

The Medieval Trebuchet

Name of the object	A mini trebuchet
A little history	<p>The trebuchet was a weapon used in the Middle Ages by siege of a castle. Very different throwing shoots were used: large stones to destroy walls, "Greek fire" to set the castle on fire, flint in balls of clay that broke into a thousand pieces when it hit, and even disease-infested carcasses to spread disease in the besieged castle. Yes, if you apprehended a spy, you could send them back using the trebuchet.</p> <p>The trebuchet could shoot with great precision and up to 400 meters.</p>
Recommended ages (from...)	<p>a) simple construction with popsicle sticks from 10 years</p> <p>b) advanced construction with med moldings made of wood: from 12 years</p> <p>c) A Large-Sized Trebuchet, for example, 2 meters height: From 15 years</p>
Thematic areas combined (STEAM)	<p>S: Potential energy to kinetic energy, linear velocity, release angle, Sianos Key Facts. Launch velocity</p> <p>T: Lever arm, counterweight, swing arm, sling, Fulcrum, counterweight ratio 133:1</p> <p>E: To create a trebuchet, which throws as far as possible. the ratio between the length of the lever arm, the weight of the counterweight, the height and the position of the fulcrum</p> <p>A: History – medieval</p> <p>M: Aspect ratio, angles, measuring</p>
Materials needed	<p>For the simplest construction:</p> <ul style="list-style-type: none"> - Corrugated cardboard - Popsicle sticks: 8 pieces - Scissors

	<ul style="list-style-type: none"> - Pencil with eraser at the top - Milkshake straw - Hot glue gun - Tape - Rubber bands - String - Paper clip - AA size battery or similar size/weight object
Sianos Key Facts	<p>For the best trebuchet, these facts developed by Siano are very useful:</p> <ol style="list-style-type: none"> a) The length of the payload arm shall be 3.75 longer than the length of the counterweight arm b) The length of the sling shall be the same as the length of the payload arm c) The initial angle between the counterweight arm and the support shall be 45 degrees at launch
Instructions step by step	<p>Step 1: Collecting the materials Step 2: Forming 2 "A" frame pieces Step 3: Creating the basis Step 4: Placing the counterweight Step 5: The hook Step 6: The axle and placement of the fulcrum Step 7: Placement of the swingarm Step 8: Creating the load Step 9: Launching Step 10: Adjustments?</p>
Help for construction	<p>Some videos that might help:</p> <p>The science: https://www.youtube.com/watch?v=bmSI9AqmVyc</p> <p>Construction of a simple popsicle stick trebuchet: https://www.youtube.com/watch?v=ksG87OUZOkA</p>



Step by step: how to build the “Mini Trebuchet”

Step 1: Collect the materials

Time needed: 9 minutes, with video watching included.

Collect the materials:

- Corrugated cardboard
- Popsicle sticks: 8 pieces
- Scissors
- Pencil
- Milkshake straw
- Hot glue gun
- Tape
- Rubber bands
- String
- Paper clip
- AA size battery or similar size/weight object

Next, watch this Youtube video: <https://www.youtube.com/watch?v=ksG87OUZOkA>



Materials:

- Corrugated cardboard
- Popsicle sticks (8)
- Scissors
- Pencil
- Milkshake straw
- Hot glue gun
- Tape
- Rubber bands
- String
- Paper clip
- AA battery (or similar size/weight object)



Step 2: Form 2 “A” frame pieces

Time needed: 5 minutes

- Cut a popsicle stick in half.
- Form 2 “A” framed pieces – make sure there is a small notch at the top at each A-frame.
- Glue each frame together.



Step 3: The base

Time needed: 5 minutes

Describe the step:

- Cut slots in the cardboard so the A-frame can stand vertically. NOTICE: the distance between the A-frames MUST allow the counterweight (the AA-battery) to move.
- Glue them in place with extra popsicle sticks as supports.



Step 4: Placing the counterweight

Time needed: 5 minutes

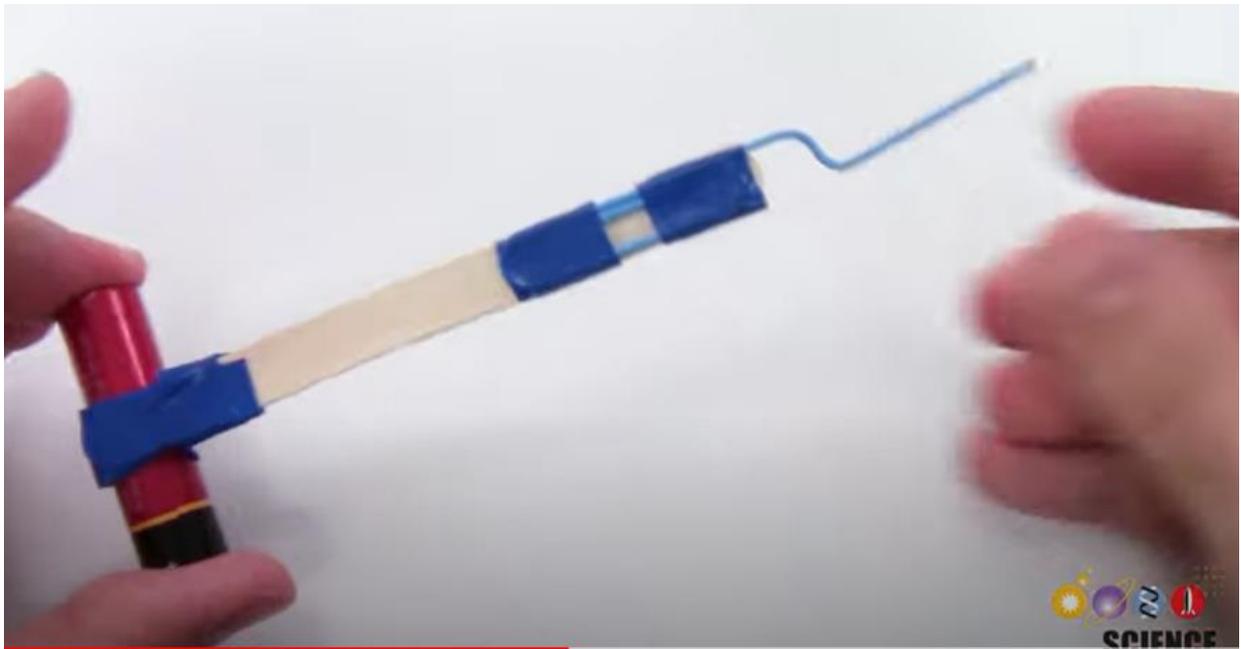
- Tape the AA-battery to the end of a popsicle stick.



Step 5: The hook

Time needed: 5 minutes

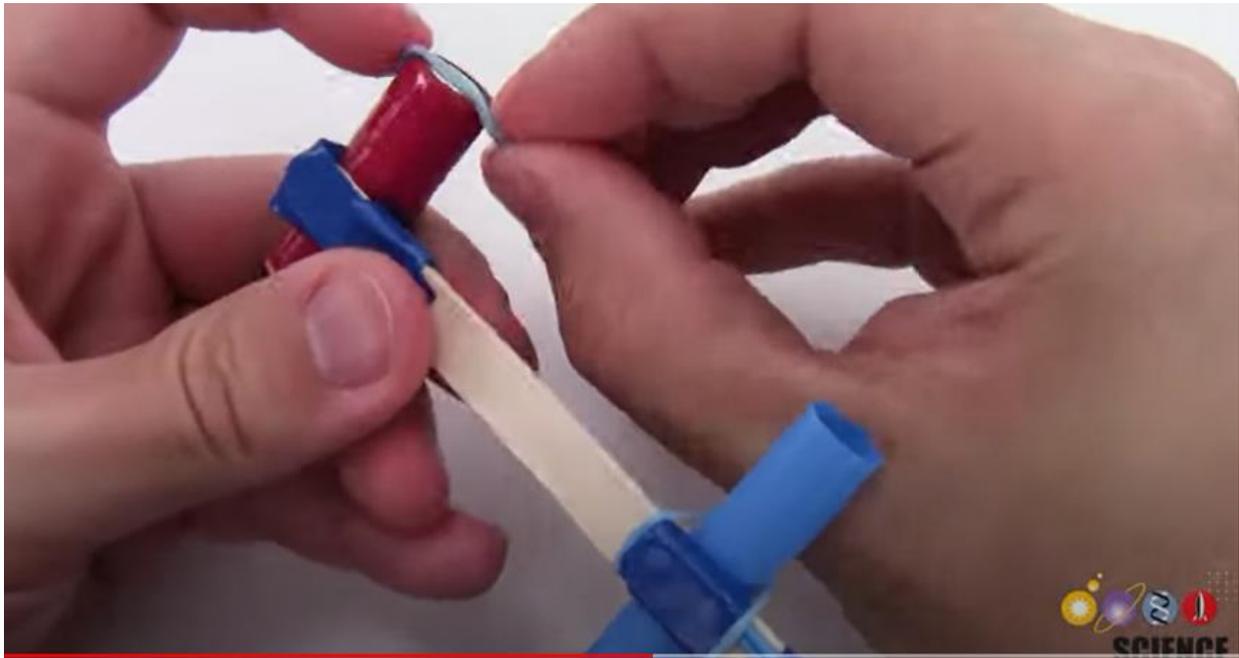
- Straighten one end of a paper clip, leaving it bent slightly upward. (**Notice:** The angle is very important as if it is too flat, it will let the load go too early. If the angle is too large, the trebuchet cannot shoot. It is very important, if you would like to build in larger scales as if the angle is wrong, the shot can go in the opposite direction!
- Tape it to the popsicle sticks with the straight end sticking out.



Step 6: The fulcrum and placement of the axle

Time needed: 5 minutes

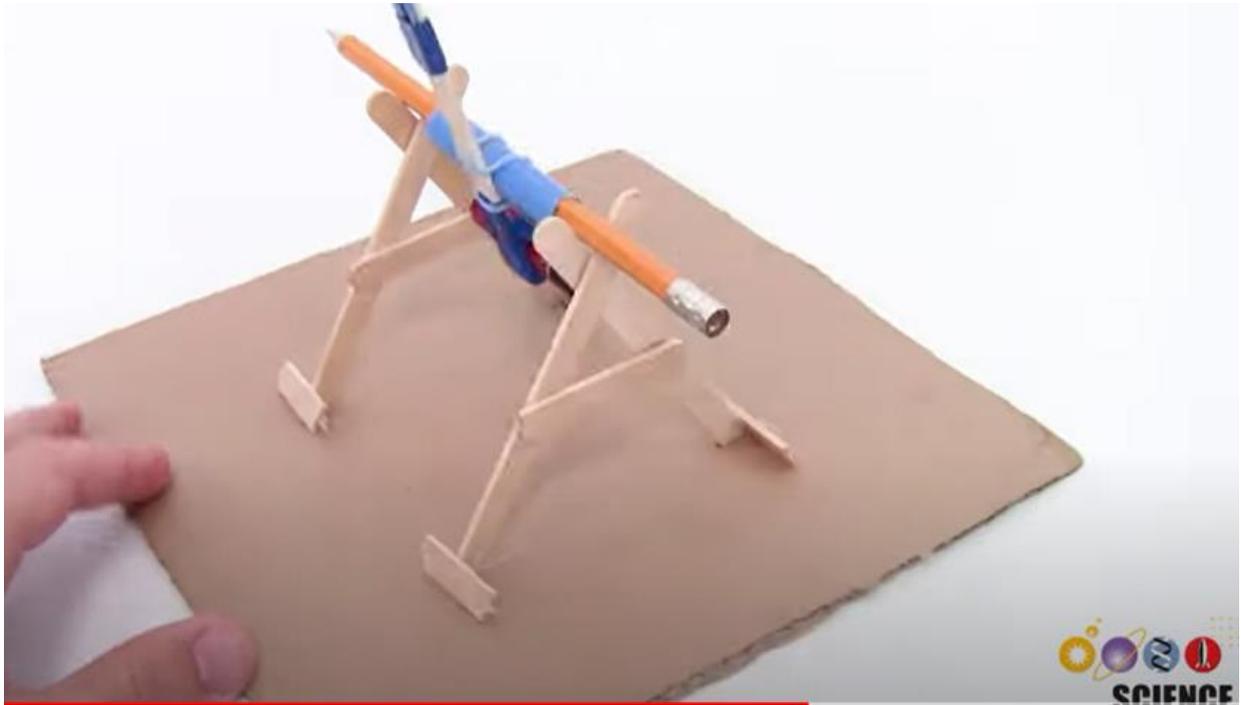
- Cut a piece of the milkshake straw about the length of the AA-battery.
- Attach it to the popsicle stick with rubber bands.
- Position the straw closer to the battery than to the paper clip.



Step 7: Placement of the swingarm

Time needed: 5 minutes

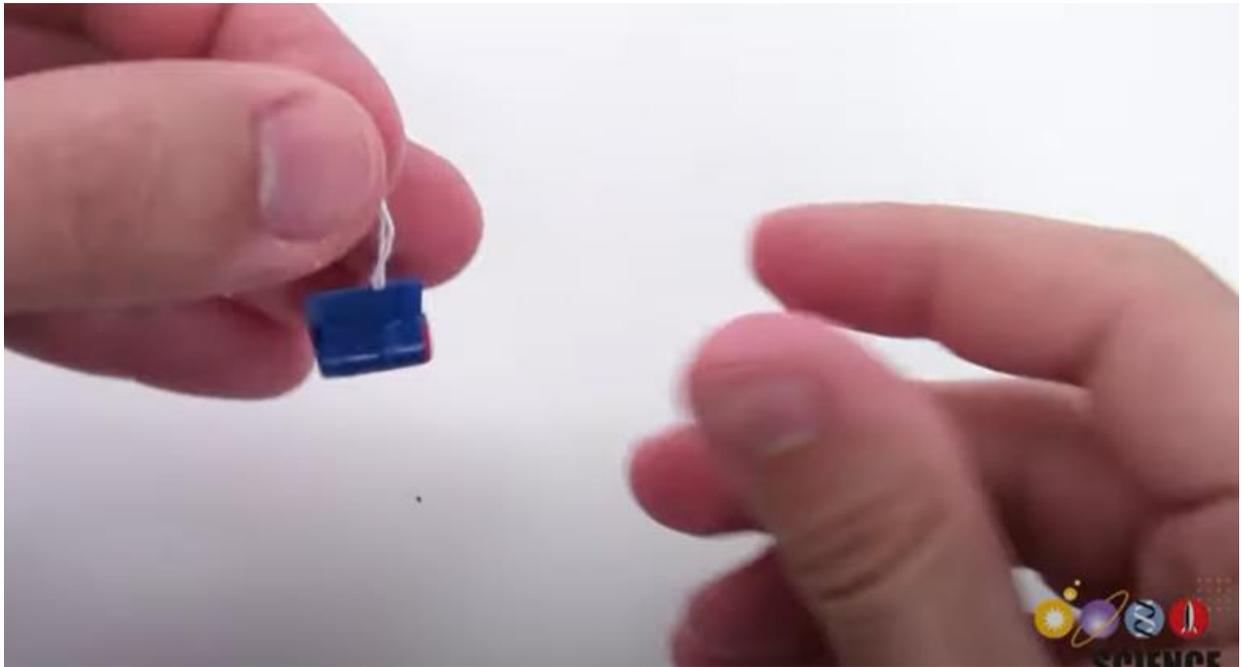
- Remove the eraser from the pencil (**Do not throw it away!**).
- Thread the pencil through the straw.
- Place the pencil in the notches on top of your A-frames.
- Hold the pencil in place with rubber bands (NOTICE: Do not use glue! This way you can remove the pencil to adjust if needed).
- Make sure the popsicle stick (swingarm) rotates freely.



Step 8: Creating the load

Time needed: 5 minutes

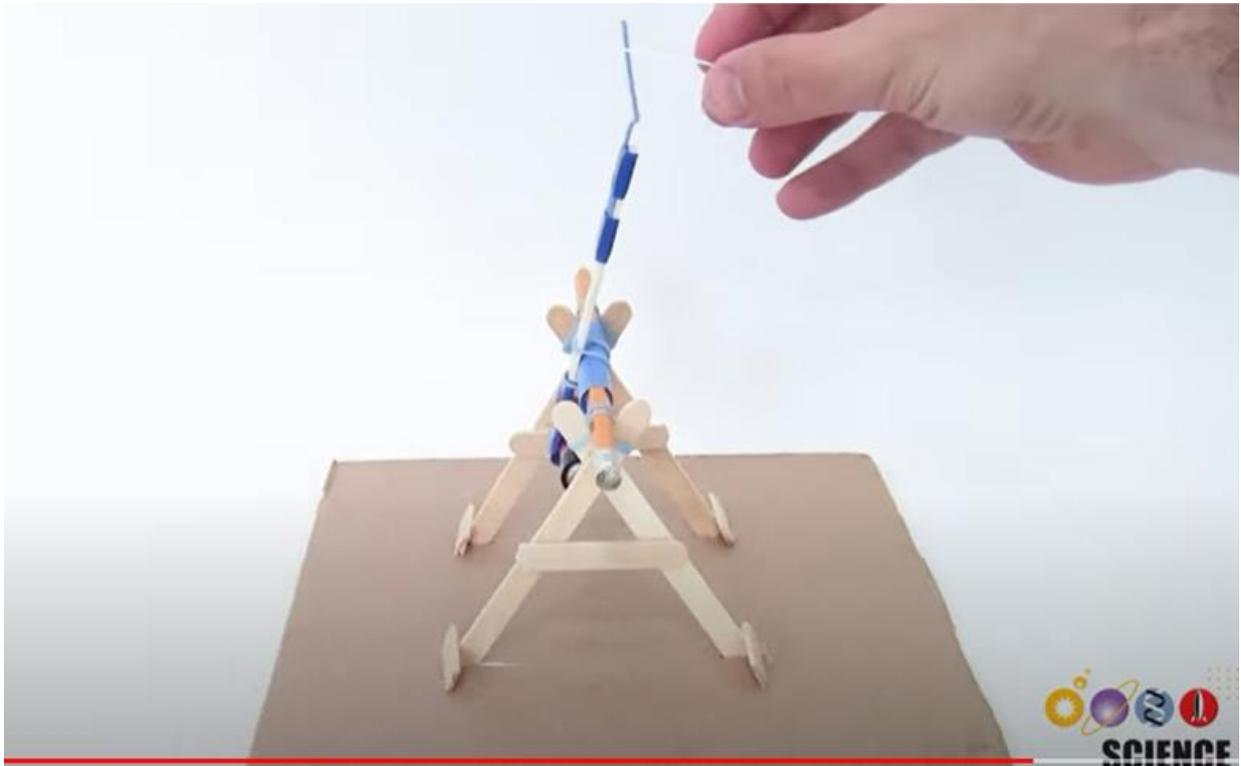
- Tape a small loop of string to the eraser (max. the length of the swingarm without the counterweight).



Step 9: Launching the load

Time needed: 5 minutes or probably the rest of the day, as it is quite fun.

- Hook the string onto the paper clip.
- Pull down, then release to launch. (Notice: the string must be between the A-frames to get the best shot.)



Step 10: Adjustments

Time needed: Hard to say

- Competition? If you are several students, it can be quite motivating to compete like this: The longest shot? The most precise shot?
- Consider: Will it be possible to shoot even longer? Is it possible to adjust the trebuchet? How?

Other Trebuchets:

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

<https://www.youtube.com/watch?v=VvWRk-l246E>

<https://www.youtube.com/watch?v=M1iPxY3FYNE>

