

STEM Curriculum Map **Specifics**
Grade 5

**Prepared by: Kathleen Shea
Clarke Schools for Hearing and
Speech,
Northampton, MA**

**Sponsored by: NSF CBET # 1452613,
PI: Caitlyn Butler
University of Massachusetts, Amherst
Civil and Environmental Engineering
2015-2016**

Month/ Standard	Essential Questions	Key Vocabulary	Student Resources	Sample Activities and Assessments (See STEM Curriculum Map Grade 5)
August -mid September Introduction and Review	<ul style="list-style-type: none"> • What is STEM; What is engineering; What do scientists and engineers do? (Pre-Assessment) • What is the difference between science and engineering? • How will we learn? • Why should more deaf students become Scientists and Engineers? 	STEM engineer(ing) technology social process model design evidence argument sustainability meter centimeter millimeter gram milligram kilogram liter milliliter	BrainPop/BrainPop Jr. - Thomas Alva Edison, Measuring Matter, Metric Units, Precision and Accuracy, Scientific Inquiry, Scientific Method, Concept Mapping Deafdigest.net: famous-deaf-scientists DeafTec.org <i>Deaf and Hard of Hearing STEM Professionals</i> www.al.com <i>What the deaf NASA engineer knows about life</i> EiE(Engineering is Elementary): Engineering design process YouTube – The Natural Step for Kids	<u>**Pre Assessment: Collins Type 1 Writing and Think-Pair-Share:</u> If you were an engineer, what problem would you solve? Why? (2 minutes) <u>**Collins Type 2 Writing:</u> <ul style="list-style-type: none"> • List the steps of the Engineering Design Process • In your opinion, which deaf scientist <i>designed</i> the most <i>valuable invention</i>? Give 2 reasons to <i>support</i> your idea. (2 minutes) <u>**Collins Type 2 (with word bank)</u> What is <i>sustainability</i> ? “Measure Me Challenge” (in pairs) to promote accuracy in choosing appropriate tool, labels and precision in measurement (metric and standard units). KWL Chart (What I K now, What I W ant to Know, What I have L earned) for Safety Procedures, Measurement

				<p>Journal reflections: (Observations –sight, smell, hearing, taste, feel; What do you think about Victoria Garcia’s statements about her challenges being a deaf engineer?)</p> <p>*EIDS(Engineering Identity Development Scale)</p> <p>***DAET(Draw an Engineer Test)</p> <p>Design Challenge: Build the Tallest Free Standing Tower</p>
--	--	--	--	---

Month/ Standard	Essential Questions	Key Vocabulary	Student Resources	Sample Activities and Assessments (See STEM Curriculum Map Grade 5)
Mid September - mid November 5-PS1 Matter and its Interactions	<ul style="list-style-type: none"> • How do we know that matter is made of particles that cannot be seen? • Does the weight of matter change after a reaction or phase change? 	matter particles dissolve phase substance conserve identify unique property phenomena data evidence microscope detect mixture volume compound reaction mass	BrainPop -Concept Mapping, Conservation of Mass, Mixtures and Compounds, Atoms, Physical and Chemical Changes www.chem4kids.com Matter YouTube – Vacation or Conservation (Of Mass): Crash Course Kids #23.1	<u>**Pre-Assessment: Collins Type 1 Writing and Think-Pair-Share:</u> How do we know that there is matter we cannot see? Project: Design Models of Matter (actual and/or pictorial) Experiments/ Lab Reports w/Graphs: <ul style="list-style-type: none"> • Properties of Mixtures and Compounds • Phase Change Measurements (ice to water, water to ice: Alka Seltzer added to water in a closed and open system) Teacher and peer review of oral presentation on Conservation of Matter (using a model) <u>**Collins Type 1, 2, 3 and 4 Writing(with scaffolding and word walls) for project, lab reports and oral presentation.</u>

Month/ Standard	Essential Questions	Key Vocabulary	Student Resources	Sample Activities and Assessments (See STEM Curriculum Map Grade 5)
Mid November – December 5PS3 Energy	<ul style="list-style-type: none"> Where does our energy for body repair, growth, motion, body warmth, and reproduction come from? How does this release energy move through our ecosystem? How does the balance of life and food sources impact an ecosystem? 	energy digest reproduction process release source transfer balance	BrainPop/BrainPop Jr. Energy Sources, Ecosystems www.DCMP.org - captioned videos: Ecosystem Dynamics, Ecosystems and Biomes YouTube – Energy Flow through Ecosystems	<u>**Pre-Assessment: Collins Type 1 Writing And Think-Pair-Share:</u> What is the main source for energy for all life on earth? Why? (3 lines) Research predator, prey and environment for a particular animal using a graphic organizer and internet and print resources. Make a model to scale to show how the energy from the sun cycles through the food chain. <u>**Collins Type 2 & 3 writing:</u> Type 2. Draw a model of a food chain for a _____ and label all parts. (With a word bank) 5 minutes Type 3. Describe how the energy from the sun moves through the food chain to provide the energy for your animal to survive. (Use first, next, then ...finally) Type 3 In this food chain, what would happen if the _____ died out. Give 3 examples of the impact on the ecosystem.

Month/ Standard	Essential Questions	Key Vocabulary	Student Resources	Sample Activities and Assessments (See STEM Curriculum Map Grade 5)
<p>January –February</p> <p>5-LS1 From Molecule to Organisms: Structures and Processes</p> <p>5-LS-2. Ecosystems, Interactions, Energy and Dynamics</p>	<ul style="list-style-type: none"> • What do plants need to grow? • How do plants grow? • Identify consumers, primary and secondary producers and decomposers and their roles. • How is energy cycled through the food web? • Life exists in scales we cannot see. • How do microorganisms get energy? 	<p>photosynthesis consumers producers decomposers environment organism microorganism fungi ecosystem nutrient minerals recycle food web</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>**Pre-Assessment: Collins Type 1 Writing and Think-Pair-Share: What do plants need to survive and grow? (2 minutes)</p> <p>Student generated hypotheses (from the pre-assessment) and designed experiments. Conclusions citing evidence from the experiments.</p> <p>Students create diagrams and/or series of cards detailing the process of photosynthesis.</p> <p>**Collins Type 4 Writing: Describe the process of Photosynthesis. (Orally and in writing.)</p> <p>Students create models – Individual food webs illustrating and labeling the roles of producers, consumers and decomposers</p> <p>Experiment/Lab Report: Camouflage and Biomimicry (collect data and graph results related to hypotheses and actual results of timed experiment. Redo experiment to verify results.</p>

				<p>Design Challenge: Build a Composter (In teams)</p> <p>Students will use a word wall and a Venn diagram to organize which features of their composter were similar to another team's composter and which features were different.</p> <p><u>Collins Type 3 Writing:</u> Compare and contrast five features of your team's composter with another team's composter.</p> <p>Using MEE Writing Templates (Main Idea, Example, Evidence) students will answer - Why this is the better composter? Give at least 4 reasons and provide evidence. Oral Presentations for Peer and teacher review will follow.</p>
--	--	--	--	---

Month/ Standard	Essential Questions	Key Vocabulary	Student Resources	Sample Activities and Assessments (See STEM Curriculum Map Grade 5)
March-April 5- ESS 2 Earth's Systems	<ul style="list-style-type: none"> Where is most of the water on Earth? How accessible is the fresh water we need? How does water cycle through Earth's systems? 	system geosphere biosphere hydrosphere atmosphere precipitation surface runoff condensation transpiration glaciers volume availability	BrainPop -Water Supply, Water Cycle, Rivers, Groundwater www.classzone.com Exploring Earth www.windows2universe.org Earth www.usgs.gov The Water Cycle, Water Cycle for Schools www.geography4kids.com Biosphere, Hydrosphere, Atmosphere, Earth Structure	<p>**Pre-Assessment: Collins Type 1 Writing: Where does the water we use everyday come from? (2 minutes)</p> <p>KWL chart: Earth's Major Systems</p> <p>Students use internet and printed resources to research the percentages of salt water and fresh water found on Earth. They will convert fractions and decimals into percentages where necessary and use the data to create graphs (circle, bar) of the distribution.</p> <p>**Collins Type 3 Writing: Use the graphs we made to provide <i>evidence</i> as to why we should be <i>concerned</i> about the <i>availability</i> of fresh water.</p> <p>Students create and label a model of the Earth's major systems. Students will work in pairs and use the models to orally describe how water is cycled on Earth.</p> <p>**Collins Type 2 Writing: Use the word wall and (first, next, then ...finally) to describe the steps of how water is cycled on Earth.</p>

Month/ Standard	Essential Questions	Key Vocabulary	Student Resources	Sample Activities and Assessments (See STEM Curriculum Map Grade 5)
<p>May</p> <p>5 ESS3 Earth and Human Activity</p>	<ul style="list-style-type: none"> • What impact do human activities in agriculture, industry, and everyday life have on the land, plant life, water and air? • What can we do to help protect Earth's resources and environments? • What can we learn from nature to help preserve our resources?(No waste in nature, biomimicry) • What do engineers do to help keep water clean? • How can we use resources we already have to clean water? 	<p>impact sewage solution wastewater treatment filter impurity pollution toxin filter sludge agriculture industry community individual source practice emissions bacteria organism resiliency sustainability dissolved organic chemical</p>	<p>BrainPop –Humans and the Environment, Natural Resources, Water Pollution, Air Pollution, Waste Management, Carbon Cycle, Biofuels, Fuel Cells</p> <p>www.egfi-k12.org Dream Up the Future</p> <p>www.USGS.gov Water</p> <p>www.teachengineering.org _ Biomimicry: Natural designs</p> <p>EiE Curriculum Kits - <i>Water, Water Everywhere: Designing Water Filters, Just Passing Through: Designing Model Membranes</i></p> <p>YouTube – Water and You: The Water Treatment Process, Wastewater Treatment P.S.A., Wally's Wastewater, Flocculation: Making Clean Water, Biomimicry 4.12.16</p>	<p>**Pre-Assessment: <u>Collins Type 1 Writing:</u> Why do humans need to protect the air, the water and the land? (2 minutes)</p> <p>Brainstorm to create a chart of human activities; their impact on land, plant life, water and air; and possible solutions to the impact.</p> <p>**Collins Type 2 Writing: (2 separate tasks) Using the word wall or your vocab cards to help you, describe the process of</p> <ul style="list-style-type: none"> • Water treatment. • Wastewater treatment <p>Students create a diagram of the ecosystem that exists in wastewater treatment. **Collins Type 2 Writing: Use your diagram to describe the ecosystem that exists in wastewater treatment.</p> <p>KWL Chart: What is a filter?</p> <p>Design Challenge: Teams will design a filter after examining which type of material will be best for allowing water to pass through a membrane under specific constraints. Students will make changes to improve their designs and share them</p>

			<p>www.epa.gov A student's guide to climate change; Think green before you shop, Wastewater Kid's Page, Water for Kids, Excuse Me is this the Way to the Drainpipe?</p> <p>www.pueblo.us Kid's Page, What is Wastewater?</p> <p>www.planetkids.biz Sewage Treatment: All the Pooey Facts</p> <p>www.kidsnet.au Sewage Treatment</p> <p>www.sd1.org Aqua Venturer Time Machine</p> <p>www.sandiego.gov Adventures in Wastewater</p> <p>www.timeforkids.com Take It From Nature 5.6.16</p> <p>www.biomimicry.org</p> <p>www.abcwua.org Students</p> <p>www.metrocouncil.org Wastewater Treatment for Youngsters</p>	<p>with the class.</p> <p>Students will work in pairs to examine visual examples of technology based on natural phenomena. They will label each one and match it to its natural counterpart. They will define its function of and problem that it solved. A master chart will be created from the examples provided.</p> <p><i>Visit to UMASS lab to see OPG granules being developed</i></p>
--	--	--	---	---

Month/ Standard	Essential Questions	Key Vocabulary	Student Resources	Sample Activities and Assessments (See STEM Curriculum Map Grade 5)
<p>June</p> <p>5-ESS1 Earth’s Place in the Universe</p> <p>5-PS2 Motion and Stability</p> <p>Year End Summary and Review</p>	<ul style="list-style-type: none"> Is the Sun the biggest star? What patterns do you observe when the earth rotates on its axis? What patterns do you observe as the Earth orbits around the Sun; as the Moon orbits around the Earth? What causes day and night? Why do the constellations appear in different parts of the sky at night? What is gravity? What is STEM; What is engineering; What do scientists and engineers do? (Post-Assessment) 	<p>relationship position constellations rotation axis orbit range gravity force distance exert center</p>	<p>BrainPop – Gravity, Sun, Constellations, Moon</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>Science Video Vocabulary: Gravity</p> <p>www.teachengineering.org/curriculum Lunar Lollipops, The Great Gravity Escape</p> <p>www.nasa.gov “Our Star the Sun”</p> <p>www.windows2universes.org Constellation: As the World Turns, The Changing Night Sky</p> <p>www.cosmos4kids.com</p> <p>www.physics4kids.co</p>	<p><u>**Collins Type 1 Writing and Think-Pair-Share:</u></p> <ul style="list-style-type: none"> What is gravity? Why does the sun look so large? Why do shadows change size during the day? <p>KWL chart – What is Gravity?</p> <p><u>**Collins Type 2 Writing and project</u></p> <ul style="list-style-type: none"> If there was no gravity, what would happen to us? Design a solution to the problem <p>Demonstrations of gravity and <u>**Collins Type 3 Writing:</u> What evidence do we have that the gravitational force exerted by Earth on objects pulls them toward the Earth’s center? Give 3 examples from the demonstrations that you saw in class and 3 additional examples.</p> <p>Create a Model of the Earth,</p>

			m Gravity	Sun and Moon Real life applications: problem solving using space and gravitational data (equivalent units, fractions, decimals, scientific notation, number lines, multiples, etc.) *EIDS Post-Survey ***DAET Post Survey
--	--	--	---------------------------	--

*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.