

Design Cycle Challenge

The Sun Flarez

Group 26



DESIGN CYCLE CHALLENGE

Design Brief:

We will create a Rube Goldberg Machine that works and relates to our visual theme, which is the sun. It consist of a few simple machines and turn out to be a whole complex one. It will start and end with dominoes.

Design Specifications:

1. We will start the machine with dominoes and end with dominoes

Test: Put 40 painted red and yellow dominos at the beginning of the machine and another 10 wooden dominos at the end.

2. Make the machine work

Test: Test the machine numerous times to see which parts are working and improvise to make whole thing work

3. Make things more dynamic:

Test: Don't put all the equipment for the machine on the floor. Make sure that some of the parts are up in the air.

4. Make sure all equipments are stable

Test: search for all unstable parts and put support underneath.

Research:

We did some research about Rube Goldberg. Before we actually started the machine, we only knew a little bit about Rube Goldberg, but then we have researched more about him, later on. Reuben Garrett Lucius Goldberg (better known as "Rube Goldberg) is a cartoonist and engineer. He was born in San Francisco, July 4th 1883. Already as a little child, Rube Goldberg wanted to be a cartoonist, but his dad told him to be an engineer, so he went to study engineering. After he has finished college, he had a job, which involves designing sewer systems. He only earned \$100 a month which is not very much compared to the money, people are getting these days. But Rube Goldberg didn't really like that job and felt depressed, so he changed his job to draw cartoons in newspapers. He only earned \$32, though, which is \$68 less than his old job. People were reading his cartoons a lot, but the reader's liked the crazy inventions, Rube Goldberg has drawn, so Rube Goldberg decided to keep drawing those kind of inventions, which are now known for the "Rube Goldberg Machines". He could think of those inventions, using his knowledge, he had gathered during college, and the experience of

designing sewer systems. Rube Goldberg wanted the machines to complete a simple task, using complex mechanisms and that's how the Rube Goldberg Machine has been created.

We have also done some research on potential and kinetic energy.

Potential and Kinetic Energy – Potential Energy is the energy stored in an object. That means that when an object is not in motion it has potential energy. There are 2 types of Potential Energy: Gravitational and Elastic potential energy. Gravitational Potential Energy is when an object is being attracted to the gravitation of the earth. These kind of objects are normally set in motion vertically, which means they fall down. Elastic potential energy is the energy stored in elastic materials as result of them compressing and stretching. Elastic potential energy is stored in rubber bands, bungee cords, trampolines, springs and arrows being drawn into a bow. The amount of elastic potential energy stored in something is equal to how much it is stretched; the more stretch, the more energy. The more potential energy, the more kinetic energy.

Kinetic energy is the energy of motion. Any object which moves has kinetic energy. So basically almost everything. There are different forms of kinetic energy: Vibrational (Objects that vibrate), rotational (Objects that spin) and transitional energy (When an object moves from one place to another).

Part of our machine was the “Newton’s Cradle” which sadly broke and we couldn’t use it, but we still did some research before that, so we could understand how it actually works. So the Newton’s Cradle wasn’t actually invented by Isaac Newton, but by an english actor, named Simon Prebble. It is just called like that because it is honored to the great scientist and it is also based on Newton’s laws of motion. The uses of the Newton’s cradle are actually only for playing around with it or showing it in class because it has only one function: When a metal ball, at the end of the cradle, is lifted up and dropped, it will collapse with the other 3 balls and the last ball, at the other end of the cradle, will swing up exactly as high as the first ball has dropped and that ball will collapse with the other 3 balls again and so on so on. Also, when, as an example, two balls are being lifted up at one end, the two balls will collapse only on one ball, and the 2 balls at the other end will be swinging up. This process will also work with more balls, but the Newton’s Cradle is normally only using 5 balls. The Newton’s Cradle will also slow down after a time, but it takes a long time to slow down and completely stop.

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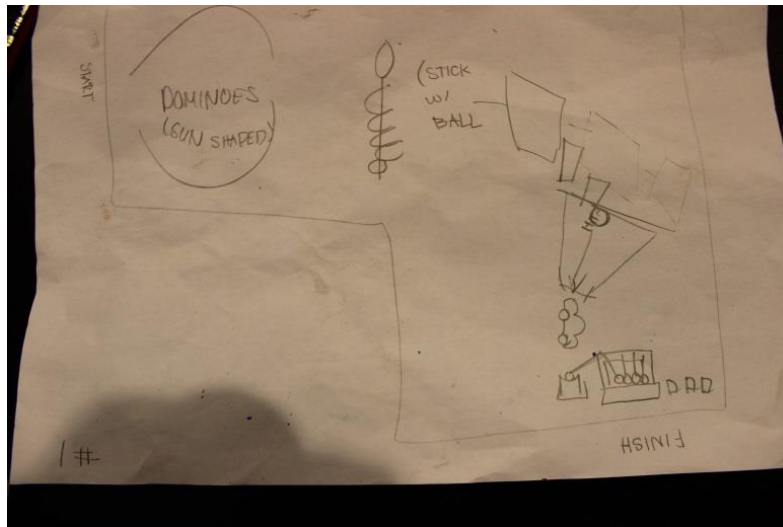
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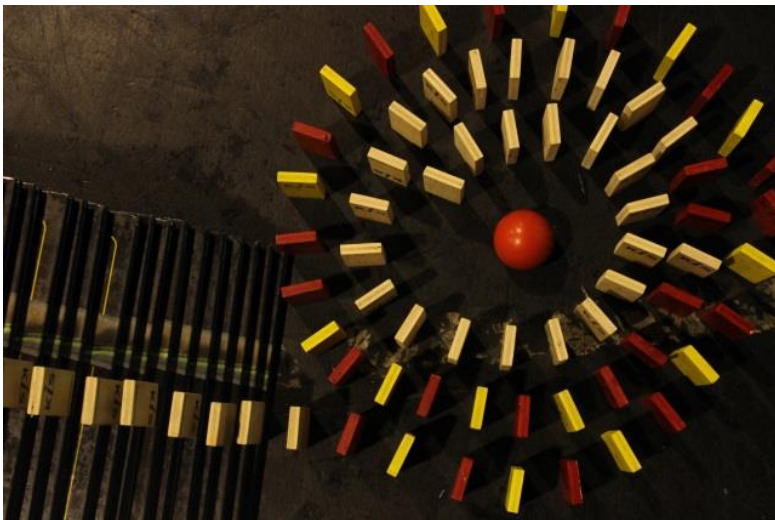
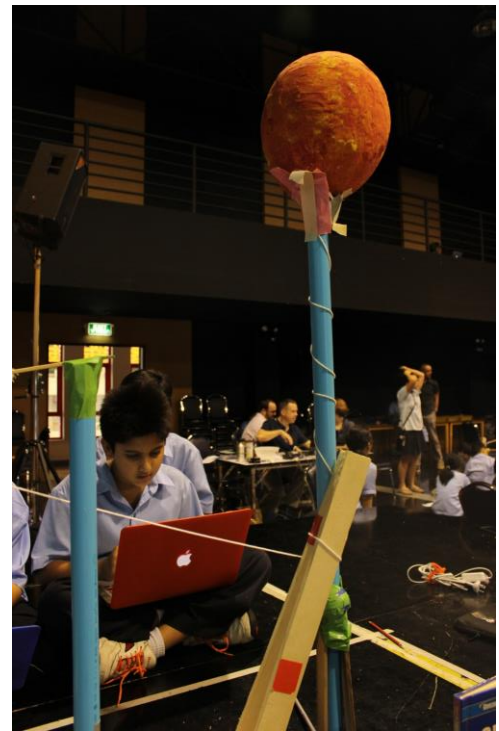


We started with this plan. This was the first few ideas we had. We actually also wanted to put a hairdryer or/and water in our machine but we couldn't because it is not allowed to use outside power sources. Our plan was to push the dominoes on the starting, then the dominoes will hit a big domino which will push away the wooden

plank. The wooden plank will fall and the ball will rotate. When it rotates, it will hit books and the books will hit a ball. That ball will roll down and hit a car. The car will hit a newton's cradle and the newton's cradle

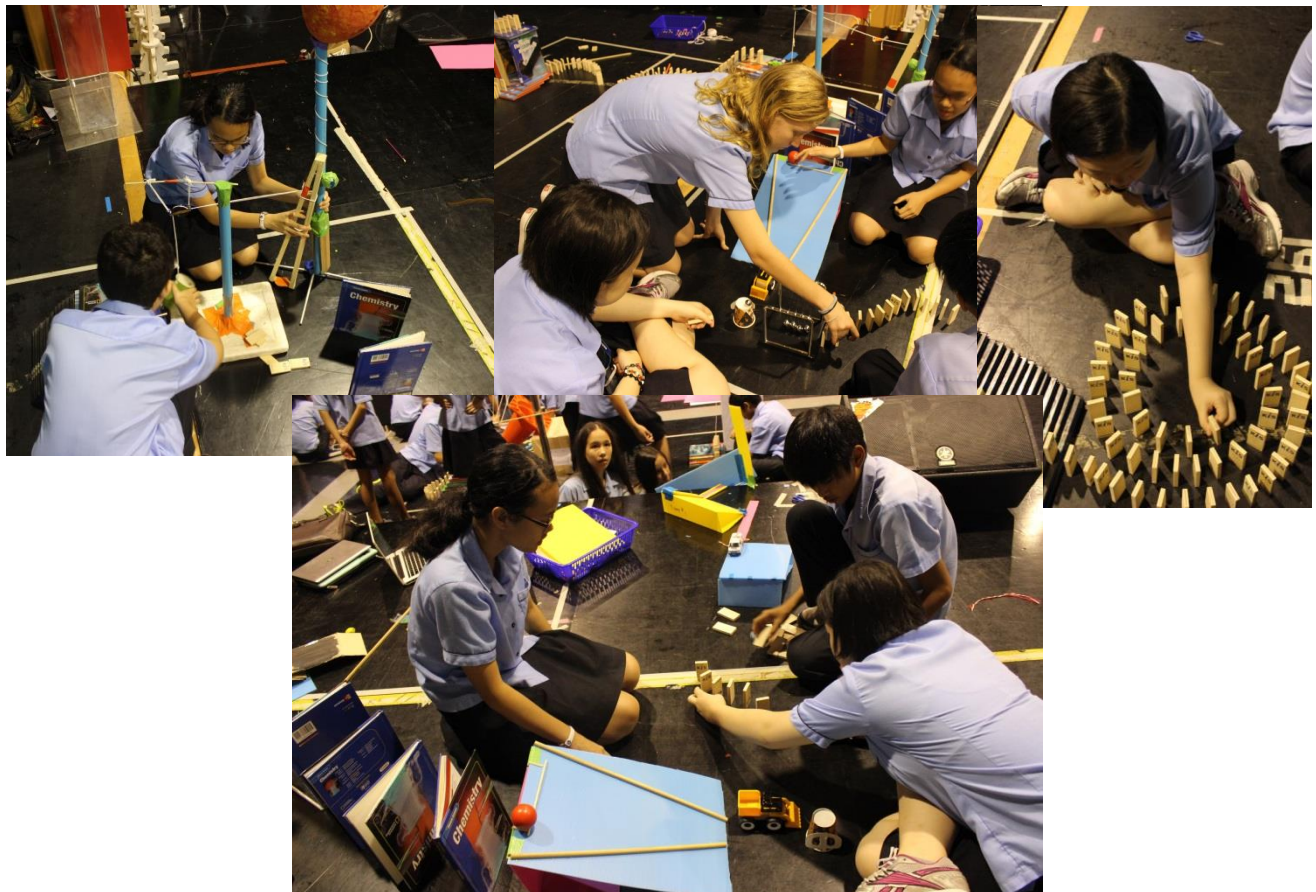
We improvised to this. We decided, to put a scale in the middle of the machine, to make it more complex and last longer. Another thing we put in the machine is a staircase made out of books because we needed a way that the dominoes get up to the scale. We made the staircase out of thin science books and used 2 books for one step. So basically the machine works the same, the dominoes just go up a staircase, then push a car into the cup of the scale and the scale will pull down the wooden plank instead of a big domino.

Then our final one is this. We decided to use this one because everything linked perfectly together and it runs very smoothly. The last one is a more complex idea that still sticks to our visual theme. We changed a few things because there were some accidents that happened along the way (the newton's cradle for the last part of our machine got all tangled up and we weren't able to fix it). We also changed the staircase because if one step was 2 books tall, the dominoes won't be able to go up, so we did the steps 1 book tall and it worked out perfectly. Also, we made a paper Mache sun to express our theme even better. This is because the paper mache represents the sun, which is our theme. The blue ball that's going around the pole represents the Earth. When the ball is spinning around the pole, it will look like the Earth orbiting around the Sun.



Our team worked very well as a group. We organized ourselves in such a way that we were getting everything done without wasting time. One person would work on the starting dominoes; another would work on the dominoes on the bookcase of stairs and fix the car. One person would work on the pulley, the wooden plank and the pole with the ball around it and another would set up the books, the ramp, the car and the dominoes at the end. As three people were enough to set up the machine, the remaining team members would do the report. For the video reflection, we made sure that everyone spoke. Since there are usually two components that are in the video, we split the group into two and three people would explain this, and the others explain the other detail. Using our teamwork and explaining our ideas, we made a working Rube Goldberg machine and a detailed report.

We think this design is the best one we have because we clearly show our visual theme in this machine. The dominoes that are at the beginning are in the shape of the sun and we even added sticks painted red, orange and yellow for the rays. The pole with a balloon on top and the blue ball spinning around the pole resembles the earth orbiting the sun. So, our machine is a combination of simple machines that turn out to be a complex machine that shows our visual theme, the sun.



Our machine worked out pretty well. All of our tests passed. We put dominoes at the start and ended with dominoes. We tested the machine numerous times and improved everything that needed to be improved to make the machine work more fluidly and to have more complexity. Our entire machine wasn't on the floor. The ball on the pole wasn't touching the floor; the dominoes on the staircase of books weren't touching the floor either. We looked for all the unstable components in our machine, which were the staircase of books and the wooden plank and made them stable. For the staircase, we put support on every 3 to 4 layers to prevent it from toppling over and we made a better base for the wooden plank too.

Our original design was to start with dominoes, and then a bigger domino will knock down the wooden plank, releasing the ball making the ball knock over books making the books knock over a ball, that hits a cup which has a ball of the newton's cradle and hits a few dominoes advancing to the next machine. Now, we improved it and made it a bit more complex. It still starts with dominoes in the shape of a sun, but now we added a pulley to help pull down the wooden plank. We changed our finishing part from having the newton's cradle and cup, to just a truck knocking the dominoes advancing to the next. For the car that was to be pushed into the cup pulling the wooden plank, we used two dominoes to knock it over instead of one to give it more of a "push". We only made a few minor changes, but that totally changed the results of the machine.

We worked hard together to make the Rube Goldberg machine and then we tried make it better. Before we make our machine, everyone researched the information about the Rube Goldberg machine and the materials that are related to our theme, sun. Everyone gave lots of ideas to make every part of the machine related to the sun. After the planning, everyone started to make the machine. Although there were lots of things that made everyone to be disappointed, but still everyone did their best to improve the machine. It was a great week working with new different people.