



Teaching Technology and Engineering STEM Showcase

Best Practice:

Exploring STEM through Literacy:

Environmental Practices That Affect Some Mammals

Best Practice Description:

Students will explore STEM through the book, *If My Mom Were a Platypus: Mammal Babies and Their Mothers* by Dia L. Michels. Students will review some effects of environmental issues that affect the lives of certain mammals found on the endangered animals list and will design a tool that will highlight those specific issues.

If My Mom Were A Platypus: Mammal Babies and Their Mothers, by Dia Michels.

Author's brief: The animal kingdom offers a special fascination for children because so many of the cozy rituals they share at home are echoed in nature. All mammal mothers feed, protect, and teach their young tasks that often challenge their own needs for survival. With beautiful illustrations and inventive text, this fascinating introduction reveals how fourteen mammals' babies travel the path from helpless infant to self-sufficient adults.

STEM Challenge:

This activity uses the informational text to study and identify the various geographical and environmental issues associated with endangering the continued existence of the 'identified' mammals in this book. Using the Makey Makey technology the students will devise a *Q & A Tool* that will allow them to match questions to correct answers (match the mammal to the environmental issues that endangers it's life).

Objectives:

Use evidence to construct a definition of energy with the Makey Makey.

Describe the components of a simple circuit and demonstrate the results of a complete circuit.

Create a challenge using (aluminum and alligator clips) to demonstrate the transfer of energy from place to place through the use of sound *and electrical* circuits.

Use the various forms of technology (computer, phone, etc.) to record data on the challenges conducted with the simple circuits.

Use various STEM strategies to showcase how sources of energy can be used to identify *Answers to mammal vs. environmental issue questions.*

Explore and devise challenges to "find out what makes things work." Students use their imagination to create their own circuits and ultimately discover, apply and demonstrate scientific ideas to design, test and refine a device that converts energy from one form to another.

STEM Activities:

- Engage: Using a computer, allow students to observe the set-up and various segments of creating complete circuits between the computer, Makey, Makey and aluminum strips (associated with connections between endangered mammals and environmental issues that can cause extinction). Have them list five unique things that they observed and discuss their findings.
- Explore: Brainstorm ideas to create sound or circuit challenges.
- Explain: Describe the model constructed for the challenge. Explain the use and transfer of energy in the model.
- Elaborate: Add or subtract a feature that shows how the model can be changed.

Evaluation/Extensions

- S. - Collaboratively design a simple circuit model using aluminum and explain the process (connections and energy transfer).
- T. - Capture the demonstrations of the challenges using the computers, cameras and drawings to portray a visual of the STEM Challenge. Create a video.
- E. - Design and create a model for the challenge using a variety of materials. Show drafting design and explain the visual.
- M. - Solve math problems related to the project (Collect and organize data on how many objects used for each challenge, size of objects, (determine time frame and or intervals between light production and lasting effects. Create your own measurement problem.

Standards

CONNECTING TO THE STANDARDS ~ NGSS: 1) Physical Sciences, 2) Life Sciences, and 3) Engineering, Technology, and Applications of Science

Standard 3-LS2 ECOSYSTEMS: INTERACTIONS, ENERGY, AND DYNAMICS

Standard 4-PS3 ENERGY

Standard 3-5 ENGINEERING AND DESIGN

Performance Expectations:

4-PS3-2. Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electrical currents.

4-PS3-4. Apply scientific ideas to design, test, and refine a device that converts energy from one form to another.

4-LS1-1. Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.

3-LS4-3. Construct an argument with evidence that in a particular habitat some organisms can survive well, some survive less well, and some cannot survive at all.

3-LS2 Ecosystems: Interactions, Energy, and Dynamics

Science and Engineering Practices

Planning and Carrying Out Investigations; Constructing Explanations and Designing Solutions; Obtaining, Evaluating, and Communicating Information

Disciplinary Core Ideas:

PS3.A: Definition of Energy

PS3.B: Conservation of Energy and Energy Transfer

ETS1.A: Defining Engineering Problems

LS1.D: Information Processing

LS2.C: Ecosystem Dynamics, Functioning, and Resilience

Crosscutting Concepts

Cause and Effect; Energy and Matter; Influence of Science, Engineering and Technology on Society and the New World; Science Is A Human Endeavor
Systems and System Models

Cause and effect relationships are routinely identified and used to explain change.

Common Core State Standards Connections:

ELA/Literacy: RI.3.1; RI.3.2; RI.3.3; W.3.2; SL.3.4 ; W.4.2 ; SL4.4; SL4.5 - Mathematics: 4MD.A.1; MP.4; 4.G.A.3; 5N.F.B.7; 4.N.F.A.2

Activities within this presentation include instructional contributions facilitated by Imani Graham and Cierra Graham, DCPS Elementary Substitute Teachers.

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ITEEA 2019 Conference, Kansas City, KA ~ Presenter, Alma S. Miller ~ 03/2019

USING AN INTEGRATED PROCESS APPROACH AND LITERACY TO PROMOTE STEM INSTRUCTIONAL PRACTICES

This instructional tool is designed to showcase the integration of STEM education in all classrooms, and in particular, elementary classrooms. It will foster deepening one's understanding of the relatedness of science, technology, engineering and mathematics; and will demonstrate the use of science trade books as an entity to promote literacy and highlight the present day and historical contributions of scientists and inventors from all cultural groups. This project will provide examples of teacher and student work.

~ ESSENTIAL QUESTIONS ~

What are the STEM processes; how are the processes related; and how do the instructional practices of STEM impact personal and social perspectives in our society?

STEM PROCESSES

SCIENCE PRACTICES	TECHNOLOGICAL DESIGN	ENGINEERING DESIGN	MATHEMATICS PRACTICES
Ask questions and define problems. Develop and use models. Plan and carry out investigations. Analyze and interpret data. Use mathematics and computational thinking. Construct explanations and design solutions. Engage in argument from evidence. Obtain, evaluate, and communicate information.	Identify the problem. Define the problem. Generate ideas for possible solutions. Select the best solution. Model the solution. Evaluate the solution. Refine the solution as needed. Communicate the solution.	Ask a question. Imagine an idea or solution. Plan Create a product. Improve on the product. <i>Continue the cycle.</i>	Make sense of problems and persevere in solving them. Reason abstractly and quantitatively. Construct viable arguments and critique the reasoning of others. Model with mathematics. Use appropriate tools strategically. Attend to precision. Look for and make use of structure. Look for and express regularity in repeated reasoning.

~ MULTI-DISCIPLINARY CURRICULAR COMPONENTS ~

How are core curricular standards addressed through the teaching and learning of STEM concepts?

Discipline	Standard	Concept	Challenge
Science	Life Science Science/Engineer Practices Crosscutting Concepts	Habitats and Endangered Animal endeavors	Design & construct models Defining environmental issues
Technology	Design World	Communication technology & engineering	Use Communication and Audio-visual Technologies View youtube/make video
Engineering	Drafting and Design	Engineering design	Animal Habitat display
Mathematics	Measurement & Data	Measurement & Data Time/length of sound	Puzzle Board unit design
Reading	Informational Text	Key Ideas and Details	Read: If My Mom Were a Platypus
Social Studies	Literacy/World History	Historical Research	Research Endangered Species
Art	Visual Arts	Portraying an image Applying media processes	Design/draw pictorial representation of mammals

References: Next Generation Science Standards (<http://www.nextgenscience.org>) 2013
 International Society for Technology in Education (<http://www.iste.org/STANDARDS>) 2012
 McREL: Engineering Education (<http://www2.mcrel.org/compendium/SubjectTopics.asp?SubjectID=28>)
 Engineering is Elementary (<http://www.eie.org/overview/engineering-design-process>)
 Mathematics Common Core Standards (<http://www.corestandards.org/math>)