose (sugar) + Oxygen (photosynthesis).
- Know that plant food is sugar and that sugar is made by combining water and carbon dioxide.
- Observe and record that a plant can germinate from air and water alone

---

### Science and Engineering Practices

**Engaging in Argument from Evidence**

Engaging in argument from evidence in 3-5 builds on K-2 experiences and progresses to critiquing the scientific explanations or solutions proposed by peers by citing relevant evidence about the natural and designed world(s).

- Support an argument with evidence, data, or a model. (5-LS1-1)

---

### Disciplinary Core Ideas

**LS1.C: Organization for Matter and Energy Flow in Organisms**

- Plants acquire their material for growth chiefly from air and water. (5-LS1-1)

---

### Cross Cutting Concepts

**Energy and Matter**

- Matter is transported into, out of, and within systems. (5-LS1-1)
<table>
<thead>
<tr>
<th>DOMAIN</th>
<th>Middletown Public Schools and <em>The Next Generations Science Standards</em></th>
<th>INSTRUCTIONAL STRATEGIES</th>
<th>RESOURCES</th>
<th>ASSESSMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>LIFE SCIENCE</td>
<td>Performance Expectations</td>
<td>TEACHER NOTES</td>
<td>RESOURCE NOTES</td>
<td>ASSESSMENT NOTES</td>
</tr>
<tr>
<td>5-LS2 Ecosystems: Interactions, Energy, and Dynamics</td>
<td>Students who demonstrate understanding can:</td>
<td>See complete instructional strategies list in the introduction</td>
<td>See complete resource list in the introduction</td>
<td>See complete assessment list in the introduction</td>
</tr>
<tr>
<td>5-LS2-1. <strong>Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment.</strong></td>
<td>Essential knowledge and skills</td>
<td>Generic Websites</td>
<td>REQUIRED COMMON ASSESSMENTS</td>
<td></td>
</tr>
<tr>
<td>[Clarification Statement: Emphasis is on the idea that matter that is not food (air, water, decomposed materials in soil) is changed by plants into matter that is food. Examples of systems could include organisms, ecosystems, and the Earth.]</td>
<td><em>Describe the sun as the major source of energy for life on Earth.</em></td>
<td>• NGSS <a href="http://www.nextgenscience.org/">http://www.nextgenscience.org/</a></td>
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<tr>
<td>[Assessment Boundary: Assessment does not include molecular explanations.]</td>
<td><em>Define a producer as an organism that makes its own food using energy from the sun.</em></td>
<td>• RIDE &amp; NGSS <a href="https://www.ride.ri.gov/">https://www.ride.ri.gov/</a></td>
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<td>ASSESSMENTS</td>
</tr>
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</table>
|        | • Define a consumer as an organism that feeds on other organisms to obtain its energy, e.g.  
  o herbivore - eat producers (plants)  
  o carnivores eat consumers (meat)  
  o omnivores - eat producers and consumers (plants and meat)  
  • Define a decomposer as an organism that breaks down waste and dead organisms returning important nutrients to the environment.  
  • Construct a food chain to demonstrate the flow of the sun’s energy through the organisms of an ecosystem.  
  - Sun → Pond Weed (producer) → Snail (1st consumer) → Minnow (2nd Consumer) → Perch (3rd Consumer) → Fungi (decomposer)  
  • Interpret a food web to describe the relationships between various species of an ecosystem.  
  • Develop a model of feeding relationships (food web) that traces the flow of energy and matter through a given ecosystem, e.g. producer to primary, e.g. partial food web below. | | www.mpsri.net/Science/NextGenerationScienceStandards.aspx  
www.sciencenetlinks.com (benchmarks and lessons)  
www.concord.org/ngss/  
www.sciencelinks.com | |

**Science and Engineering Practices**

**Disciplinary Core Ideas**

LS2.A: Interdependent Relationships in Ecosystems

- 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. A healthy ecosystem is one in which multiple species of different types are each able to meet their needs in a relatively stable web of life. Newly introduced species can damage the balance of an ecosystem. (5-LS2-1)

**Cross Cutting Concepts**

Systems and System Models

- A system can be described in terms of its components and their interactions. (5-LS2-1)
<table>
<thead>
<tr>
<th>DOMAIN</th>
<th>Middletown Public Schools and <em>The Next Generations Science Standards</em></th>
<th>INSTRUCTIONAL STRATEGIES</th>
<th>RESOURCES</th>
<th>ASSESSMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>LS2.B: Cycles of Matter and Energy Transfer in Ecosystems</strong></td>
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<tr>
<td></td>
<td>• Matter cycles between the air and soil and among plants, animals, and</td>
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<td>microbes as these organisms live and die. Organisms obtain gases, and</td>
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<td>water, from the environment, and release waste matter (gas, liquid, or</td>
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<td></td>
<td>solid) back into the environment. (5-LS2-1)</td>
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</tbody>
</table>

**Connections to**

Connections to other DCIs in fifth grade: 5.ESS2.A (5-LS2-1); 5.PS1.A (5-LS2-1)
Articulation of DCIs across grade-bands: 2.PS1.A (5-LS2-1); 2.LS4.D (5-LS2-1); 4.ESS2.E (5-LS2-1); MS.LS1.C (5-LS2-1); MS.LS2.A (5-LS2-1); MS.LS2.B (5-LS2-1)

**Common Core State Standards Connections:**

**ELA/Literacy –**
RI.5.7 Draw on information from multiple print or digital sources, demonstrating the ability to locate an answer to a question quickly or to solve a problem efficiently. (5-LS2-1)
SL.5.5 Include multimedia components (e.g., graphics, sound) and visual displays in presentations when appropriate to enhance the development of main ideas or themes. (5-LS2-1)

**Mathematics –**
MP.2 Reason abstractly and quantitatively. (5-LS2-1)
MP.4 Model with mathematics. (5-LS2-1)

**Websites**
- http://scienconewsforkids.com/
- http://sciencespot.net/index.html
- www.brainpop.com
- www.concord.org/ngss/
- www.explorelarning.com (Gizmos)
- www.geography4kids.com
- www.googledocs.com
- www.scienconetlinks.com (benchmarks and lessons)

**Academic Vocabulary**
- carnivores
- consumer
- decomposer
- ecosystem
- energy
- food chain
- food web
- herbivore
- omnivores
- organism
- producer

**Resources**
- Sciencesaurus

8/14/2015  
The section entitled "Disciplinary Core Ideas" is reproduced verbatim from A Framework for K-12 Science Education: Practices, Cross-Cutting Concepts, and Core Ideas. Integrated and reprinted with permission from the National Academy of Sciences.
## EARTH AND SPACE SCIENCE

### 5-ESS1 Earth's Place in the Universe

#### Performance Expectations

**5-ESS1-1. Support an argument that the apparent brightness of the sun and stars is due to their relative distances from Earth.**

*Assessment Boundary: Assessment is limited to relative distances, not sizes, of stars. Assessment does not include other factors that affect apparent brightness (such as stellar masses, age, stage).*

**Essential knowledge and skills**

- Recognize the biggest and only star in the Solar System is the sun.
- Recognize there are many other stars in our galaxy.
- Understand that the closer a star is to the observer the brighter it will appear.
- Understand that the farther a star is from the observer the dimmer it will appear.
- Compare the brightness of the sun to other stars.
- Explain the differences between apparent and relative size of an object based on distance of those objects.
- Explain the difference between apparent and relative brightness of an object based on distances of those objects, e.g.:
  - When car headlights are far away they appear dim and when it comes closer it appears brighter
  - Flashlight
- Uses different evidence sources (e.g. The Krupoz Planetarium, flashlight model, graphs) to support and argument that the apparent brightness of the sun and stars is due to their relative distances from Earth.

### Cross Cutting Concepts

- **Scale, Proportion, and Quantity**: Natural objects exist from the very small to the immensely large. (5-ESS1-1)

### Articulation of DCIs across grade-bands:

- MS.5ESS1.A; MS.5ESS1.B

### Connections to

- **RI.5.1 Quote accurately from a text when explaining what the text says explicitly and when drawing inferences from the text. (5-ESS1-1)**

---

**TEACHER NOTES**

See complete instructional strategies list in the introduction.

**RESOURCE NOTES**

See complete resource list in the introduction.

**ASSESSMENT NOTES**

See complete assessment list in the introduction.

**REQUIRED COMMON ASSESSMENTS**

- NGSS http://www.nextgenscience.org/
- www.mpsri.net/science
- www.sciencelinks.com (benchmarks and lessons)
- www.concord.org/ngss/
- www.sciencelinks.com
### SCIENCE CURRICULUM Grade 5

Curriculum Writers: Erica Bulk, Susan Cunningham, Deb O’Bryan, Stephanie Sims, Tara Sweeney, and Jacqueline Zahm

<table>
<thead>
<tr>
<th>DOMAIN</th>
<th>Middletown Public Schools and The Next Generations Science Standards</th>
<th>INSTRUCTIONAL STRATEGIES</th>
<th>RESOURCES</th>
<th>ASSESSMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>RI.5.7</td>
<td>Draw on information from multiple print or digital sources, demonstrating the ability to locate an answer to a question quickly or to solve a problem efficiently. (5-ESS1-1)</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>RI.5.8</td>
<td>Explain how an author uses reasons and evidence to support particular points in a text, identifying which reasons and evidence support which point(s). (5-ESS1-1)</td>
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<tr>
<td>RI.5.9</td>
<td>Integrate information from several texts on the same topic in order to write or speak about the subject knowledgeably. (5-ESS1-1)</td>
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<tr>
<td>W.5.1</td>
<td>Write opinion pieces on topics or texts, supporting a point of view with reasons and information. (5-ESS1-1)</td>
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</tbody>
</table>

**Mathematics**

- MP.2 Reason abstractly and quantitatively. (5-LS2-1)
- MP.4 Model with mathematics. (5-LS2-1)

**5.NBT.A.2** Explain patterns in the number of zeros of the product when multiplying a number by powers of 10, and explain patterns in the placement of the decimal point when a decimal is multiplied or divided by a power of 10. Use whole number exponents to denote powers of 10.

**Academic Vocabulary**

- apparent brightness
- galaxy
- relative distance
- relative size
- solar system
- star
- sun

**Resources**

- The Krupowicz Planetarium
- Light meter
- Stellar Magnitude chart
- apparent brightness chart
- Khan Academy

**EARTH AND SPACE SCIENCE**

**5-ESS1 Earth’s Place in the Universe**

**Performance Expectations**

**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.

- Clarification Statement: Examples of patterns could include the position and motion of Earth with respect to the sun and selected stars that are visible only in particular months.

- Assessment Boundary: Assessment does not include causes of seasons.

**Essential knowledge and skills**

- Recognize and describe that the Earth, moon, and sun have predictable patterns of movement.

**TEACHER NOTES**

See complete instructional strategies list in the introduction

**RESOURCE NOTES**

See complete resource list in the introduction

**ASSESSMENT NOTES**

See complete assessment list in the introduction

**Generic Websites**

- NGSS http://www.nextgenscience.org/
- RIDE & NGSS https://www.ride.ri.gov/InstructionAssessment/Science/NextGenerationScience
### DOMAIN

<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>students investigate the following observable patterns of change that occur due to the position and motion of the Earth, sun, moon, and stars.</td>
</tr>
<tr>
<td>- <strong>Day and night</strong>—This pattern of change is a daily, cyclical pattern that occurs due to the rotation of the Earth every 24 hours. Students can observe model simulations using online or digital resources, or they can create models in class of the day/night pattern caused by the daily rotation of the Earth.</td>
</tr>
<tr>
<td>- <strong>The length and direction of shadows</strong>—These two interrelated patterns of change are daily, cyclical patterns that can be observed and described through direct observation. Students need the opportunity to observe a stationary object at chosen intervals throughout the day and across a few days. They should measure and record the length of the shadow and record the direction of the shadow (using drawings and cardinal directions), then use the data to describe the patterns observed.</td>
</tr>
<tr>
<td>- <strong>The position of the sun in the daytime sky</strong>—This daily, cyclical pattern of change can also be directly observed. Students will need the opportunity to make and record observations of the position of the sun in the sky at chosen intervals throughout the day and across a few days. Data should then be analyzed in order to describe the pattern observed.</td>
</tr>
<tr>
<td>- <strong>The appearance of the moon in the night sky</strong>—This cyclical pattern of change repeats approximately every 28 days. Students can use media and online resources to find data that can be displayed graphically (pictures in a calendar, for example), which will allow them to describe the pattern of change that occurs in the appearance of the moon every four weeks.</td>
</tr>
<tr>
<td>- <strong>The position of the moon in the night sky</strong>—This daily, cyclical pattern of change can be directly observed, but students would have to make observations of the position of the moon in the sky at chosen intervals throughout the night, which is not recommended. Instead, students can use media and online resources to learn that the moon, like the sun, appears to rise in the eastern sky and set in the western sky every night.</td>
</tr>
<tr>
<td>- <strong>The position of the stars in the night sky</strong>—Because the position of the stars changes across the seasons, students will need to use media and online resources to learn about this pattern of change.</td>
</tr>
<tr>
<td>- Define and provide examples of graphical display methods, e.g. Venn diagram, pie chart, bar graph, etc.</td>
</tr>
<tr>
<td>- Collect data about the length and <strong>direction of a shadow</strong> (their own or object) across time and graph it. (<a href="http://www.childrensuniversity.manchester.ac.uk">www.childrensuniversity.manchester.ac.uk</a>)</td>
</tr>
<tr>
<td>- Collect data about the <strong>length of a day</strong> across time and graph it. (<a href="http://www.childrensuniversity.manchester.ac.uk">www.childrensuniversity.manchester.ac.uk</a>)</td>
</tr>
<tr>
<td>- Provide evidence to support the existence of the pattern.</td>
</tr>
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## SCIENCE CURRICULUM Grade 5

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<table>
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<th>DOMAIN</th>
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<th>RESOURCES</th>
<th>ASSESSMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Science and Engineering Practices</td>
<td>Disciplinary Core Ideas</td>
<td>Cross Cutting Concepts</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Analyzing and Interpreting Data</td>
<td>ESS1.B: Earth and the Solar System</td>
<td>Patterns</td>
<td></td>
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</tr>
<tr>
<td>Analyzing data in 3–5 builds on K–2 experiences and progresses to introducing quantitative approaches to collecting data and conducting multiple trials of qualitative observations. When possible and feasible, digital tools should be used.</td>
<td>• 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; and different positions of the sun, moon, and stars at different times of the day, month, and year. (5-ESS1-2)</td>
<td>• Similarities and differences in patterns can be used to sort, classify, communicate and analyze simple rates of change for natural phenomena. (5-ESS1-2)</td>
<td></td>
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</tr>
<tr>
<td>Analyzing data in 3–5 builds on K–2 experiences and progresses to introducing quantitative approaches to collecting data and conducting multiple trials of qualitative observations. When possible and feasible, digital tools should be used.</td>
<td>• Represent data in graphical displays (bar graphs, pictographs and/or pie charts) to reveal patterns that indicate relationships. (5-ESS1-2)</td>
<td></td>
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</tbody>
</table>

### Connections to


Common Core State Standards Connections:

- SL.5.5 Include multimedia components (e.g., graphics, sound) and visual displays in presentations when appropriate to enhance the development of main ideas or themes. (5-ESS1-2)
  
* Mathematics -
  - MP.2 Reason abstractly and quantitatively. (5-ESS1-1)
  - MP.4 Model with mathematics. (5-ESS1-1)
  - 5.G.A.2 Represent real world and mathematical problems by graphing points in the first quadrant of the coordinate plane, and interpret coordinate values of points in the context of the situation. (5-ESS2-1)

### Websites

- [http://sciencespot.net/index.html](http://sciencespot.net/index.html)
- [www.brainpop.com](http://www.brainpop.com)
- [www.concord.org/ngss/](http://www.concord.org/ngss/)
- [www.cosmo4kids.com](http://www.cosmo4kids.com)
- [www.explorelearning.com](http://www.explorelearning.com)  (Gizmos growing plants)
- [www.googledocs.com](http://www.googledocs.com)
- [www.sciencenetlinks.com](http://www.sciencenetlinks.com)  (benchmarks and lessons)
- [www.childrensuniversity.manchester.ac.uk](http://www.childrensuniversity.manchester.ac.uk)  (day and night shadows, data, charts)

### Academic Vocabulary

- axis
- constellation
- graphical display
- orbit
- pattern
- revolution
- rotation

### Materials/resources

- The Krupowicz Planetarium
- Khan Academy
- Flashlights
### EARTH AND SPACE SCIENCE

#### 5-ESS2 Earth’s Systems

**Performance Expectations**

Students who demonstrate understanding can:

**5-ESS2-1. Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact.**

[Clarification Statement: Examples could include the influence of the ocean on ecosystems, landform shape, and climate; the influence of the atmosphere on landforms and ecosystems through weather and climate; and the influence of mountain ranges on winds and clouds in the atmosphere. The geosphere, hydrosphere, atmosphere, and biosphere are each a system.]

[Assessment Boundary: Assessment is limited to the interactions of two systems at a time.]

**Essential knowledge and skills**

- Identify the **Earth’s major systems** as the:
  - geosphere (solid and molten rock, soil, and sediments)
  - hydrosphere (water and ice)
  - atmosphere (air)
  - biosphere (living things, including humans).

- Provide examples to describe how these systems interact in multiple ways to affect Earth’s surface materials and processes, e.g.
  - Recognize the ocean supports.
    - a variety of ecosystems and organisms
    - shapes landforms
    - influences climate
  - Comprehend that winds and clouds in the atmosphere interact with the landforms to determine patterns of weather.

- Create a model that demonstrates how these systems interact in multiple ways, e.g.
  - Modified Venn diagram – cause and effect
  - Stream table

### Science and Engineering Practices

- Developing and Using Models
  - Modeling in 3-5 builds on K-2 experiences and progresses to building and revising simple models and using models to represent events and design solutions.
  - Develop a model using an example to describe a scientific principle. (5-ESS2-1)

### Disciplinary Core Ideas

- 5-ESS2.A: Earth Materials and Systems
  - 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). These 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 systems and system models.

### Cross Cutting Concepts

- Systems and System Models
  - A system can be described in terms of its components and their interactions. (5-ESS2-1)
## SCIENCE CURRICULUM Grade 5

**Curriculum Writers:** Erica Bulk, Susan Cunningham, Deb O’Bryan, Stephanie Sims, Tara Sweeney, and Jacqueline Zahm

<table>
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<th>DOMAIN</th>
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<th>INSTRUCTIONAL STRATEGIES</th>
<th>RESOURCES</th>
<th>ASSESSMENTS</th>
</tr>
</thead>
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<tr>
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<td><strong>5-ESS2 Earth's Systems</strong></td>
<td><strong>Performance Expectations</strong></td>
<td><strong>TEACHER NOTES</strong></td>
<td><strong>RESOURCE NOTES</strong></td>
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<td>See complete resource list in the introduction</td>
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<td>5-ESS2-2. <strong>Describe and graph</strong> the amounts and percentages of water and fresh water in various reservoirs to provide evidence about the distribution of water on Earth.</td>
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<td>[Assessment Boundary: Assessment is limited to oceans, lakes, rivers, glaciers, ground water, and polar ice caps, and does not include the atmosphere.]</td>
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<td><strong>Essential knowledge and skills</strong></td>
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<td>• Identify where water is located on Earth.</td>
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<td>• Explain the difference between water and fresh water.</td>
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**Connections to**


Common Core State Standards Connections:

**ELA/Literacy**

- **RI.5.7** Draw on information from multiple print or digital sources, demonstrating the ability to locate an answer to a question quickly or to solve a problem efficiently.
- **SL.5.5** Include multimedia components (e.g., graphics, sound) and visual displays in presentations when appropriate to enhance the development of main ideas or themes.

**Mathematics**

- **MP.2** Reason abstractly and quantitatively. (5-ESS2-1),(5-ESS2-2)
- **MP.4** Model with mathematics. (5-ESS2-1),(5-ESS2-2)
- **5.G.A.2** Represent real world and mathematical problems by graphing points in the first quadrant of the coordinate plane, and interpret coordinate values of points in the context of the situation. (5-ESS2-1)

**Websites**

- http://dsc.discovery.com/
- http://sciencenewsforkids.com/
- http://sciencespot.net/index.html
- www.brainpop.com
- www.chem4kids.com
- www.explorelearning.com (Gizmos) growing plants
- www.googledocs.com
- www.sciencenetlinks.com (benchmarks and lessons)
- http://www.howstuffworks.com/
- www.geography4kids.com
- www.concord.org/ngss/

**Academic Vocabulary**

- atmosphere
- biosphere
- ecosystems
- geosphere
- hydrosphere
- interact
- land form

**Materials/resources**

- The Krupowicz Planetarium

8/14/2015

**Science and Engineering Practices**

**Using Mathematics and Computational Thinking**
Mathematical and computational thinking in 3–5 builds on K–2 experiences and progresses to extending quantitative measurements to a variety of physical properties and using computation and mathematics to analyze data and compare alternative design solutions.

- Describe and graph quantities such as area and volume to address scientific questions.

**Disciplinary Core Ideas**

**The roles of Water in Earth's Surface Processes**
- 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.

**Cross Cutting Concepts**

**Scale, Proportion, and Quantity**
- Standard units are used to measure and describe physical quantities such as weight and volume. (5-ESS2-2)

**Connections to**

**Articulation of DCIs across grade-bands:** 2.ESS2.C; MS.ESS2.C; MS.ESS2.D (5-ESS2-1); MS.ESS3.A

**Common Core State Standards Connections:**

**ELA/Literacy –**
- RI.5.7 Draw on information from multiple print or digital sources, demonstrating the ability to locate an answer to a question quickly or to solve a problem efficiently. (5-ESS2-1),(5-ESS2-2)
- W.5.8 Recall relevant information from experiences or gather relevant information from print and digital sources; summarize or paraphrase information in notes and finished work, and provide a list of sources. (5-ESS2-2)
- SL.5.5 Include multimedia components (e.g., graphics, sound) and visual displays in presentations when appropriate to enhance the development of main ideas or themes. (5-ESS2-1),(5-ESS2-2)

**Mathematics –**
- MP.2 Reason abstractly and quantitatively. (5-ESS2-1),(5-ESS2-2)
- MP.4 Model with mathematics. (5-ESS2-1),(5-ESS2-2)

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- [www.brainpop.com](http://www.brainpop.com)
- [www.chem4kids.com](http://www.chem4kids.com)
- [www.explorelearning.com](http://www.explorelearning.com) [Gizmos] growing plants
- [www.goggledocs.com](http://www.goggledocs.com)
- [www.sciencenetlinks.com](http://www.sciencenetlinks.com) (benchmarks and lessons)

**Academic Vocabulary**
- distribution
- fresh water
- glacier
- ground water
- lake
- ocean
- polar ice caps
- reservoir
- river
## EARTH AND SPACE SCIENCE

### 5-ESS3 Earth and Human Activity

**Performance Expectations**

Students who demonstrate understanding can:

5-ESS3-1. Obtain and combine information about ways individual communities use science ideas to protect the Earth’s resources and environment.

**Essential knowledge and skills**

- Understand that human activities in agriculture, industry, and everyday life have had major effects on the land, vegetation, streams, ocean, air, and even outer space.
- Identify what individuals and communities are doing things to help protect Earth’s resources and environments, recycling bags, bring your own bags, recycle trash, etc.
- Research a current environmental issue, e.g., landfill, oil spill, organic farming vs. commercial farming that show how communities use science ideas to protect the environment

**Science and Engineering Practices**

<table>
<thead>
<tr>
<th>Science and Engineering Practices</th>
<th>Disciplinary Core Ideas</th>
<th>Cross Cutting Concepts</th>
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</thead>
<tbody>
<tr>
<td>Obtaining, Evaluating, and</td>
<td>ESS3.C: Human Impacts on Earth Systems</td>
<td>Systems and System Models</td>
</tr>
<tr>
<td>Communicating Information</td>
<td>• Human activities in agriculture, industry, and everyday life have had major effects on the land, vegetation, streams, ocean, air, and even outer space. But individuals and communities are doing things to help protect Earth’s resources and environments.</td>
<td>• A system can be described in terms of its components and their interactions. (5-ESS3-1)</td>
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<tr>
<td>Obtaining, evaluating, and</td>
<td><strong>Connections to Nature of Science</strong></td>
<td><strong>Connections to Nature of Science</strong></td>
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<tr>
<td>communicating information in 3–5</td>
<td>Addresses Questions</td>
<td>1. Science findings are limited to questions that can be answered with empirical evidence. (5-ESS3-1)</td>
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<tr>
<td>builds on K–2 experiences and</td>
<td>About the Natural and Material World.</td>
<td><strong>Articulation of DCIs across grade-bands:</strong> M5.ESS3.A (5-ESS3-1); M5.ESS3.C (5-ESS3-1); M5.ESS3.D (5-ESS3-1)</td>
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<tr>
<td>progresses to evaluating the</td>
<td>• Science findings are limited to questions that can be answered with empirical evidence. (5-ESS3-1)</td>
<td><strong>Common Core State Standards Connections:</strong></td>
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<tr>
<td>merit and accuracy of ideas and</td>
<td>Systems and System Models</td>
<td>ELA/Literacy – RI.5.1 Quote accurately from a text when explaining what the text says explicitly and when drawing inferences from the text. (5-ESS3-1)</td>
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<tr>
<td>methods.</td>
<td>• A system can be described in terms of its components and their interactions. (5-ESS3-1)</td>
<td>RI.5.7 Draw on information from multiple print or digital sources, demonstrating the ability to locate an answer to a question quickly or to solve a problem efficiently. (5-ESS3-1)</td>
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<td>• Obtain and combine information from books and/or other reliable media to explain phenomena or solutions to a design problem.</td>
<td>---------------------------------------------</td>
<td><strong>Connections to Nature of Science</strong></td>
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</tbody>
</table>

**Connections to**

Articulation of DCIs across grade-bands: M5.ESS3.A (5-ESS3-1); M5.ESS3.C (5-ESS3-1); M5.ESS3.D (5-ESS3-1)

**Common Core State Standards Connections:**

ELA/Literacy – RI.5.1 Quote accurately from a text when explaining what the text says explicitly and when drawing inferences from the text. (5-ESS3-1)

RI.5.7 Draw on information from multiple print or digital sources, demonstrating the ability to locate an answer to a question quickly or to solve a problem efficiently. (5-ESS3-1)
# Science Curriculum Grade 5

## Middletown Public Schools and The Next Generations Science Standards

<table>
<thead>
<tr>
<th>DOMAINS</th>
<th>INSTRUCTIONAL STRATEGIES</th>
<th>RESOURCES</th>
<th>ASSESSMENTS</th>
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<tbody>
<tr>
<td>RI.5.9 Integrate information from several texts on the same topic in order to write or speak about the subject knowledgeably. (5-ESS3-1)</td>
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<td>W.5.8 Recall relevant information from experiences or gather relevant information from print and digital sources; summarize or paraphrase information in notes and finished work, and provide a list of sources. (5-ESS3-1)</td>
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<td>W.5.9 Draw evidence from literary or informational texts to support analysis, reflection, and research. (5-ESS3-1)</td>
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<td>Mathematics – MP.2 Reason abstractly and quantitatively. (5-ESS3-1)</td>
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<td>MP.4 Model with mathematics. (5-ESS3-1)</td>
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## Websites
- [http://sciencedpot.net/index.html](http://sciencedpot.net/index.html)
- [http://www.howstuffworks.com/](http://www.howstuffworks.com/)
- [www.brainpop.com](http://www.brainpop.com)
- [www.concord.org/next Generation](http://www.concord.org/next Generation)
- [www.explorelearning.com](http://www.explorelearning.com) (Gizmos growing plants)
- [www.googledocs.com](http://www.googledocs.com)
- [www.sciencenetlinks.com](http://www.sciencenetlinks.com) (benchmarks and lessons)

## Essential Knowledge and Skills
- Define a problem that includes:
  - Constraints on materials, time, or cost, e.g.
    - Boat building from recyclable materials
  - Go kart

## Performance Expectations

### 3-5-ETS1-1. Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.

<table>
<thead>
<tr>
<th>Science and Engineering Practices</th>
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<th>Cross Cutting Concepts</th>
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<tr>
<td>Asking questions and defining problems in 3–5 builds on grades K–2 experiences and progresses to specifying qualitative relationships.</td>
<td>Possible solutions to a problem are limited by available materials and resources (constraints). The success of a designed solution is determined by considering the desired features of a solution (criteria). Different proposals for solutions can be compared on the basis of the criteria.</td>
<td>People’s needs and wants change over time, as do their demands for new and improved technologies. (3-5-ETS1-1)</td>
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<tr>
<td>Define a simple design problem that can be solved through the development of an object, tool, or system.</td>
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</table>
## SCIENCE CURRICULUM Grade 5

Curriculum Writers: Erica Bulk, Susan Cunningham, Deb O’Bryan, Stephanie Sims, Tara Sweeney, and Jacqueline Zahm

### Middletown Public Schools and The Next Generation Science Standards

<table>
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<tr>
<th>DOMAIN</th>
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<td>process, or system and includes several criteria for success and constraints on materials, time, or cost.</td>
<td><strong>Connections to</strong>&lt;br&gt;Connections to 3-5-ETS1-A: Defining and Delimiting Engineering Problems include: <strong>Fourth Grade:</strong> 4-PS3-4&lt;br&gt;<strong>Fourth Grade:</strong> 4-PS4-3&lt;br&gt;Articulation of DCIs across grade-bands: K-2.ETS1.A, K-2.ETS1.B&lt;br&gt;<strong>Common Core State Standards Connections:</strong>&lt;br&gt;W.5.7 Conduct short research projects that use several sources to build knowledge through investigation of different aspects of a topic. (3-5-ETS1-1), (3-5-ETS1-3)&lt;br&gt;W.5.B Recall relevant information from experiences or gather relevant information from print and digital sources; summarize or paraphrase information in notes and finished work, and provide a list of sources. (3-5-ETS1-1), (3-5-ETS1-3)&lt;br&gt;W.5.9 Draw evidence from literary or informational texts to support analysis, reflection, and research. (3-5-ETS1-1), (3-5-ETS1-3)&lt;br&gt;<strong>Mathematics</strong>&lt;br&gt;MP.2 Reason abstractly and quantitatively. (3-5-ETS1-1), (3-5-ETS1-2), (3-5-ETS1-3)&lt;br&gt;MP.4 Model with mathematics. (3-5-ETS1-1), (3-5-ETS1-2), (3-5-ETS1-3)&lt;br&gt;MP.5 Use appropriate tools strategically. (3-5-ETS1-1), (3-5-ETS1-2), (3-5-ETS1-3)&lt;br&gt;3-5.OA Operations and Algebraic Thinking (3-5-ETS1-1), (3-5-ETS1-2)&lt;br&gt;<strong>Websites</strong>&lt;br&gt;• <a href="http://dsc.discovery.com/">http://dsc.discovery.com/</a>&lt;br&gt;• <a href="http://sciencesnewsforkids.com/">http://sciencesnewsforkids.com/</a>&lt;br&gt;• <a href="http://sciencespot.net/index.html">http://sciencespot.net/index.html</a>&lt;br&gt;• <a href="http://www.ipl.nasa.gov/video/index.php?id=1090">http://www.ipl.nasa.gov/video/index.php?id=1090</a>&lt;br&gt;• <a href="http://www.brainpop.com">www.brainpop.com</a>&lt;br&gt;• <a href="http://www.concord.org/ngss/">www.concord.org/ngss/</a>&lt;br&gt;• <a href="http://www.explorelearning.com">www.explorelearning.com</a> (Gizmos) growing plants&lt;br&gt;• <a href="http://www.googledocs.com">www.googledocs.com</a>&lt;br&gt;• <a href="http://www.sciencenetlinks.com">www.sciencenetlinks.com</a> (benchmarks and lessons)&lt;br&gt;<strong>Resources</strong>&lt;br&gt;• Models and Design Kit (FOSS)</td>
<td><strong><a href="http://www.sciencelink.com">www.sciencelink.com</a></strong></td>
<td>the black boxes. The models help students explain what is in the black boxes.</td>
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<tr>
<td><strong>ENGINEERING and TECHNOLOGY</strong></td>
<td><strong>Academic Vocabulary</strong>&lt;br&gt;• constraints&lt;br&gt;• design/design problem&lt;br&gt;• proposal&lt;br&gt;• solution&lt;br&gt;• criteria</td>
<td><strong>TEACHER NOTES</strong>&lt;br&gt;See complete instructional strategies list in the introduction</td>
<td><strong>ASSESSMENT NOTES</strong>&lt;br&gt;See complete assessment list in the introduction</td>
</tr>
</tbody>
</table>
| Students who demonstrate understanding can: 3-5-ETS1-2. Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem. | **Performance Expectations**<br>3-5-ETS1-2. Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem. | **RESOURCE NOTES**<br>See complete resource list in the introduction | 28

8/14/2015

<table>
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<td>3-5-ETS1 Engineering Design</td>
<td><strong>Science and Engineering Practices</strong></td>
<td><strong>Disciplinary Core Ideas</strong></td>
<td><strong>Cross Cutting Concepts</strong></td>
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<td>Essential knowledge and skills</td>
<td>ETS1.B: Developing Possible Solutions</td>
<td>Influence of Engineering, Technology, and Science on Society and the Natural World</td>
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<td>• Create and test possible solution to a problem.</td>
<td>• Research on a problem should be carried out before beginning to design a solution. Testing a solution involves investigating how well it performs under a range of likely conditions. (3-5-ETS1-2)</td>
<td>• People's needs and wants change over time, as do their demands for new and improved technologies. (3-5-ETS1-1)</td>
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<td>• Compare the different proposals for solutions on the basis of how well each one meets the specified criteria for success or how well each takes the constraints into account, e.g.</td>
<td>• At whatever stage, communicating with peers about proposed solutions is an important part of the design process, and shared ideas can lead to improved designs. (3-5-ETS1-2)</td>
<td>• Engineers improve existing technologies or develop new ones to increase their benefits, decrease known risks, and meet societal demands. (3-5-ETS1-2)</td>
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<td>○ Boat building from recyclable materials</td>
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<td>• Communicate with peers on proposed solutions.</td>
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## Science Curriculum Grade 5

Curriculum Writers: Erica Bulk, Susan Cunningham, Deb O’Bryan, Stephanie Sims, Tara Sweeney, and Jacqueline Zahm

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### Domain

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<thead>
<tr>
<th>Middletown Public Schools and The Next Generations Science Standards</th>
<th>Instructional Strategies</th>
<th>Resources</th>
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### Engineering and Technology

**3-5-ETS1 Engineering Design**

### Performance Expectations

Students who demonstrate understanding can:

**3-5-ETS1-3. Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.**

**Essential knowledge and skills**

- Understand what is meant by “fair test”
- Understand how to identify failure points or difficulties of the design that need to be improved (cause and effect), e.g.
  - Boat building from recyclable materials
  - Go kart

### Science and Engineering Practices

**Planning and Carrying Out Investigations**

Planning and carrying out investigations to answer questions or test solutions to problems in 3–5 builds on K–2 experiences and progresses to include investigations that control variables and provide evidence to support explanations or design solutions.

- Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence, using fair tests in which variables are controlled and the number of trials considered. (3-5-ETS1-3)

**ETS1-B: Developing Possible Solutions**

- Tests are often designed to identify failure points or difficulties, which suggest the elements of the design that need to be improved. (3-5-ETS1-3)

**ETS1-C: Optimizing the Design Solution**

- Different solutions need to be tested in order to determine which of them best solves the problem, given the criteria and the constraints. (3-5-ETS1-3)

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8/14/2015


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30
### Domain

| Middletown Public Schools and *The Next Generation Science Standards* |
|---|---|
| Connections to |  |
| **Common Core State Standards Connections:** |  |
| W.5.7 Conduct short research projects that use several sources to build knowledge through investigation of different aspects of a topic. (3-5-ETS1-1); (3-5-ETS1-3) |  |
| W.5.8 Recall relevant information from experiences or gather relevant information from print and digital sources; summarize or paraphrase information in notes and finished work, and provide a list of sources. (3-5-ETS1-1); (3-5-ETS1-3) |  |
| W.5.9 Draw evidence from literary or informational texts to support analysis, reflection, and research. (3-5-ETS1-1); (3-5-ETS1-3) |  |
| Mathematics – |  |
| MP.2 Reason abstractly and quantitatively. (3-5-ETS1-1); (3-5-ETS1-2); (3-5-ETS1-3) |  |
| MP.4 Model with mathematics. (3-5-ETS1-1); (3-5-ETS1-2); (3-5-ETS1-3) |  |
| MP.5 Use appropriate tools strategically. (3-5-ETS1-1); (3-5-ETS1-2); (3-5-ETS1-3) |  |
| 3-5.OA Operations and Algebraic Thinking (3-5-ETS1-1); (3-5-ETS1-2) |  |

#### Websites

- [http://sciencedotnet/index.html](http://sciencedotnet/index.html)
- [www.brainpop.com](http://www.brainpop.com)
- [www.concord.org/ngss/](http://www.concord.org/ngss/)
- [www.explorelearning.com](http://www.explorelearning.com) (Gizmos) growing plants
- [www.googledocs.com](http://www.googledocs.com)
- [www.sciencenetlinks.com](http://www.sciencenetlinks.com) (benchmarks and lessons)

#### Academic Vocabulary

- constraint
- design/design problem
- proposal
- solution
- specified criteria

#### Resources

- Models and Design Kit (FOSS)

#### Assessments

Students are presented with a device that hums when its string is pulled and dings when the string is released. They design and build a physical model of a hum dinger, comparing the performance of the real device to their models.

**3. GO-CARTS**

Students work in pairs to design and build a self-propelled cart. They relate structures to functions as they design, test, and improve their rolling carts.