Engineering in Action: Renewable Ride

Grades: K - 6
Time: 50 minutes

Engineering Challenge: Students will plan, build, and test a wind-powered vehicle that runs the length of a MagLev track.

Rationale and Context:

Students will learn about the effects of climate change on humans, animals and our local environment. Students will also use the Engineering Design Process (EDP) to define and construct a playful solution to a problem related to alternative transportation. The EDP is a series of steps that engineers employ to develop solutions to a given problem. It is a cyclical process that can be applied to any problem requiring a technological solution. Many of the environmental challenges facing the Lake Champlain Basin benefit from engineered technologies, such as management of invasive species and stream monitoring. Students will come to see that the EDP can be used to solve problems in a diversity of contexts and themselves as possessing the ability to design and improve technologies.

Teacher Background Information:

Climate change is characterized by a change in weather patterns over time. Decades of climate data records give evidence of numerous changes to weather patterns. Globally we are experiencing increasing land and ocean temperatures, rising sea levels, ice loss at the poles and more frequent and severe extreme weather events. In Vermont changing patterns include a longer frost-free season each year, more rain and less snow in the winter, an increase in hot days over 87 degrees or higher, an increase in frequency of heavy precipitation events. It is important to note that climate change has long-term impacts but weather patterns will continue to vary from one year to another and in various locations. Machines that burn fossil fuels are the biggest contributor to climate change. We can reduce our impact by limiting our use of fossil fuels. This may include using electric or hybrid vehicles, carpooling, using public transportation or traveling by bike or foot.

The Engineering Design Process

Engineers improve existing technologies or develop new ones to increase their benefits, decrease known risks, and meet societal demands. The Engineering Design Process (EDP) is a set of steps engineers follow to solve problems. Steps include: Define, Plan, Create, Test, and Improve. The process is designed to be cyclical with students repeating the steps as many times as necessary to refine their ideas. Fundamental to this process is the ability of students to solve problems creatively and work together. Typically solutions involve designing a product that meets certain criteria and possible solutions to a problem are limited by available materials and resources (constraints). Different proposals for

solutions can be compared on the basis of how well each one meets the specified criteria for success. Different solutions need to be tested in order to determine which of them best solves the problem.

Next Generation Science Standards

Standard	**K-5**
ESS2.D	Weather and Climate
ESS3.A	Natural Resources
ESS3.C	Human Impacts on Earth's Systems
ESS3.D	Global Climate Change
ETS1.A	Defining and Delimiting an Engineering Problem
ETS1.B	Developing Possible Solutions
ETS1.C	Optimizing the Design Solution
ETS2.B	Influence of Engineering, Technology, and Science on Society and the Natural World
Science and Engineering Practices	Defining problems Developing and using models Constructing Explanations and Designing solutions
Crosscutting Concepts	Cause and Effect Structure and Function

Vocabulary: Students will gain an understanding of certain vocabulary words through active participation and explanation.

Adapt	Climate Change	Renewable
Alternative	Engineer	Resource
Climate	Fossil Fuel	Technology

Learning/Behavioral Objectives:

1. Students will define a problem facing the Lake Champlain Basin.
2. Students will use the EDP to collaboratively plan and build a solution, taking into account material/time constraints and criteria for success.
3. Students will engineer their own solutions to a problem or challenge.
4. Through testing and discussion, students will evaluate their designs.
5. Students will revise their solutions, considering how the structure of their original designs impacted their function.
6. Students will reflect on the EDP and its application in everyday life.

Focusing Questions:

1. What is climate change?
2. How is climate change affecting living things and their habitats in Vermont?
3. How can we adjust our behaviors to minimize the impact of climate change?
4. How can we use the Engineering Design Process to solve problems in everyday life?