

## Core Skills Analysis

### Science

- Learned the basics of simple machines by constructing a lever mechanism with popsicle sticks.
- Understood force and motion concepts as the catapult launches objects over a distance.
- Explored energy transfer from potential energy stored in the catapult arm to kinetic energy of the launched projectile.
- Practiced experimentation by adjusting variables like the angle or tension to change how far the object travels.

### Engineering

- Applied principles of design and construction through assembling the popsicle stick catapult.
- Developed problem-solving skills by refining the catapult to improve its performance.
- Gained experience with materials and structural stability in building simple devices.
- Learned the importance of measurement and precision when balancing and connecting parts.

### Mathematics

- Practiced measuring distances and angles to evaluate catapult performance.
- Collected and analyzed data on how changes affect launch distance, introducing basic data recording and pattern recognition.
- Developed skills in estimating and comparing numerical values during trials.
- Used concepts of geometry such as angles to enhance understanding of projectile paths.

### Tips

Encourage your child to test how different materials (rubber bands of various thicknesses or different stick sizes) affect the catapult's performance to deepen understanding of physics and engineering principles. Suggest experimenting with varying arm lengths or launch angles and recording results in a homemade chart for pattern recognition and mathematical analysis. You might also introduce simple calculations related to projectile motion, such as measuring launch height or distance, to develop quantitative reasoning. For a creative twist, challenge your child to design a target practice game, promoting strategic thinking and practical application of their engineering model.

### Book Recommendations

- [Awesome Engineering Activities for Kids](#) by Christina Schul: A book filled with hands-on projects like building simple machines to spark young engineers' creativity and problem-solving skills.
- [Simple Machines \(Science for Kids\)](#) by Diane M. Bailey: An introduction to the basic types of simple machines, including levers, with kid-friendly explanations and activities.
- [Math in Motion: Using Simple Machines to Learn Geometry](#) by Janet Slingerland: Combines math and science concepts through practical projects, helping kids understand angles, force, and measurements.

### Learning Standards

- CCSS.ELA-LITERACY.RI.4.3 - Explain events, procedures, ideas, or concepts in a scientific text (related to learning and explaining catapult construction and function).
- CCSS.MATH.CONTENT.4.MD.A.2 - Use the four operations to solve word problems involving distances (measuring launch distances and analyzing results).
- NGSS 3-5-ETS1-2 - Generate and compare multiple possible solutions to a problem (modifying the catapult to improve performance).
- NGSS 3-5-ETS1-3 - Plan and carry out fair tests in which variables are controlled and failure

points are considered (experimenting with different variables to test catapult function).

### **Try This Next**

- Worksheet to record launch distances and angles to track improvements and analyze results.
- Design challenge prompt: Build and modify a catapult to hit a set target with maximum accuracy.