

Put a Spin on It – Inquiry Based Instruction

Nevada Academic Content Standards for Science

We realize that you will need to tailor the lesson and line of questioning to the grade level you teach, to best address the NSSCS that are covered. The following strands are applicable to this lesson:

Disciplinary Core Ideas

- PS2 Motion and Stability
 - PS2A Forces and Motion
 - PS2B Types of Interactions
 - PS2C Stability and Instability in Physical Systems
- PS3 Energy
 - PS3A Definitions of Energy
 - PS3B Conservation of Energy and Energy Transfer
 - PS3C Relationship Between Energy and Forces

Cross Cutting Concepts

- Cause and effect
- Scale, proportion and quantity
- Energy and matter
- Structure and function
- Interdependence of science, engineering, and technology

Science and Engineering Practices

- Asking questions and defining problems
- Developing and using models
- Planning and carrying out investigations
- Analyzing and interpreting data
- Using mathematics and computational thinking
- Constructing explanations (for science) and designing solutions (for engineering)
- Engaging in argument from evidence
- Obtaining, evaluating, and communicating information

YOUR DESIGN CHALLENGE

Design a spinning top.

FACTS TO CONSIDER

A spinning top is a toy designed to spin rapidly on a flat surface, when torque (the rotational version of force) is applied. When kinetic energy is applied by torque, it sends the top into motion. The point where the top rotates is known as the axis of rotation, where the center of gravity lies. The movement of the top, or angular momentum, causes it to remain precisely balanced on its tip until friction pulls the top off center.

FOLLOW THE DESIGN THINKING PROCESS

EMPATHIZE

The product users are K-5 students. The students would like a spinning top that is attractive, simple to operate, durable, and engineered to spin for 10 seconds.

DEFINE

Write a problem statement that defines the problem you are trying to solve, who you are solving the problem for, and why it's important to solve the problem.

Problem Statement:

IDEATE

Use the "Facts to consider" and the supporting materials to brainstorm design ideas for a spinning top. **THINK BIG!** Every member of the group must provide ideas for designing the top. Don't dismiss any ideas during this stage. Input can be related to the materials used to design the top, and the sequence of design. Record all ideas below. When the brainstorming session has ended, select 2-3 design ideas that everyone agrees to utilize.

Design Ideas:

PROTOTYPE

Put your ideas into action. Illustrate a prototype of a spinning top below, and then build your prototype.

TEST

Test your design within your group. Does it meet the needs of your users, and can it be improved? Incorporate group feedback into your redesign. After the redesign, record your final spinning time below.

Final Spinning Time: _____