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
<table>
<thead>
<tr>
<th>Month/Standard</th>
<th>Essential Questions</th>
<th>Key Vocabulary</th>
<th>Student Resources</th>
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</tr>
</thead>
<tbody>
<tr>
<td>August -mid September</td>
<td><strong>Introduction and Review</strong></td>
<td>STEM engineer(ing) technology social process model design evidence argument sustainability meter centimeter millimeter gram milligram kilogram liter milliliter</td>
<td>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 Deaf and Hard of Hearing STEM Professionals <a href="http://www.al.com">www.al.com</a> What the deaf NASA engineer knows about life EiE(Engineering is Elementary): Engineering design process YouTube – The Natural Step for Kids</td>
<td><strong>Pre Assessment: Collins Type 1 Writing and Think-Pair–Share:</strong> If you were an engineer, what problem would you solve? Why? (2 minutes) <strong>Collins Type 2 Writing:</strong> • List the steps of the Engineering Design Process • In your opinion, which deaf scientist <em>designed</em> the most valuable invention? Give 2 reasons to support your idea. (2 minutes) <strong>Collins Type 2 (with word bank)</strong> What is sustainability? “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 Know, What I Want to Know, What I have Learned) for Safety Procedures, Measurement</td>
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| Journal reflections: (Observations –sight, smell, hearing, taste, feel; What do you think about Victoria Garcia’s statements about her challenges being a deaf engineer?)

*EIDS(Engineering Identity Development Scale)

***DAET(Draw an Engineer Test)

**Design Challenge:** Build the Tallest Free Standing Tower
<table>
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| Mid September - mid November | 5-PS1 Matter and its Interactions | • 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 | **Pre-Assessment: Collins Type 1 Writing and Think-Pair-Share:**  
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:  
• 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)  
**Collins Type 1, 2, 3 and 4 Writing( with scaffolding and word walls) for project, lab reports and oral presentation. |
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| Mid November – December | **5PS3 Energy** | • 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 | **Pre-Assessment: Collins Type 1 Writing And Think-Pair-Share:**  
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.  
**Collins Type 2 & 3 writing:**  
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. | BrainPop/BrainPop Jr. Energy Sources, Ecosystems  
www.DCMP.org - captioned videos: Ecosystem Dynamics, Ecosystems and Biomes  
YouTube – Energy Flow through Ecosystems |
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<td>January –February 5-LS1 From Molecule to Organisms: Structures and Processes 5-LS-2. Ecosystems, Interactions, Energy and Dynamics</td>
<td>• 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?</td>
<td>photosynthesis, consumers, producers, decomposers, environment, organism, microorganism, fungi, ecosystem, nutrient, minerals, recycle, food web</td>
<td>BrainPop-Food Chains, Food Pyramid  sheppardsoftware.com- Food Chain Game  pbs.org NatureWorks: decomposers and Scavengers  star.spsk12.net/science/k3/FoodChains.ppt</td>
<td><strong>Pre-Assessment: Collins Type 1 Writing and Think-Pair-Share:</strong> What do plants need to survive and grow? (2 minutes)  Student generated hypotheses (from the pre-assessment) and designed experiments. Conclusions citing evidence from the experiments.  Students create diagrams and/or series of cards detailing the process of photosynthesis.  <strong>Collins Type 4 Writing:</strong> Describe the process of Photosynthesis. (Orally and in writing.)  Students create models – Individual food webs illustrating and labeling the roles of producers, consumers and decomposers  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.</td>
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Design Challenge: Build a Composter (In teams)

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. Collins Type 3 Writing: Compare and contrast five features of your team’s composter with another team’s composter.

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.
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| March-April   | 5- ESS 2 Earth’s Systems  | • 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 | **Pre-Assessment: Collins Type 1 Writing: Where does the water we use everyday come from? (2 minutes)**  
KWL chart: Earth’s Major Systems  
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.  
**Collins Type 3 Writing: Use the graphs we made to provide evidence as to why we should be concerned about the availability of fresh water.**  
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.  
**Collins Type 2 Writing: Use the word wall and (first, next, then …finally) to describe the steps of how water is cycled on Earth.** |
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| May            | • 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? | 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 | **BrainPop** – Humans and the Environment, Natural Resources, Water Pollution, Air Pollution, Waste Management, Carbon Cycle, Biofuels, Fuel Cells  
www.egfi-k12.org  
Dream Up the Future  
www.USGS.gov  
Water  
www.teachengineerin.org _ Biomimicry: Natural designs  
**Pre-Assessment: Collins Type 1 Writing:** Why do humans need to protect the air, the water and the land? (2 minutes)  
Brainstorm to create a chart of human activities; their impact on land, plant life, water and air; and possible solutions to the impact.  
**Collins Type 2 Writing:** (2 separate tasks) Using the word wall or your vocab cards to help you, describe the process of  
• Water treatment.  
• Wastewater treatment  
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.  
KWL Chart: What is a filter?  
**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 |
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?

Kid’s Page, What is Wastewater?

Sewage Treatment: All the Pooey Facts

Sewage Treatment

Aqua Venturer Time Machine

Adventures in Wastewater

Take It From Nature 5.6.16

Visit to UMASS lab to see OPG granules being developed

with the class.

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.
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<td>June</td>
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<td><strong>Collins Type 1 Writing and Think-Pair-Share:</strong></td>
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| 5-ESS1 Earth’s Place in the Universe | • 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) | relationship position constellations rotation axis orbit range gravity force distance exert center | **BrainPop** – Gravity, Sun, Constellations, Moon  
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  
Science Video Vocabulary: Gravity  
[www.teachengineering.org/curriculum](http://www.teachengineering.org/curriculum)  
[Lunar Lolipops, The Great Gravity Escape](http://www.nasa.gov)  
[“Our Star the Sun”](http://www.windows2universe.org)  
[Constellation: As the World Turns, The Changing Night Sky](http://www.cosmos4kids.com)  
[www.physics4kids.com](http://www.physics4kids.com) | **Collins Type 2 Writing and project**  
• If there was no gravity, what would happen to us?  
• Design a solution to the problem  
Demonstrations of gravity and  
**Collins Type 3 Writing:** 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.  
Create a Model of the Earth,
Gravity

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

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*Capobianco, B. (2015). *Engineering Identity Development Scale (EIDS).* Purdue University Research Repository


***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.