**All Caught Up**

**Overview**

Bycatch is a serious problem for many marine fisheries. In this engineering challenge focused on fisheries and conservation, students learn about bycatch and then design fishing nets that will maximize catch of a target species while minimizing bycatch. We’ll test the nets in a fishing competition, then redesign them to improve performance. Discussion will include examples drawn from fisheries management.

**Alignment with NGSS**

##### Performance Expectations

**MS-ESS3-3.** Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment. *Students will design fishing nets that minimize bycatch*

**MS-ETS1-2.** Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem*. Students will evaluate their net designs in a fishing competition*

**MS-ETS1-3.**Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success. *The class will record data on fishing success and bycatch avoidance success for each net design, and then discuss the characteristics of successful and unsuccessful designs.*

**MS-ETS1-4.**Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved. *After the first round of testing, students will put what they learned into practice as they redesign their nets for a new target species. We will then repeat the testing and evaluation process.*

##### Science and Engineering Practices

**Defining Problems.** *Students be provided with an engineering challenge and materials, and will need to first clearly define the design problem so that they can build a prototype net to test.*

**Developing and Using Models**. *Students will develop and test model fishing nets.*

**Designing Solutions.** *Students will apply scientific principles to design model fishing nets that minimize bycatch.*

##### Crosscutting Concepts

**Influence of Science, Engineering, and Technology on Society and the Natural World.** *Students will explore how net design can help to minimize the impact of bycatch in commercial fishing.*

##### Disciplinary Core Ideas

**ESS3.C Human Impacts on Earth Systems.** *Students will discuss how fishing techniques and fisheries management strategies impact fish populations. They will also discuss the problem of bycatch and design solutions that minimize this problem.*

**ETS1.B Developing Possible Solutions.** *Students will develop solutions, test them, then incorporate what they have learned as they redesign for a new target species and test again.*

**ETS1.C Optimizing the Design Solution.** *Students will work collaboratively to identify the characteristics of successful and unsuccessful designs. They will then have the opportunity to incorporate what they have learned as they redesign for a new target species and test again.*