

Science Standards Covered

HS-PS3-1. Create a computational model to calculate the change in the energy of one component in a system when the change in energy of the other component(s) and energy flows in and out of the system are known.

HS-PS3-2. Create a computational model to calculate the change in the energy of one component in a system when the change in energy of the other component(s) and energy flows in and out of the system are known.

Kinetic, potential energy

HS-PS3-3. Design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy.*

HS-PS2-1. Analyze data to support the claim that Newton's second law of motion describes the mathematical relationship among the net force on a macroscopic object, its mass, and its acceleration.

HS-PS2-2. Use mathematical representations to support the claim that the total momentum of a system of objects is conserved when there is no net force on the system.

HS-PS2-3. Apply scientific and engineering ideas to design, evaluate, and refine a device that minimizes the force on a macroscopic object during a collision.*

ZHS-PS2-4. Use mathematical representations of Newton's Law of Gravitation and Coulomb's Law to describe and predict the gravitational and electrostatic forces between objects.

Resources

<https://www.youtube.com/watch?v=8hAX72Xgf1U>

Groups: Pairs

Objective:

1. Design, build and refine a miniature trebuchet within the given constraints.
2. Design, build and refine a device that will catch an object launched by your trebuchet without the object breaking.
3. Incorporate physic concepts into both devices.
4. More details to come

HW night before First Siege: research trebuchet design.

First Siege

1. Fast prototype: using popsicle sticks, glue guns and given materials build a trebuchet.
2. Reflect on the build. What worked? What didn't? What exact things did you learn that you will use in your final build? Post reflection on blogger.

Second Siege

1. Use the internet to research how to build a working trebuchet. There are specific aspects to look for.
 1. Length of arm, behavior of counterweight, sling design, structure, base
 2. Take notes on paper

Third Siege

1. Create a detailed drawing of your trebuchet. You should include 2-3 different views. Especially important is illustrating the connections of the different pieces of wood. If you can't draw it, you can't build it. This will pay off later, trust me. Requirements:
 1. Straight lines, RULER
 2. Dimensions of each length of wood
 3. Clearly illustrated wood joints

Fourth Siege

PRECISION, PRECISION, PRECISION. Precision of measurements, cuts and gluing is critical. Take the time to do GOOD work. A poorly built trebuchet will probably work poorly.

1. Plan your build. Think about the most logical way to construct your trebuchet. Are there ways to save time and work efficiently? Think about sawing, drilling, gluing!
2. Build!! Start building. Remember, a glued joint is permanent.

Fifth Siege

REFINE, REFINE, REFINE.

1. Think and act like a scientist (or engineer). Choose one part of your trebuchet to test and refine. It needs to be easily altered, for example the sling would be easy to change, but not the height of your trebuchet.
2. Devise a way to properly document this process. Think data collection...

Sixth Siege

1. Design a device that will catch a glass projectile launched by your trebuchet without it shattering.
2. Think about how to catch and also ACCURACY of trebuchet.