DESIGN PROJECTS



SPINNING TOPS

GRADE LEVEL

Grades 6-8

MODELING TIME

2 hours

MATERIALS

- Access to a 3D printer
- Filament – Approximately 7g
- CAD Software (SOLIDWORKS Design or xDesign)



DESIGN OBJECTIVE

- Create and design a lightweight spinning top that spins for the longest duration possible.
- Discuss how the top's design influences its spinning ability.
- Introduce concepts of testing and competition.

EDUCATIONAL CONCEPTS

- **Physics:** Discuss Center of Mass, Gravity, Angular Velocity/Rotation Conservation of Angular Momentum, Torque and Friction.
- **Mechanical Design:** Introduce concepts of weight distribution and vertical axis.
- **CAD:** Provide an overview of CAD modeling, focusing on sketch and solid features.

DESCRIPTION

Designing a spinning top involves physics, engineering, and artistic design elements. This project can be adapted for various skill levels, ranging from a simple introductory activity to a more complex exploration for advanced students.

HISTORY

Spinning tops have emerged independently in various cultures around the world and are considered some of the oldest known toys, as revealed by archaeological discoveries. These toys have been found on every continent except Antarctica. For example, tops dating back to around 1250 BCE were unearthed in China, while a carved wooden top from approximately 2000 BCE was discovered in Tutankhamun's tomb.

DISCUSSION STARTERS

- Why did some tops spin longer than others?
- Did any tops fail to spin? If so, what were the reasons?
- How do small changes in the design affect stability?
- What are the physics that explain how a top balances while spinning?
- What modifications could allow a top to spin longer or enhance its stability?
- How could the 3D printer affect the spin performance?

ASSESSMENT CRITERIA

- Did the top spin?
- How long did it spin for?
- Was it perfectly balanced?

ADVANCED OPTIONS

- Reversible: Create a top that spins oriented up or down.
- Reduce Weight: Create a top that uses less material than your initial design but still spins as long.
- Crazy design: Create a top that looks like it shouldn't spin but does

ADDITIONAL RESOURCES

LINK TO DOCUMENTS
LINK TO YOUTUBE VIDEO
LINK TO STEP-BY-STEP

SPINNING TOP IDEAS

