

# Inspired by Nature: Engineering and Design

*Grade Levels: 3-7*

## Program Description:

The Hitchcock Center's new Living Building is a teaching tool for sustainability. Students will learn about how natural systems can inform human innovation as they explore the building's water, waste and energy systems. They will participate in a design challenge to solve a human problem in a way that mimics nature's solutions.

## Massachusetts Curriculum Standards:

### Grade 3: Life Science

#### LS1. From Molecules to Organisms: Structures and Processes

3-LS1-1. Use simple graphical representations to show that different types of organisms have unique and diverse life cycles. Describe that all organisms have birth, growth, reproduction, and death in common but there are a variety of ways in which these happen.

#### LS4. Biological Evolution: Unity and Diversity

3-LS4-3. Construct an argument with evidence that in a particular environment some organisms can survive well, some survive less well, and some cannot survive.  
3-LS4-4. Analyze and interpret given data about changes in a habitat and describe how the changes may affect the ability of organisms that live in that habitat to survive and reproduce.

### Grade 3: Technology/Engineering

#### ETS1. Engineering Design

3.3-5-ETS1-1. Define a simple design problem that reflects a need or a want. Include criteria for success and constraints on materials, time, or cost that a potential solution must meet.\*  
3.3-5-ETS1-2. Generate several possible solutions to a given design problem. Compare each solution based on how well each is likely to meet the criteria and constraints of the design problem.\*  
3.3-5-ETS1-4(MA). Gather information using various informational resources on possible solutions to a design problem. Present different representations of a design solution. \*



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## **Grade 4: Earth and Space Sciences**

### **ESS3. Earth and Human Activity**

4-ESS3-1. Obtain information to describe that energy and fuels humans use are derived from natural resources and that some energy and fuel sources are renewable and some are not.

## **Grade 4: Physical Science**

### **PS3. Energy**

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

## **Grade 4: Technology/Engineering**

### **ETS1. Engineering Design**

4.3-5-ETS1-3. Plan and carry out tests of one or more design features of a given model or prototype in which variables are controlled and failure points are considered to identify which features need to be improved. Apply the results of tests to redesign a model or prototype.\*

Clarification Statement:

- Examples of design features can include materials, size, shape, and weight.

4.3-5-ETS1-5(MA). Evaluate relevant design features that must be considered in building a model or prototype of a solution to a given design problem.\*

## **Grade 5: Earth and Space Sciences**

### **ESS3. Earth and Human Activity**

5-ESS3-1. Obtain and combine information about ways communities reduce human impact on the Earth's resources and environment by changing an agricultural, industrial, or community practice or process.

5-ESS3-2(MA). Test a simple system designed to filter particulates out of water and propose one change to the design to improve it.\*

## **Grade 5: Physical Science**

### **ETS3. Technological Systems**

5.3-5-ETS3-1(MA). Use informational text to provide examples of improvements to existing technologies (innovations) and the development of new technologies (inventions). Recognize that technology is any modification of the natural or designed world done to fulfill human needs or wants.\*



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## **Grade 6: Technology/Engineering**

### **ETS1. Engineering Design**

- 6.MS-ETS1-1. Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution. Include potential impacts on people and the natural environment that may limit possible solutions.\*
- 6.MS-ETS1-5(MA). Create visual representations of solutions to a design problem. Accurately interpret and apply scale and proportion to visual representations.\*

### **ETS2. Materials, Tools, and Manufacturing**

- 6.MS-ETS2-2(MA). Given a design task, select appropriate materials based on specific properties needed in the construction of a solution.

## **Grade 7: Earth and Space Sciences**

### **ESS3. Earth and Human Activity**

- 7.MS-ESS3-2. Obtain and communicate information on how data from past geologic events are analyzed for patterns and used to forecast the location and likelihood of future catastrophic events.
- 7.MS-ESS3-4. Construct an argument supported by evidence that human activities and technologies can mitigate the impact of increases in human population and per capita consumption of natural resources on the environment.

## **Grade 7: Technology/Engineering**

### **ETS1. Engineering Design**

- 7.MS-ETS1-2. Evaluate competing solutions to a given design problem using a decision matrix to determine how well each meets the criteria and constraints of the problem. Use a model of each solution to evaluate how variations in one or more design features, including size, shape, weight, or cost, may affect the function or effectiveness of the solution.\*
- 7.MS-ETS1-4. Generate and analyze data from iterative testing and modification of a proposed object, tool, or process to optimize the object, tool, or process for its intended purpose.\*
- 7.MS-ETS1-7(MA). Construct a prototype of a solution to a given design problem.\*

