

STEM Curriculum Map Grade 5
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* Capobianco, B. (2015). [Engineering Identity Development Scale \(EIDS\)](#). Purdue University Research Repository

**Chadwell, Gary B. Developing an Effective Writing Program for the Elementary Grades. Collins Education Associates, 1999.

***Knight, M., & Cunningham, C. M. (2004). Draw an Engineer Test (DAET): Development of a tool to investigate students' ideas about engineers and engineering. Presented at the ASEE Annual Conference & Exposition, Salt Lake City, UT.

Month	Content / Standards (Next Generation Science Standards, Massachusetts Science and Technology/Engineering Standards-Draft Revised 2013)	Teacher Resources	Sample Assessments See STEM Curriculum Specifics Grade 5 Map
August -mid September	<p>Introduction and Review:</p> <ul style="list-style-type: none"> • What is STEM; What is engineering; What do scientists and engineers do? (Pre-Assessment) • Science and Engineering Practices, Goals and Skills • Safety Procedures • Deaf Scientists and Engineers • Key Science vocabulary • Measurement, Equipment 	<p>JEE “Elementary School Students’ Conception of an Engineer” Capobianco et.al. April 2011 Vol. 100 No. 2</p> <p>JEE “Engineering Identity Among Pre-Adolescent Learners” Capobianco et.al. Oct. 2012 Vol 101 No.4</p> <p>BrainPop/BrainPop Jr. - Thomas Alva Edison, Measuring Matter, Metric Units, Precision and Accuracy, Scientific Inquiry, Scientific</p>	<p>**Collins Type 1 and 2 writing samples</p> <p>Journal reflections</p> <p>Measure Me Challenge</p> <p>Design Challenge</p> <p>KWL charts</p> <p>*EIDS(Engineering Identity Development Scale)</p> <p>***DAET(Draw an Engineer Test)</p> <p>Quizzes</p>

		<p>Method, Concept Mapping</p> <p>Deafdigest.net: famous-deaf-scientists</p> <p>DeafTec.org <i>Deaf and Hard of Hearing STEM Professionals</i></p> <p>www.al.com <i>What the deaf NASA engineer knows about life</i></p> <p>EiE(Engineering is Elementary): Engineering design process</p> <p>YouTube – The Natural Step for Kids</p>	
<p>Mid September - mid November</p>	<p>5-PS1 Matter and its Interactions</p> <p>5PS1-1 Use a model of matter as made of particles too small to be seen to explain common phenomena involving gasses, phase changes between gas and liquid, and dissolving.</p> <p>5PS1-2 Measure and graph the weights of substances before and after a reaction or phase change to provide evidence that regardless of the type of change that occurs when heating, cooling or combining substances, the total weight of matter is conserved.</p>	<p>www.teachengineering.org Lesson: Air Is It Really there?</p> <p>BrainPop-Concept Mapping, Conservation of Mass, Mixtures and Compounds, Atoms, Physical and Chemical Changes</p>	<p>Daily Focus Question</p> <p>Think-Pair-Share</p> <p>Project: Model of Matter</p> <p>Lab Reports w/Graphs: Properties of Mixtures and Compounds, Phase Change Measurements</p>

	<p>5-PS1-3. Make observations and measurements to identify substances based on their unique properties, including color, hardness, reflectivity, electrical conductivity, thermal conductivity, response to magnetic forces, and solubility.</p> <p>5-PS1-4. Conduct an experiment to determine whether the mixing of two or more substances results in new substances with new properties</p> <p>Science and Engineering Practices:</p> <p>Developing and Using Models Use a model to describe phenomena. (5-PS1-1)</p> <p>Planning and Carrying Out Investigations Make observations and measurements to produce data to serve as the basis for evidence for an explanation of a phenomenon. (5-PS1-3)</p> <p>Using Mathematics and Computational Thinking Measure and graph quantities such as weight to address scientific questions and problems. (5-PS1-2)</p> <p>Disciplinary Core Ideas:</p> <p>PS1.A: Structure and Properties of Matter</p> <ul style="list-style-type: none"> • 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. (5-PS1-1) • The amount (weight) of matter is conserved when it changes form, even in transitions in which it seems to vanish. (5-PS1-2) 	<p>www.chem4kids.com Matter</p> <p>YouTube – Vacation or Conservation (Of Mass): Crash Course Kids #23.1</p>	<p>Project: Design Models of Matter</p> <p>Teacher and peer review of oral presentation on Conservation of Matter</p> <p>**Collins Type 1, 2, 3 and 4 writing samples with language scaffolding and word walls</p> <p>Quizzes</p> <p>Unit test</p>
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- 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.] (5-PS1-3)

PS1.B: Chemical Reactions

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

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)

Common Core State Standards Connections:

Mathematics

5.MD.C.3 Recognize volume as an attribute of solid figures and understand concepts of volume measurement. (5-PS1-1)

5.G.A.2 Recall relevant information from experiences or gather relevant information from print and digital sources; take notes and categorize information, and provide a list of sources. (5-PS1-2)

ELA/Literacy

SL.5.4 Report on a topic or text or present an opinion, sequencing ideas logically and using appropriate facts and relevant, descriptive details to support main ideas or themes; speak clearly at an understandable pace. (5-PS2-1)

<p>Mid November -December</p>	<p>5PS3 Energy 5-PS3-1. Use a model to describe that the food animals digest: a. contains energy that was once energy from the sun, and b. provides energy and materials for body repair, growth, motion, body warmth, and reproduction</p> <p>Science and Engineering Practices: Developing and Using Models Use a model to describe phenomena. (5-PS3-1)</p> <p>Disciplinary Core Ideas</p> <p>PS3.D: Energy in Chemical Processes and Everyday Life</p> <ul style="list-style-type: none"> • 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 also releases energy when digested. (5-PS3-1) <p>LS1.C: Organization for Matter and Energy Flow in Organisms</p> <ul style="list-style-type: none"> • 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. (<i>secondary to 5-PS3-1</i>) <p>LS2.A: Interdependent Relationships in Ecosystems The food of almost any kind of animal can be traced back to plants. (5-PS3-1)</p>	<p>BrainPop/Brainpop Jr. Energy Sources, Food Chains, Food Pyramid</p> <p>YouTube – Energy Flow Through Ecosystems</p> <p>www.DCMP.org - captioned videos: Ecosystem Dynamics, Ecosystems and Biomes</p>	<p>Daily Focus Question</p> <p>Think-Pair-Share</p> <p>Research predator, prey and environment for a specific animal using a graphic organizer and internet and print resources.</p> <p>**Collins Type 1, 2, and 3 writing samples with language scaffolding and word walls.</p> <p>Quizzes</p> <p>Unit test</p>

<p>January - February</p>	<p>5-LS1 From Molecule to Organisms: Structures and Processes</p> <p>5-LS1-1. Support an argument with evidence that plants get the materials they need for growth and reproduction chiefly through a process in which they use air, water, and energy from the sun to produce sugars and plant materials. [Assessment Boundary: The chemical formula or details about the process of photosynthesis is not expected.]</p> <p>Science and Engineering Practices</p> <p>Engaging in Argument from Evidence Support an argument with evidence, data, or a model. (5-LS1-1)</p> <p>Disciplinary Core Ideas</p> <p>LS1.C: Organization for Matter and Energy Flow in Organisms Plants acquire their material for growth chiefly from air and water. (5-LS1-1)</p> <p>5-LS-2. Ecosystems, Interactions, Energy and Dynamics</p> <p>5-LS2-1. Develop a model of a food web to describe the movement of matter among producers, primary and secondary consumers, decomposers, and the air and soil in the environment: a. show that plants produce sugars and plant materials; b. show that some animals eat plants for food and other animals eat the animals that eat plants; and c. show that some organisms, including fungi and bacteria, break down dead organisms and recycle some materials back to the air and soil. [Clarification Statement: Emphasis is on matter moving throughout the ecosystem. Waste includes matter in the form of gasses (such as air), liquids (such as water), or solids (such as minerals or nutrients).] [Assessment Boundary: Assessment does not include molecular explanations.]</p>	<p>BrainPop - Food Chains, Food Pyramid</p> <p>sheppardsoftware.com- Food Chain Game</p> <p>pbs.org NatureWorks: decomposers and Scavengers</p> <p>star.spsk12.net/science/k3/FoodChains.ppt</p>	<p>Stanford Achievement Test - 10th edition (Beginning February)</p> <p>Daily Focus Question</p> <p>Think-Pair- Share</p> <p>**Collins Type 1, 3 and 4 Writing; MEE Writing(Main Idea, Example, Evidence)</p> <p>Student Designed Experiment - What Do Plants Need to Grow?</p> <p>Oral Presentation on the Process of Photosynthesis(using diagrams or card sets)</p> <p>Student created models of food webs</p> <p>Experiment/Lab Report: Camouflage and Biomimicry</p> <p>Design Challenge in Teams – Build a Composter</p> <p>Quizzes</p> <p>Unit test</p>
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5-LS2-2(MA). Compare at least two designs for a composters to determine which is most likely to encourage decomposition

Science and Engineering Practices

Developing and Using Models

Develop a model to describe phenomena.

(5-LS2-1)

Planning and Carrying Out Investigations

Test two different models of the same proposed object, tool, or process to determine which better meets criteria for success.

(5-LS2-2)

Disciplinary Core Ideas

LS2.A: Interdependent Relationships in Ecosystems

- Organisms are related in food webs in which some animals eat plants for food and other animals eat the animals that eat plants. (5-LS2-1)
- 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. (5-LS2-1)

LS2.B: Cycles of Matter and Energy Transfer in Ecosystems

-Matter cycles between the air and soil and among plants, animals, and microbes as these organisms live and die.

-Organisms obtain gases, and water, from the environment, and release waste matter (gas, liquid, or solid) back into the environment. (5-LS2-1)

<p>March-April</p>	<p>5- ESS 2 Earth's Systems</p> <p>5-ESS2-1. Use a model to describe the cycling of water on Earth between the geosphere, biosphere, hydrosphere, and atmosphere through evaporation, precipitation, surface runoff, condensation, transpiration, and runoff. [Assessment Boundary: Assessment does not include explanations of mechanisms that drive the cycle.]</p> <p>5-ESS2-2. Describe and graph the amounts and percentages of salt water in the ocean; fresh water in lakes, rivers, and ground water; and fresh water frozen in glaciers and polar ice caps to provide evidence about the availability of fresh water in Earth's biosphere. [Clarification Statement: Nearly all of Earth's available water is in the ocean; most fresh water is in glaciers or underground.] [Assessment Boundary: Assessment does not include the atmosphere.]</p> <p>Science and Engineering Practices</p> <p>Developing and using Models Develop a model using an example to describe a scientific principle. (5-ESS2-1)</p> <p>Using Mathematics and Computational Thinking Describe and graph quantities such as area and volume to address scientific questions. (5-ESS2-2)</p> <p>Disciplinary Core Ideas</p> <p>ESS2.A: Earth Materials and Systems</p> <ul style="list-style-type: none"> 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). (5-ESS2-1) <p>ESS2.C: The Roles of Water in Earth's Surface Processes</p> <ul style="list-style-type: none"> Nearly all of Earth's available water is in the ocean. Most 	<p>eo.ucar.edu/educators Climate Discovery Teacher's Guide(NCAR)</p> <p>scied.ucar.edu Earth Energy Cycle Albedo</p> <p>www.nasa.gov Water Cycle</p> <p>www.fcusd.org ppt Earth's Systems Sphere Interactions, Water Cycle</p> <p>www.geology.com Mini Water Cycle</p> <p>www.windows2universe.org Earth</p> <p>BrainPop - Water Supply, Water Cycle, Rivers, Groundwater</p> <p>www.usgs.gov The Water Cycle, Water Cycle for Schools</p> <p>www.geography4kids.com Biosphere,Hydrosphere, Atmosphere, Earth Structure</p>	<p>Daily Focus Question</p> <p>Think-Pair-Share</p> <p>KWL Chart: Earth's Major Systems</p> <p>Student research using print and internet resources (interdisciplinary connection to math: converting fractions, decimals, percents; creating and interpreting graphs)</p> <p>Model of Earth's Major Systems (constructed and described in teams)</p> <p>**Collins Type 1, 2 and 3 Writing</p> <p>Quizzes</p> <p>Unit test</p>
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	<p>fresh water is in glaciers or underground; only a tiny fraction is in streams, lakes, wetlands, and the atmosphere. (5-ESS2-2)</p> <p>Water continually cycles among land, ocean atmosphere via transpiration, evaporation, condensation and crystallization and precipitation, as well as downhill flows on land. (5-ESS2-1)</p>		
<p>May</p>	<p>5 ESS3 Earth and Human Activity</p> <p>5-ESS3-1. Obtain and combine information about ways communities reduce the impact on the Earth’s resources and environment by changing an agricultural, industrial, or community practice or process. [Clarification Statement: Examples of changed practices or processes include treating sewage, reducing the amounts of materials used, capturing polluting emissions from factories or power plants, and preventing runoff from agricultural activities.] [Assessment Boundary: Assessment does not include social science aspects of practices such as regulation or policy.]</p> <p>5-ESS3-2(MA). Test a simple system designed to filter an impurity out of water and propose one change to the design to improve it.* [Clarification Statement: Examples of impurities could include particulates or bacteria.]</p> <p>Science and Engineering Practices</p> <p>Obtaining, Evaluating, and Communicating Information Obtain and combine information from books and/or other reliable media to explain phenomena or solutions to a design problem. (5-ESS3-1)</p> <p>Planning and Carrying Out Investigations</p>	<p>www.sandiego.gov Wastewater treatment, Water treatment</p> <p>files.eric.gov/fulltext/ED377075.pdf Water Sourcebook (3-5)</p> <p>www.wef.org Supplemental resources, Curriculum Materials, Aqua Venturer Teacher Guide</p> <p>www.sd1.org Education Program: Resources for Educators, Curriculum</p> <p>www.abcwua.org</p>	<p>Pre-Assessment: MCAS(Massachusetts Comprehensive Assessment System) Practice Science and Technology/Engineering and previous MCAS STE Tests: Grade 5</p> <p>MCAS Science and Technology/Engineering test (May 2016)</p> <p>KWL Chart: What is a filter?</p> <p>Design Challenge: (in teams – Design a Filter to Keep your “Frog” Alive) Make improvements to design based on effectiveness, research and group feedback. Retest design.</p>

	<p>Make observations and/or measurements to test a design solution. (5-ESS3-2)</p> <p>Disciplinary Core Ideas</p> <p>ESS3.C: Human Impacts on Earth Systems 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. For example, they are treating sewage, reducing the amounts of materials they use, and regulating sources of pollution such as emissions from factories and power plants or the runoff from agricultural activities. (5-ESS3-1)</p> <p>Common Core State Standards Connections:</p> <p>ELA/Literacy –</p> <p>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)</p> <p>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)</p> <p>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)</p> <p>W.5.9 Draw evidence from literary or informational texts to support analysis, reflection, and research. (5-ESS3-1)</p>	<p>Water Resources Education – Educators, Curriculum</p> <p>www.geology.com Water Classroom Activities</p> <p>YouTube – Nitrogen Removal Basics</p> <p>Missouri Department of Natural Resources: The Water Use Cycle: How do Bacteria Help Treat Wastewater</p> <p>www.epa.gov Primer for Municipal Wastewater Systems Sep.2014</p> <p>www.usgs.gov Water</p> <p>BrainPop - Humans and the Environment, Natural Resources, Water Pollution, Air Pollution, Waste Management, Carbon Cycle, Biofuels, Fuel Cells</p>	<p>**Collins Type 1 and 2 Writing</p> <p>Student created diagrams of the ecosystem that exists in wastewater treatment and oral description of the process.</p> <p>Group brainstorm to create a master chart of human activities; their impact on land, plant life, water and air; and possible solutions to the impact.</p> <p>Students will work in pairs to collect visual examples of technology based on natural phenomena. A master chart will be created to label each picture, match it to its natural counterpart and provide a description of the problem it solved.</p> <p>Quizzes</p> <p>Unit test</p>
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		<p>www.egfi-k12.org Dream Up the Future</p> <p>www.teachengineering.org Biomimicry: Natural Designs</p> <p>EIE Curriculum Kits- Water, Water Everywhere, Designing Water Filters, Just Passing Through: Designing Model Membranes</p>	
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<p>June</p>	<p>5-ESS1 Earth’s Place in the Universe</p> <p>5-ESS1-1. Use observations, first-hand and from various media, to argue that the sun is a star that appears larger and brighter than other stars because it is closer to the Earth. [Assessment Boundary: Assessment does not include other factors that affect apparent brightness (such as stellar masses, age, stage).]</p> <p>5-ESS1-2. Use a model to communicate Earth’s relationship to the sun, moon, and stars that explain: a. why people on Earth experience day and night; b. patterns in daily changes in length and direction of shadows over a day; and c. changes in the position of the sun, moon and constellations at different times during a day, over a month, and over a year. [Clarification Statement: Any model used should illustrate that the Earth, sun, and moon are spheres; include orbits of the Earth around the sun and of the moon around Earth; and Earth’s rotation about its axis.] [Assessment Boundary: Assessment does not include causes of seasons nor expect use of Earth’s tilt.]</p> <p>Science and Engineering Practices</p> <p>Developing and Using Models Use a model to test cause and effect relationships or interactions concerning the functioning of a natural or designed system. (5-ESS1-2)</p> <p>Engaging in Argument from Evidence Support an argument with evidence, data, or a model. (5-ESS1-1)</p>	<p>www.windows2universe.org Constellations: As the World Turns, The Changing Night Sky</p> <p>DCMP(Described and Captioned Media): Exploring Earth, Sun and Moon; Earth’s Rotation and Revolution, What’s Up in Space? Stars; Gravity, Force and Work</p> <p>BrainPop – Gravity, Sun, Constellations, Moon</p> <p>www.nasa.gov “Our Star the Sun”</p> <p>www.teachengineering.org/curriculum Lunar Lollipops, The Great Gravity Escape</p> <p>www.physics4kids.com Gravity</p> <p>www.cosmos4kids.com</p>	<p>Daily Focus Question</p> <p>Think-Pair-Share</p> <p>KWL chart – What is Gravity?</p> <p>Design Challenge: Design a solution to having no gravity?</p> <p>Student created models of Earth, Sun and Moon and oral description of their interactions.</p> <p>Real life problem solving using space and gravitational data(Interdisciplinary connections to math).</p> <p>Quizzes</p> <p>Unit test</p> <p>*EIDS Post-Survey</p> <p>***DAET Post Survey</p>
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Disciplinary Core Ideas

ESS1.A: The Universe and its Stars

- 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. (5-ESS1-1)

ESS1.B: Earth and the Solar System

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)

Common Core State Standards Connections:

Mathematics –

4.MD.A.2 Use the four operations to solve word problems involving distances, intervals of time, liquid volumes, masses of objects, and money, including problems involving simple fractions or decimals, and problems that require expressing measurements given in a larger unit in terms of a smaller unit. Represent measurement quantities using diagrams such as number line diagrams that feature a measurement scale. (5-ESS1-1)

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-ESS1-1)

ELA/Literacy –

RI.3.7 Use information gained from illustrations (e.g., maps, photographs) and the words in a text to demonstrate understanding of the text (e.g., where, when, why, and how key events occur). (5-ESS1-1)

SL.5.4 Report on a topic or text or present an opinion, sequencing ideas logically and using appropriate facts and relevant, descriptive details to support main ideas or themes; speak clearly at an understandable pace. (5-ESS1-1)

5-PS2 Motion and Stability

5-PS2-1. Support an argument with evidence that the gravitational force exerted by Earth on objects is directed toward the Earth's center. [Assessment Boundary: Assessment does not include mathematical representation of gravitational force.]

Science and Engineering Practice

Engaging in Argument from Evidence

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

Disciplinary Core Ideas

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)

Common Core State Standards Connections:

ELA/Literacy –

SL.5.4 Report on a topic or text or present an opinion, sequencing ideas logically and using appropriate facts and relevant, descriptive details to support main ideas or themes;

Speak clearly at an understandable pace. (5-PS2-1)

Review and Summary

- What is STEM; What is engineering; What do scientists and engineers do? (Post-Assessment)