

Design Cycle Challenge Week 2013

Team #12- Report

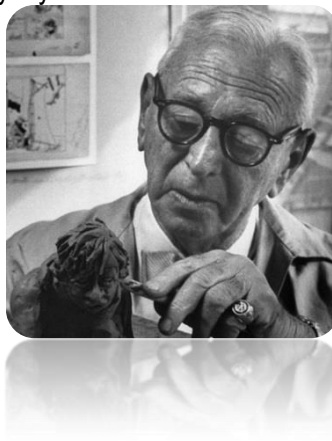
Inquiry and Analyzing:

Design Brief- Our goal is to create a Rube Goldberg machine that best matches our theme. In order to do this we will be using objects such as boxes, wood, marbles, dominoes, pipe, future board, tape, string, and clay. We will also do some internet research for some inspiration and unique ideas.



Research:

History: Reuben Lucius Goldberg was an engineer, inventor, sculptor and cartoonist. He was born in 1883 in San Francisco. Reuben Lucius Goldberg started training himself to improve his art skills. Later his father sent him to the University of California at Berkeley. After graduating in 1904, he helped design the sewer systems in water and sewers department. After working there for many years, He was assigned to sketch sportsmen during the sport events. He became the sports cartoonist in San Francisco. In 1922, he earned \$100,000 a year. He won the Pulitzer Prize in the 1948. The Smithsonian Institute in Washington D.C. organized an exhibition that displayed his life's work in 1970 just a week before his death. He was the first cartoonist that had been honored. Rube Goldberg spent about 55 years drawing cartoons of machine. "For instance, his cartoon invention of an automatic garage door opener used a bathtub, a flower, a bumblebee and an athlete. He had an extraordinary style and worked over 30 hours on each invention cartoon".



Physics involved in Rube Goldberg Machines:

Velocity- the speed of the action

Acceleration- is the change in the speed such as increasing or decreasing.

Potential Energy- is the energy the object contains when it's not moving at all.
 Momentum- is the speed or force of the object when it's moving.

Best Ways to construct a Rube Goldberg Machine work:

- Use slippery objects such as shiny papers, and plastic which also relates to friction.
- Using levers can be really helpful as they are really useful when you need to connect your machine together.
- Use objects that will slow down the speed of your machine such as long strings and ramps.
- Use objects that are really noisy and have a hard surface too.

Design Specifications:

1. We will use only two marbles for our Rube Goldberg Machine.
2. Our Rube Goldberg Machine will be based on the theme given to us.
3. We will use dominoes to start and end our machine.
4. We will only create one wooden ramp.
5. To start our Rube Goldberg Machine we will use an object that has a good height and a hard surface.
6. We will paint eight of our dominoes green and blue.
7. We will only use blue color future board.

Tests:

For all of the design specifications we will create one checklist and put a tick in it if we have followed that design specification. For example:

<u>Tests</u>	
We will use only two marbles for our Rube Goldberg Machine	✓
Our Rube Goldberg Machine will be based on the theme given to us.	✓
We will use dominoes to start and end our machine.	✓
We will only create one wooden ramp.	✓
To start our Rube Goldberg Machine we will use an object that has a good height and a hard surface.	✓
We will paint eight of our dominoes green and blue.	✓
We will only use blue color future board.	✓

Works Cited

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Developing Ideas:

Design Ideas-

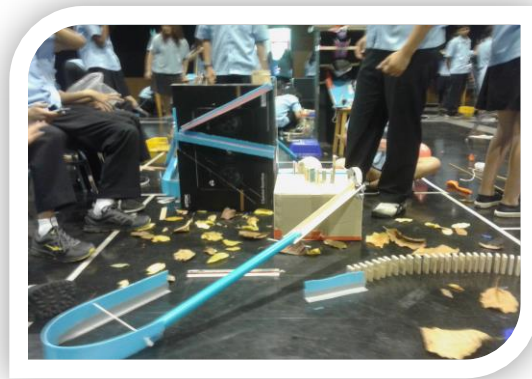
1. Our first idea was very basic and simple which was just to create a pathway using wood, a pipe, marbles, string, plastic containers containing marbles for more weight, future board, and dominoes. For example, we would start with the dominoes and then with a string we would connect a domino by attaching clay with a marble that would be placed on the ramp which would be above the plastic containers. We would use two plastic containers which were filled with marbles and we placed one plastic container on top of the other one. Then we would connect a pipe with the wooden ramp placed on top of the containers so that the marble can pass through it easily. After that we connect a future board at the end of the pipe and bended the future board with a string which looked like a semi-circle. Finally, we thought to simply place the dominoes so that our machine could end with dominoes. For our theme we thought to use a green chart paper and cut some leaves out of it and blue chart paper for water effects.

2. As we started to look at other team's design ideas we felt that ours is very simple and has no creativity involved in it. We decided to keep the same idea but add some changes in it. We thought to use objects that are high in height. We thought to use a box instead of plastic containers and on the box we would create two ramps with future board so that the marble will be able to pass through it easily. So now our machine would start with dominoes with one domino connected with a domino by a string which would be placed on the box. We would place some dominoes on the box in a circular shape and then after that a marble in front of it. For example, if we hit the dominoes placed at the start it would also hit the dominoes placed on the box. As these will fall down they will hit the marble and then the marble would start to move through the ramps on the box. After that we would have another box placed down on the floor which would have dominoes placed on top of it so that the marble could fall down the box and hit all the dominoes placed. Then we would place a tape roll with a chopstick stuck on it. We would do this so that the dominoes could hit the tape roll which would hit the marble placed on the wooden ramp. Then the marble would move all the way through the ramp and come out of the pipe connected to it. As we had the semi-circle shaped future board glued with the pipe we thought to just end our machine with dominoes placed all the way through the finish point.
 3. We thought that the second idea wouldn't work every time and would be risky due to the semi-circle shaped future board so we decided to change it a bit. We first tried to figure out where the problem would be and at which point would it stop working. Then we thought that the semi-circle future board would cause the marble to move another and won't really hit all the dominoes placed. So we thought to stick a ruler to the place the marble would first move and then stick a piece of future board to the point the marble would move after hitting the ruler. After that we would place the dominoes at the end of the future board all the way through the finishing point. For our visual theme we have thought to paint eight of dominoes blue and green and scatter some leaves on the floor.
- ✚ Basically, we didn't change our ideas instead we kept developing and improving them by using everybody's ideas and opinions.



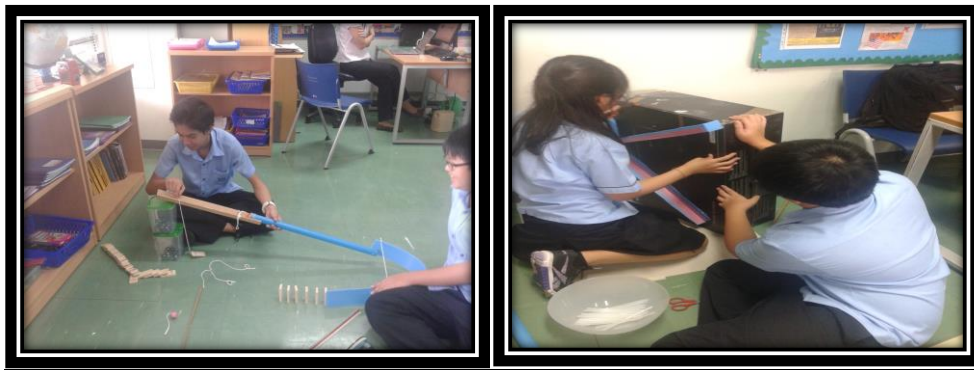
Justification of the design chosen-

We chose the third design because we felt that this design will be really creative especially in the way it reflects our visual theme. Another main reason is that after we tried making it we checked to see if it worked or not and it did work due to which we all very really happy and decided to use this design. If we compare our third design to the first design it is a lot more developed and creative. The first one was really very simple but this design is unique. We really like the way the third design is created such as the ramps on the boxes and the dominoes that are painted are reflecting our visual theme effectively. We think that this design is really well developed and when we compared it to other team's machines it seems to look equivalent. This is what makes us feel good and due to this we decided to choose the third design as our final design.



Creating the Solution:

Collaboration-





Visual Theme-

To reflect our visual theme we have painted eight pieces of our dominoes blue and green. We have also used only blue future board for our Rube Goldberg Machine to reflect water. Lastly, we also got some leaves and scattered them down on the floor.

Evaluating:

Critical Evaluation-

We think that we tested our design specifications effectively which really helped us achieve our goal. The table that we created made our work really simple as it reminded us of what we needed to follow every time. Due to this we followed all the design specifications that we had written before creating our machine which is a really very good work. However, we can still improve it and make it a lot better as sometimes we couldn't really open up our laptops. Apart from that, we think that creating a checklist was the best way to test our design specifications.

Changes made throughout the design cycle process-

We made numerous changes while creating our Rube Goldberg Machine such. For example a few of them are, we kept changing the placing of the dominoes when our machine didn't work. Also first we thought to use only one ramp but then we added two more ramps. Before we had planned to use plastic containers but instead of plastic containers we later used a box and we also had planned to use one marble but then later we used two marbles. For our theme we had decided to use blue and green chart paper first but later we painted our dominoes blue and green and scattered some leaves on the floor. Lastly, as I had said before we kept making changes and developing our design idea due to which there are so many changes.

Improvements-

We think that our machine needs a lot of improvement as doesn't work every time we test it. We could improve it by adding more ramps to the machines and placing the dominoes correctly. By doing this the marble will move by itself and won't require anybody to touch it. We also need to improve the way we reflected the theme given to us as it isn't really noticeable. We could improve it by painting all the dominoes so that everybody could see it. Lastly, we would like to say that we think our machine lacks a bit of creativity when we compare it with other machines.