BREAK IT DOWN

INTRODUCTION

This is a reverse-engineering activity. Students carefully deconstruct a simple toy and figure out how it works. They make a diagram (model) to explain, and then they generalize the mechanism to some other device.

MATERIALS

+ Simple toys from the dollar store (two per group). Toys from children's fast food meals can also be used.

STANDARDS

NGSS 3-5 ETS1-1
Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.

NGSS 3-5 ETS1-2
Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.

NGSS MS ETS1-1
Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.

NGSS MS ETS1-2
Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.

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In both elementary and middle school students need to be able to generate and evaluate designs based on criteria. This activity is an opportunity to focus on these skills. Engineers often have to work in teams to develop a design or product, so the productive talk in the group is valuable. Depending upon the particular challenge a student group gets, and how their conversation goes, they may examine the Crosscutting Concepts of Structure and Function and Cause and Effect. They will certainly gain experience using the Science and Engineering Practices of Defining Problems, Designing Solutions and Engaging in Argument from Evidence.

NAME: DATE:

BREAK IT DOWN

Your teacher will give you one or more toys to examine. Carefully take your toys apart one at a time and in steps. Answer the questions below for each toy.

An officer operating a radio-controlled target plane in a training exercise.
(The National WWII Museum, 2011.065.1179)

What does the toy do?

Draw a diagram of the toy's parts and how they work together:

Give an example of something else that works like this toy: