



Engineering in Action: Zipcarts 7-12

Grades: 7-12

Time: 50 minutes

Engineering Challenge: Students will plan, build, and test a cart that can transport a toy turtle down a zipline.

Rationale and Context:

Students will learn about a threatened species in Vermont and the steps being taken to restore its population. 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:

The Eastern Spiny Softshell Turtle has been designated as a threatened species in Vermont since 1987. These turtles nest in a specific environment: beaches with shale or sand beaches. They often nest adjacent to public beaches, where they are threatened by human disturbance, dogs, and most significantly, predation from subsidized predators like raccoons, skunks, and foxes. Development also reduces their nesting habitat and feeds/attracts those predators. Four nesting sites in Vermont have been designated as critical habitat by the state. The Department of Fish and Wildlife protects those sites and monitors them during nesting season. ECHO partners with Fish and Wildlife through a Headstart program. Late-hatching neonates spend the winter at ECHO where they grow large enough to avoid predation from subsidized predators when they are released the following spring. Data collected by Fish and Wildlife indicates that the overall nesting population is increasing.

Next Generation Science Standards

Standard	Description
MS-LS 2-4	Ecosystems: Interactions, Energy, and Dynamics
HS-PS 2-3	Motion and Stability: Forces and Interactions
MS-ETS 1-2 HS-ETS 1-2	Engineering Design
Science and Engineering Practices	Developing and using models Planning and carrying out investigations
Cross Cutting Concepts	Structure and function Cause and effect.

Learning Objectives:

1. Students will be introduced to a threatened species in Vermont and explore causes for its threatened status as well as current steps being taken to restore its population.
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 evaluate and revise their solutions, considering how the structure of their original designs impacted their function.

Focusing Questions:

How can we use the Engineering Design Process to solve problems in everyday life?

How does the availability of materials and resources impact the Engineering Design Process?

How should a piece of technology's end user influence its design?

How does the structure of a design affect its function?

How does one determine the success of a design?

What is the role of failure in the EDP?

How do groups of people work together to solve problems?