

Spinning Tops Rubric

Standards	Lesson Objectives	Advanced 3 Points	Intermediate 2 Points	Beginner 1 Point	Points
<i>MS-ETS1-2</i> <i>ITEE-12:D, E & F</i> <i>FAB-DESIGN.1</i> <i>FAB-PROGRAMMING.1</i> <i>FAB-MODELING.1&2</i>	Using Computer Aided Design Software (CAD)	Follows along with instruction, is able to use tools taught, and anticipate next steps. Creates a design with detailed thought of forces acting upon a spinning top. Is able to learn more tools than those taught and can redesign without assistance. Identifies all of the forces acting upon a spinning top.	Follows along with instruction and is able to use tools taught. Creates a design similar to instructors with some thought of forces acting upon a spinning top. Is able to redesign using the same steps taught with little to no assistance. Identifies some of the forces acting upon a spinning top.	Completes steps with minimal design thought and needs instructor's direct guidance for tool use. Needs assistance with redesign. Identifies one of the forces acting upon a spinning top.	
<i>MS-ETS1-2</i> <i>ITEE- 8:C & D; 9:C, D & E</i> <i>FAB-DESIGN.1</i> <i>FAB-MODELING.1&2</i>	Understanding the Engineering Design Process	Understands how a top's shape, weight distribution, and center of gravity affect how it spins. Define angular momentum and articulate its relevance. Creates multiple designs based on competing solutions and tests spin time. Systematically determines the best-designed pieces and consolidates them into a final design with the longest spin time.	Understands how a top's shape, weight distribution, or center of gravity affect how it spins. Can define angular momentum. Creates and tests one or more entirely new designs.	Shows some understanding of how a top's shape, weight distribution, or center of gravity affect how it spins. Changes one aspect of the design and tests a second time.	
<i>MS-ETS1-4</i> <i>3-5-ETS1-3</i> <i>ITEE-13: F, G & I</i>	Data Collection	Develops and tests hypotheses around how to optimize the longevity and stability of a top's spin. Develops a model to control accuracy. Controls tests by spinning each top 3 times in the exact same spot to find the average, applies the controlled force for each spin, tracks exact times and records each test.	Develop and test hypotheses around how to optimize the longevity of a top's spin. Uses some methods to control accuracy. Spins tops in the same spot, controls force on spin to best ability, checks spin time with stopwatch and records them.	Does not use accuracy. Not controlling force applied for each spin, only tests once, and checks spin time by eye alone.	
<i>MS-ETS1-3</i> <i>3-5-ETS1-2</i> <i>ITEE-9:F, G & H; 10:F, G & H</i>	Analysis	Calculates the average spin time of their top tests. Analyzes their data to determine the similarities and differences among several different designs. Generates and compares multiple solutions to identify the best characteristics of each top. Then combines these characteristics into a new solution and evaluates its success to find the final design.	Calculates the spin time of their top tests. Analyzes their data to determine which top spun the longest. Generates and compares several solutions to identify their best design.	Makes a rough estimate of the time difference between original top design and second with one design change.	
<i>3-5-ETS1-1</i>	Communication	Can communicate their findings based on the forces acting upon a spinning top and how each force impacted their final design. Understands the constraints on their design due to the material used, inability to make every spin the exact same, ect.	Can communicate their findings based on their understanding of the forces acting upon a spinning top and how it impacts their designs but does not recognize the constraints on their design due to the material used, inability to make every spin the exact same, ect.	Can communicate how one of the forces acting upon a spinning top impacted their design.	
Point System Key:		11 - 15 Points	6 - 10 Points	1 - 5 Points	Total: