Engineering Extensions in Elementary Science

Kindergarten

Suggestion: Prior to introducing students to their first engineering design challenge, it is recommended that teachers begin with the following two *model lessons:

- Technology all Around Us
- Engineering is in the Design

These model lessons have been prepared to introduce students to the engineering design process referenced in the following engineering standards:

Listed are Engineering Design Standards K-2 ETS 1:

ETS1.A: Defining and Delimiting Engineering Problems

- A situation that people want to change or create can be approached as a problem to be solved through engineering. Such problems may have many acceptable solutions.
- Asking questions, making observations, and gathering information are helpful in thinking about problems.
- Before beginning to design a solution, it is important to clearly understand the problem.

ETS1.B: Developing Possible Solutions

- Designs can be conveyed through sketches, drawings, or physical models. These representations are useful in communicating ideas for a problem's solutions to other people.

ETS1.C: Optimizing the Design Solution

- Because there is always more than one possible solution to a problem, it is useful to compare and test designs.

(ETS=Engineering, Technology, and Applications of Science)

In addition, in working with ETS1 the Science and Engineering Practices are an important part of the engineering design process:

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

*(*Model Lessons-are sample lessons that have been fully developed using the engineering design process)*

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Suggested Engineering Extension Lessons for Kindergarten Classrooms						
Grade	**Strand/ Length**	**FOSS CA Module**	**Standards**	**Engineering Extensions**	**Science Connection**	**Notes**
K	Earth Science 10 Weeks	Trees	ETS1.A ETS1.B ETS1.C	Challenge • Design and build a structure that reduces the effects of the sun on a Gummy Bear. Focus Question • What scientific knowledge about the sun do you need to know to engage in this challenge?	**Scientific Knowledge**: • Sunlight warms the Earth's surface.	Once students have completed: FOSS CA – TREES Investigation 1 (all parts) Investigation 2 (all parts) Investigation 3-Part 2 (Food from Trees) Students will have enough content knowledge to engage in the **Gummy Bear Challenge.** **(*MODEL LESSON)**
K	Physical Science 11 Weeks	Wood and Paper	ETS1.A ETS1.B ETS1.C	Challenge • Determine a method for sinking the plywood and the pine blocks. Focus Question • What scientific knowledge about wood do you need to know to engage in this challenge?	**Scientific Knowledge**: • Different kinds of wood have different properties. • Some wood is heavier than others.	Once students have completed: FOSS CA – Wood and Paper Investigation 1 (Parts 1-4) Students will have enough content knowledge to engage in the **Sink the Wood Challenge**.
K	Life Science 12 Weeks	Animals 2 X 2	ETS1.A ETS1.B	Challenge • Design a snail environment that will keep the snail healthy and move quickly from one place to another. Focus Question • What scientific knowledge about snails do you need to know to engage in this challenge?	**Scientific Knowledge**: • Snail behavior is influenced by conditions in the environment. • Snails have basic needs.	Once students have completed: FOSS CA – Animals 2 X 2 Investigation 1 (Parts 1-3) Students will have enough content knowledge to engage in the **Create a Good Home for Your Snail Challenge**.

*(*Model Lessons-are sample lessons that have been fully developed using the engineering design process)*
The Engineering Challenges listed in the table can be designed as extensions of the specified FOSS Investigations

Suggested Lesson Sequence for Engineering Extensions for 2017-2018

Grade	Trimester	Lesson	Purpose	Location
K	1	**Technology All Around Us**	**Introduction to Technology:** This is an introductory lesson to engineering. It provides students a basic understanding of what technology is and how it impacts engineering.	Technology Lesson
K	2	**Engineering is in the Design**	**Introduction to Engineering:** This is a basic lesson introducing the Engineering Design Process (EDP) for elementary engineering. The EDP is foundational for students to understand how to design and test engineering solutions like real engineers.	Engineering Design Lesson
K	3	**Gummy Bear Challenge** **OR** ↓	**Model Engineering Lesson:** This follows the Trees FOSS CA Earth Science Module and provides an example of how to extend from a science unit into an engineering unit.	K-Model Engineering Lesson
		Other FOSS CA Engineering Extensions	**EDP Lesson Template:** This can be used to extend the other FOSS CA connections listed on page 2 into an engineering unit.	EDP Template