

Unit 6: Engineering Design

Content Area: **Science**
Course(s):
Time Period: **Generic Time Period**
Length: **4 weeks**
Status: **Published**

Disciplinary Core Ideas

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. (K-2-ETS1-1)
- Asking questions, making observations, and gathering information are helpful in thinking about problems. (K-2-ETS1-1)
- Before beginning to design a solution, it is important to clearly understand the problem. (K-2-ETS1-1)

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. (K-2-ETS1-2)

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. (K-2-ETS1-3)

Standards

Science —

K-2-ETS1-1 Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool.

K-2-ETS1-2 Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.

K-2-ETS1-3 Analyze data from tests of two objects designed to solve the same problem to compare the strengths and weaknesses of how each performs.

ELA/Literacy —

RI.2.1 Ask and answer such questions as who, what, where, when, why, and how to demonstrate understanding of key details in a text. (K-2-ETS1-1)

W.2.6 With guidance and support from adults, use a variety of digital tools to produce and publish writing, including in collaboration with peers. (K-2-ETS1-1),(K-2-ETS1-3)

W.2.8 Recall information from experiences or gather information from provided sources to answer a question. (K-2-ETS1-1),(K-2-ETS1-3)

SL.2.5 Create audio recordings of stories or poems; add drawings or other visual displays to stories or recounts of

experiences when appropriate to clarify ideas, thoughts, and feelings. (K-2-ETS1-2)

Mathematics —

MP.2 Reason abstractly and quantitatively. (K-2-ETS1-1),(K-2-ETS1-3)

MP.4 Model with mathematics. (K-2-ETS1-1),(K-2-ETS1-3)

MP.5 Use appropriate tools strategically. (K-2-ETS1-1),(K-2-ETS1-3)

2.MD.D.10 Draw a picture graph and a bar graph (with single-unit scale) to represent a data set with up to four categories. Solve simple put-together, take-apart, and compare problems using information presented in a bar graph. (K-2-ETS1-1),(K-2-ETS1-3)

Essential Questions

Given a STEAM problem/challenge, How can you work cooperatively with peers to develop a solution(s) to the problem utilizing the engineering process within a set time limit?

Student Objectives

Objectives:

SWBAT:

- *Work collaboratively in groups to complete the Bone Bridge Challenge by problem solving.
- *Construct a bridge that holds the most pumpkins (capacity measurement)
- *Construct a ship that will hold the most cargo possible
- *Construct a tower created out of 100 cups to celebrate our upcoming 100th day of school.
- *Design and build an enticing leprechaun trap with their group
- *Students will be able to clean up a mock oil spill using only the given materials

Concepts taught:

1. A situation that people want to change or create can be approached as a problem to be solved through engineering. (K-2-ETS1-1)
2. Asking questions, making observations, and gathering information are helpful in thinking about problems. (K-2-ETS1-1)
3. Before beginning to design a solution, it is important to clearly understand the problem. (K-2-ETS1-1)
4. 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. (K-2-ETS1-2)
5. Because there is always more than one possible solution to a problem, it is useful to compare and test designs. (K-2-ETS1-3)
6. The shape and stability of structures of natural and designed objects are related to their function(s). (K-2-ETS1-2)

Activities

Learning Activities:

Halloween STEM Activity (Bone Bridge Challenge)

- What does STEM look like in our classroom? Overview of routines and expectations
- What does the structure of a bridge look like?
- Plan, Build, Reflect/alter design, Record Results, Share/discuss

Thanksgiving STEAM (Mayflower Challenge)

- Why was the Mayflower important?
- Identify parts of the ship
- How do we sketch a ship?
- Construct a ship with your group that will hold the most cargo possible

100th Day Themed STEAM Activity

Construct a tower created out of 100 cups to celebrate our upcoming 100th day of school

Leprechaun Traps STEAM *How can we catch a leprechaun?*

Design and build an enticing leprechaun trap with their group based on what they have learned about trap design and cause/effect relationships

STEAM Oil Spill Challenge

What do you wonder about oil spills? What do you hope to learn? How is the environment affected by humans?

1. "Oil Spill!" By Melvin Berger read aloud to build background knowledge
2. Introduce the challenge and restraints
3. Assign groups
4. Brainstorm
5. Complete the challenge in 30 minutes
6. Reflect

Materials & Resources

McGraw Hill Science Book

www.mysteryscience.com

writing journals

various ramps (cardboard)

cotton balls

rubber bands

ping pong balls

sand paper, aluminum foil, wax paper

small toy cars

yard sticks

plastic cups

activity handouts (design page, reflection, data collection)

Q-tips

pipe cleaners

popsicle sticks

clothes pins

scissors

rules

candy pumpkins

aluminum foil

straws

pennies

4 containers

paper

plastic cups

tape

teacher created handouts

teacher created SMARTboard introduction

bowls

various snacks

various materials to create a trap (shoe boxes, foil, straws, string, etc)

handout/organizer to design and revise

vegetable oil

tin pans

toothbrushes

tweezers

feathers (not craft)

eye droppers

paper towels

sponges

Assessment

Teacher observations/experiment

Students use of standard and non-standard units of measurement recorded

Students' discussion trial and error

Recordings in journal

Multiple Choice Test

Student writing pieces (informational writing unit Lucy Calkins)

Accommodations and Modifications

-Use of scribe

-Partnered with classmate

-Use of scribe

-Adaptive computer to type assignments

-Adjustable tables and lab equipment within reach

-Flexible seating

-Additional time and/or small-group for testing

- Additional time and/or small-group for assignments
- Captioned videos
- Visual and tactile instructional demonstrations
- Computer with voice output, spelling and grammar checker
- Preferential seating
- Tactile drawings and graphs, and three-dimensional models
- Directions repeated/clarified. Check for understanding.