Engineering in Action: Nest Rescue

Grades: K - 6
Time: 50 minutes

Engineering Challenge: Students will plan, build, and test a container that can catch a falling egg model and prevent it from breaking.

Rationale and Context:

Students will learn about the decline and recovery of the peregrine falcon population in Vermont. Students will also use the Engineering Design Process (EDP) to define and construct a playful solution to a problem related to peregrine eggs in the nest. 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:

In 1970 peregrine falcons were no longer in evidence in the eastern United States and were placed on the federal list of endangered species. This was in large part due to the use of DDT. This insecticide accumulated in birds of prey; one of its side effects was the thinning of bird shells. Vermont's population of peregrines has risen steadily over the past fifty years through a combination of a ban on DDT, breeding peregrines in captivity, and releasing them through the 1980s. In 1999 they were removed from the federal list of endangered species and in 2005 Vermont removed them from their list of threatened species. Like many other birds, peregrine populations are also at risk due to predation, development, and the effects of extreme weather from climate change. However human disturbance is the greatest threat to the continued success of their breeding population. Conservation efforts to counteract this include prohibiting access to hiking trails and climbing routes near known nesting sites in the spring and early summer. Monitoring efforts of community scientists is also key.

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**
LS1.B	Growth and Development of Organisms
LS4.D	Biodiversity and Humans
ESS3.C	Human Impacts on Earth Systems
PS3.A	Definitions of Energy
PS3.B	Conservation of Energy and Energy Transfer
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	Developing and Using Models Analyzing and Interpreting Data Constructing Explanations and Designing Solutions
Crosscutting Concepts	Cause and Effect Energy and Matter Structure and Function

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

Captivity
Conservation
Endangered
Eyries
Extinct
Fledgling
Human disturbance
Raptor
Stooping
Threatened

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. How have peregrine falcon populations changed over the past 50 years?
2. Why have peregrine falcon populations changed over the past 50 years?
3. What actions will support the population of peregrines in our state?
4. How can we use the Engineering Design Process to solve problems in everyday life?