For students & educators

Camp Fire
MINNESOTA

# My nature connection

ENGINEERING DESIGN

GRADES: 2+
TIME: 60-90 min.

## WHAT DOES IT MEAN TO BE AN ENGINEER?

Engineers are problem-solvers. They ask questions and design tools to help people, following the engineering design cycle: Ask, Imagine, Plan, Create, and Improve.

## WHAT YOU'LL NEED

### Activity 1:

Newspapers/ Magazines
Popsicle sticks
Masking tape
Textbook or heavy book
Scissors
Engineering design handout

### Activity 2:

*Same materials as above, plus*
A bowl filled with water
Pebbles or small rocks
Engineering design handout

## ACTIVITY

### CHAIR DESIGN

Your first goal as an engineer is to design a chair. The chair must be able to hold the weight of a textbook and can only use newspapers/ magazines, tape, and popsicle sticks. You can use scissors during your creation. How will you design a solution?

1. Use the handout to reflect on your process as an engineer.
2. First, what is the question you are trying to answer or problem you are trying to solve? (How will you build a chair using only paper, tape and sticks?)
3. Second, imagine and plan out the chair design (a stool, armchair, etc.).
4. Once your design plan is set, use the materials to create your chair.
5. When you are ready to test your chair, go ahead and place the textbook on top and see if it holds.
6. If the initial plan doesn't work, how might you make changes so the chair is able to support the book?
7. Write down observations of what works, what is not successful and the steps you will take to improve the design.

## Students will:

1. Learn the process of engineering and creative design.
2. Gain engineering practice by designing and building a chair and a bridge.

SETTING
Indoors and Outdoors

## BRIDGE DESIGN

Your next engineering design goal is to create a bridge. The bridge will be made from the same materials that we used for the chair design. Make sure the bridge can span from one side of the bowl of water to the other. How many pebbles can your bridge support?

1. Use the handout to reflect on your process as an engineer.
2. First, what is the question you are trying to answer or problem you are trying to solve? (How will you build a bridge using only paper, tape and sticks that can support a ton of pebbles?)
3. Second, imagine and plan out your bridge design.
4. Once your design plan is set, go ahead and use the materials to create the bridge.
5. When you are ready to test the bridge, a parent or guardian may help them fill up the bowl of water and lay the bridge across.
6. Place as many pebbles on the bridge as it will hold.
7. Does the bridge support as many pebbles as you thought? What can you do to make it stronger?
8. Write down observations of what works, what is not successful and the steps you will take to improve the design.

**Engineering Design Process**

**ASK** a question or pose an problem that needs to be solved.
**IMAGINE** and get creative.
Build an action **PLAN** and name the steps you will take to solve the problem or answer the question.
**CREATE** and experiment based on your plan.
Once you are finished, test, review, and **IMPROVE** the design.

Share your designs!
Post your projects on social media using #mynatureconnection

### CONNECTING WITH QUESTIONS: THINK LIKE AN ENGINEER

What was challenging? What was easy?

How did you come up with your design?

What would you differently next time?

Did it work on the first try? If no, how did you improve your design?

If yes, what changes would you make to support more books, a longer bridge, etc.?

### TELL US WHAT YOU THINK!

take a short survey at:
campfiremn.org/mynatureconnection

or here:
Kids Survey - click here
Teachers/Parents Survey - click here



Adapted from lessons on TeachEngineering.org

# ENGINEERING DESIGN PROCESS

Ask

Imagine

Plan

Create

Improve

Chair Design

## Observations

TELL US WHAT YOU THINK!

# ENGINEERING DESIGN PROCESS

Ask

Imagine

Plan

Create

Improve

Bridge Design

## Observations

# EDUCATION STANDARDS

## Social Emotional Learning Competency: Responsible Decision-Making

| Grade Level | Science Education Standard |
|---|---|
| Grade 2 | 1.1.1 Students will be able to ask questions about aspects of the phenomena they observe, the conclusions they draw from their models or scientific investigations, each other's ideas, and the information they read. |
| Grade 3 | 3.2.2 Students will be able to use their understanding of scientific principles and the engineering design process to design solutions that meet established criteria and constraints. |
| Grade 4 | 1.1.2 Students will be able to ask questions about a problem to be solved so they can define constraints and specifications for possible solutions. |
| Grade 5 | 3.2.2 Students will be able to use their understanding of scientific principles and the engineering design process to design solutions that meet established criteria and constraints. |
| Grade 6 | 1.2.1 Students will be able to design and conduct investigations in the classroom, laboratory, and/or field to test students' ideas and questions, and will organize and collect data to provide evidence to support claims the students make about phenomena. |
| Grade 7 | 3.2.1 Students will be able to apply scientific principles and empirical evidence (primary or secondary) to construct causal explanations of phenomena or identify weaknesses in explanations developed by themselves or others. |
| Grade 8 | 3.2.1 Students will be able to apply scientific principles and empirical evidence (primary or secondary) to explain the causes of phenomena or identify weaknesses in explanations developed by the students or others. |
| Grades 9-12 | 1.2.1 Students will be able to design and conduct investigations in the classroom, laboratory, and/or field to test students' ideas and questions, and will organize and collect data to provide evidence to support claims the students make about phenomena. |