

SCSU CRISP CCSA Kit Pages 2016

Title of Module: Mousetrap Catapult

Subject or Unit of Study: Engineering Design

GRADE LEVEL 6-8 LENGTH OF DEMO/LESSON: 5 hours

STUDENT OBJECTIVES

Students will...

Students will design and construct a catapult built to design specifications using limited materials provided.

Students will go through the engineering design process to refine and improve their catapult design.

NEXT GENERATION SCIENCE STANDARDS

- 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.
- MS-ETS1-2. Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.
- MS-ETS1-3. Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.
- MS-ETS1-4. Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.

NATIONAL STANDARDS & COMMON CORE

ELA/Literacy -

- RST.6-8.1** Cite specific textual evidence to support analysis of science and technical texts. (MS-ETS1-1),(MS-ETS1-2),(MS-ETS1-3)
- RST.6-8.7** Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table). (MS-ETS1-3)
- RST.6-8.9** Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic. (MS-ETS1-2),(MS-ETS1-3)
- WHST.6-8.7** Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration. (MS-ETS1-2)
- WHST.6-8.8** Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation.(MS-ETS1-1)
- WHST.6-8.9** Draw evidence from informational texts to support analysis, reflection, and research. (MS-ETS1-2)
- SL.8.5** Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest.(MS-ETS1-4)

Mathematics -

- MP.2** Reason abstractly and quantitatively. (MS-ETS1-1),(MS-ETS1-2),(MS-ETS1-3),(MS-ETS1-4)
- 7.EE.3** Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form (whole numbers, fractions, and decimals), using tools strategically. Apply properties of operations to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies. (MS-ETS1-1),(MS-ETS1-2),(MS-ETS1-3)
- 7.SP** Develop a probability model and use it to find probabilities of events. Compare probabilities from a model to observed frequencies; if the agreement is not good, explain possible sources of the discrepancy. (MS-ETS1-4)

CONNECTICUT STATE STANDARDS

8.4 - In the design of structures there is a need to consider factors such as function, materials, safety, cost and appearance.

CINQ 5 Use appropriate tools and techniques to make observations and gather data.

MATERIALS

List all materials needed for this lesson/demonstration (Per Team)

Duct tape
Plastic Spoon
Wooden Spoon
Metal Spoon
2 Plastic Knives
8 Erasers (1"x2")
Mousetrap
Hot glue Gun
Marshmallows (Small)

SAFETY

List all safety precautions needed for this lesson/demonstration

Safety Goggles

LEARNER BACKGROUND

Describe the students' prior knowledge or skill related to the learning objective(s) and the content of this lesson, using data from pre-assessment as appropriate.

Forces
Potential and Kinetic Energy
Angles
Procedure Writing
Measurement
Sequential Thinking

LEARNING ACTIVITY OR PROCEDURE:

Explicitly layout the lesson or demonstration

Students will be given the materials the catapult and design requirements (i.e., marshmallow must travel 3 meters and land within a 10 cm square)

Students will sketch a design, built their catapult to their design specifications, test and then refine their design.

ASSESSMENT:

Provide an assessment to measure student progress of objectives.

Summative – Steps along the way

Formative - Design Evaluation, Competition, Team Evaluation

ADDITIONAL RESOURCES:

Apply any links or additional information for students or teacher including videos, websites, etc.

<http://www.instructables.com/id/MouseTrap-Catapult/>

**TEACHER NOTES:**

Describe any tips/tricks for implementing this lesson/demonstration that might be helpful to future educators. Provide answer keys if applicable.

Differentiation – Grouping with mixed ability

STEM CAREERS:

Field Artillery Officer
Mechanical Engineer
Mathematical Scientist

