Mousetrap Car Final Design Principles

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1. Define The Problem

My mousetrap car is designed for the 5 meter race, speed. Some of my biggest challenges I needed to considered was the weight of the car, balancing the power between the wheels, and managing friction and traction.

$E = MC^2$

2. Identify Constraints

Some constraints was the time and the mousetrap. In this project we only had two weeks to build with one week of class time and we must use the mousetrap to power our cars.

3. Brainstorm

Design Brainstorm

Principle 1: I am designing my mouse trap car for the 5 meter race. (Speed.)

Principle 2: Constraints

2 weeks to build!

Materials:

- Mouse trap (Approx 4.5 cm by 9.5 cm.)
- 3 wooden sticks/chopsticks
- Cardboard / Wood / Poster Board
- String
- Tape roller / Pocket CD
- Ultra Sticky Foam Wheels / Pocket CDs
- Tape / Hot glue
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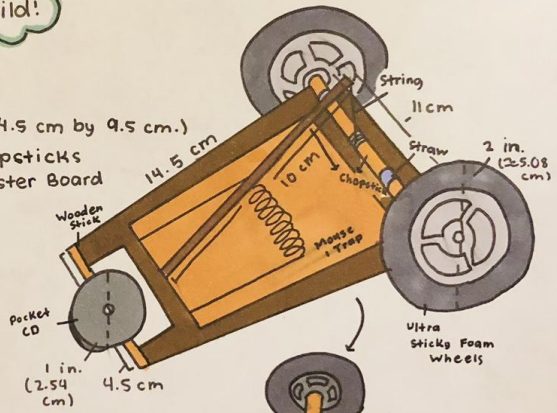
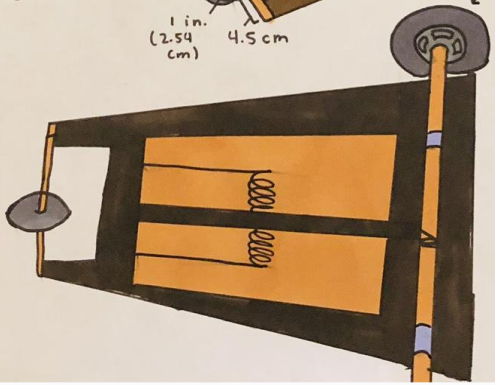




4. Select The Best Solutions

In the end, I used a cardboard and poster board base with a length of about 14.5 centimeters and widths of about 4.5 centimeters and 11 centimeters. I also used 2.5 inch wheels from parts of a toy car to have small enough wheels to increase its acceleration. I used only three wheels, two in the back of the car and one in the front to reduce rotational inertia. As well as, built a 10 centimeter lever to increase the burst of energy in the beginning and used a small, short ribbon attached to my lever to increase tension. Which, therefore makes the string quickly unravel and speed the car up.

5. Build A Prototype

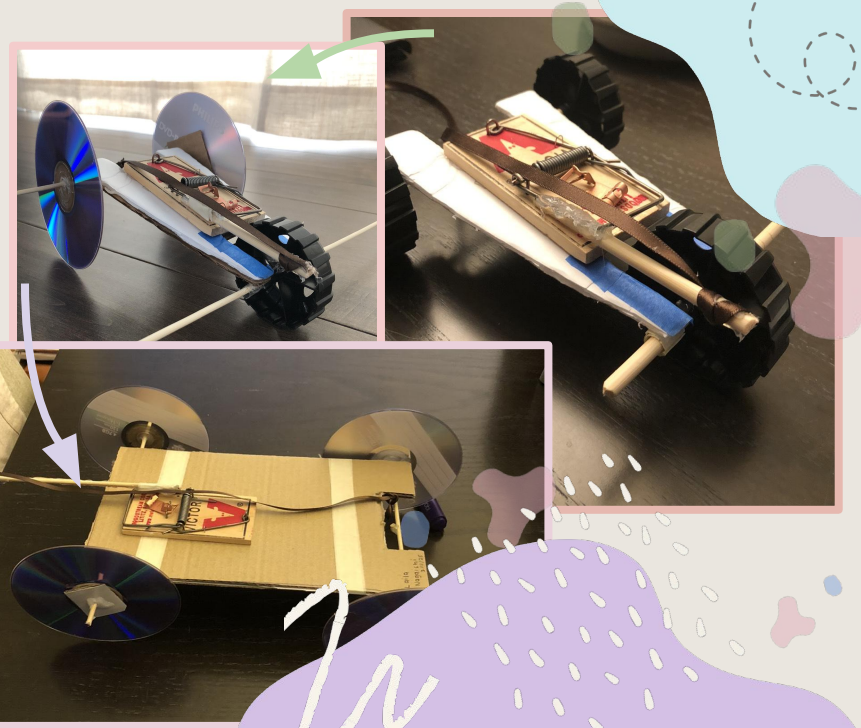
This is my first prototype. I used wheels from a toy truck because they are smaller and used a smaller lever so the burst of energy is used up all at once.

6. Test The Prototype

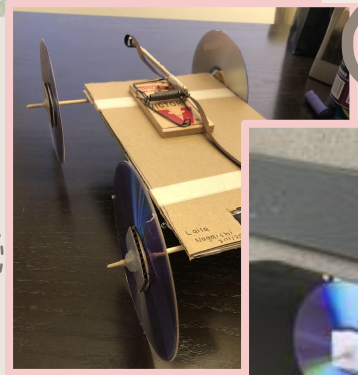
Unfortunately, my car only moved about three inches because the glue at the bottom of the mousetrap car created too much friction. The bamboo chopsticks holding the wheels of the car also was not even, creating bumps. Which, also adds too much friction

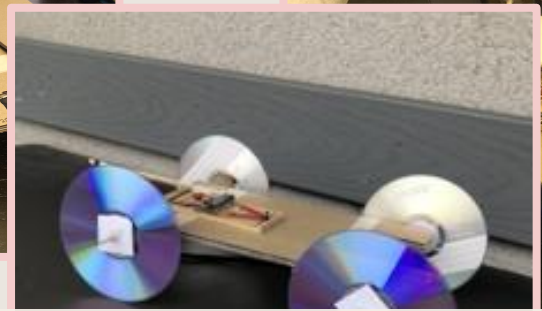
7. Iterate The Prototype

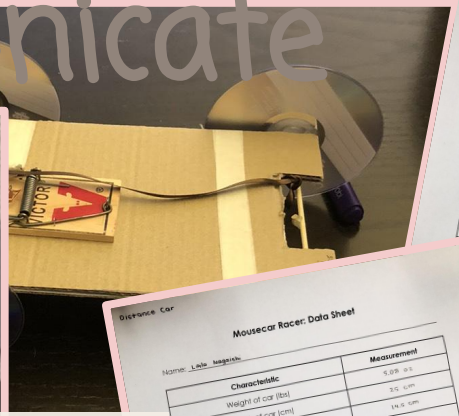
Since the wheels and glue created too much friction on my car, I reduced it by using straws to hold the wheels instead of glue and replaced my wheels with CDS to lessen friction caused by bumps. Then I changed my car entirely to distance because my corrections from before was okay but the results were not what I hoped it would be. So I made a longer cardboard base and used a longer lever for distance.

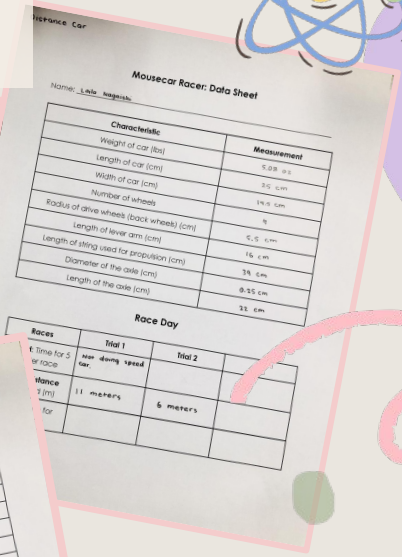


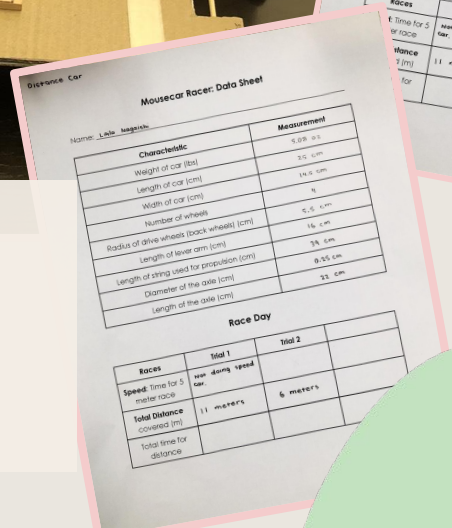
8. Communicate











If I were to make this again, two things I would do differently would be to make a longer lever for the distance car and put tape around it's wheels to increase traction.

9. Science Knowledge - How Did Knowledge of The Science Help You Build Your Car?

One of the things that helped me build my car was knowing mechanical advantage. Mechanical advantage is the ratio of output force by the input force. It is used in our mousetrap cars because it converts the fast burst of energy from the spring and transfers it into a longer lasting but weak output of energy. You need to consider mechanical advantage when building because depending on your car's function it will depend on how much mechanical advantage you want to use in a certain amount of time. For example, in a speed car, you want to be able to have a shorter lever to increase the mechanical advantage and have a quick burst of energy to power your car faster.

9. Science Knowledge - How Did Knowledge of The Science Help You Build Your Car?

Knowledge of Newton's laws of motion also helped me build my car. Newton's first law of motion is that when an object is at rest it will remain in rest and if an object is in motion it will remain in motion at a constant speed unless it is acted upon by an unbalanced force. For a mousetrap car it is important to consider this because you want to find a balance in its wheel's size and weight. The heavier it is the more rotational inertia it has, allowing it to keep moving once starting. However, it also means that it will be harder to start the car's motion. So you have to find a balance between the two. Newton's second law of motion also says that acceleration is directly proportional to the net force and inversely proportional to its mass. This applies to mousetrap car building because it explains how we should keep our cars light weight to make the car faster and travel longer distances.