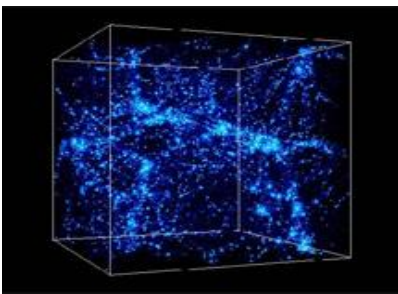


## Team 2 (BuoLoy) Rube Goldberg Report

Group Members: Aou G10, Turbo G9, Cherry G8, Monet G6, Minsue G8

Rube Goldberg is a gigantic machine made out of small components of materials. It might go up and down or make the objects fly instantly and so on.

First of all, we needed to interpret the theme based on the picture designated by the teachers. Our photo was a picture of a blue splash covered in a white box.



We came to a conclusion that the main theme of our picture that the blue splash inside the box symbolizes the universe. So what we had to do is to design our Goldberg related to some objects flying around the universe. (eg. Milky Ways, asteroids, planets, etc.)

After analyzing the theme, our group has done some researches from the sites where it describes about some of the features in the Rube Goldberg. Here are some of our group's research notes and the bibliographies of the sites we have accessed.

- Rube Goldberg is a chain-like reacting machine with various components connecting to each other to create one movement.
- From the videos we have looked Rube Goldbergs mostly need the kinetic force from upwards to downwards in order to create a high power for the objects to move fast
- Objects can either stumble on to each other creating a domino shape, blast like a rocket, or even change directions by deflecting on to the obstacles.
- Milky way is an object appearing in the space where the white objects makes kind of like a route shape.

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Before jumping on to the design stage we have made some specifications (guidelines) in order to make our machine much easier

### **Design Specifications**

1. We will use the pulley movement to create more energy for the marble to move
2. We will start our machine with dominos and end with dominos
3. We will design/decorate our machine related to space.
4. We will try and make our machine last less than 30 seconds
5. We will use some of the equipment we brought from home/outdoors.

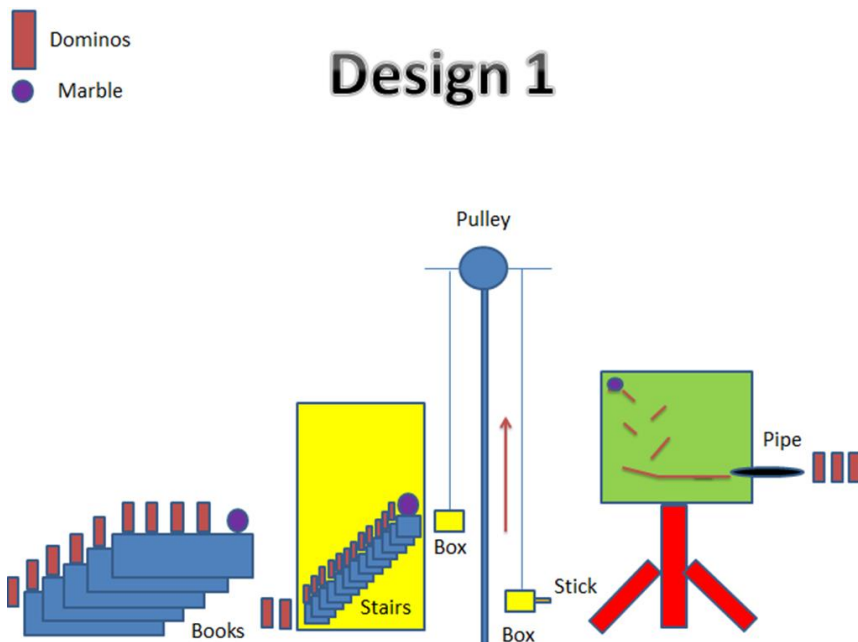
In order to see if our machine would follow these specifications, we also made some tests in order to compare the machine with the specifications to see if it would pass or fail.

### **Tests (matching with the specifications)**

1. Investigate if there is a pulley installed in the machine.
2. Check if there are dominos at the beginning and at the end of our machine.
3. (Debatable) Analyze if the theme matches to the construction style or decorations of the Rube Goldberg.
4. Check the amount of time taken using the calculator.
5. Investigate if the Goldberg consists anything which the school didn't provide us.

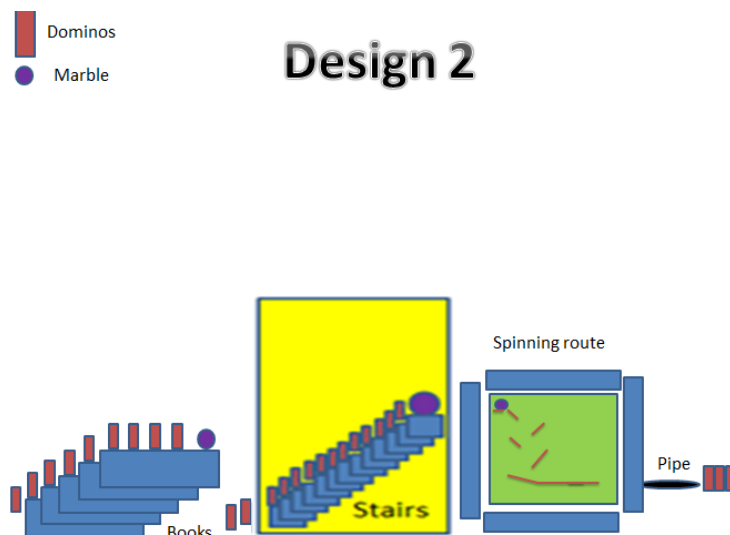
Based on the data we accumulated, and trying to match up with the specifications. We have gathered our ideas together to make some brief designs of what to do. These are 3 main designs we have thought of before going on to the making stage.

1.



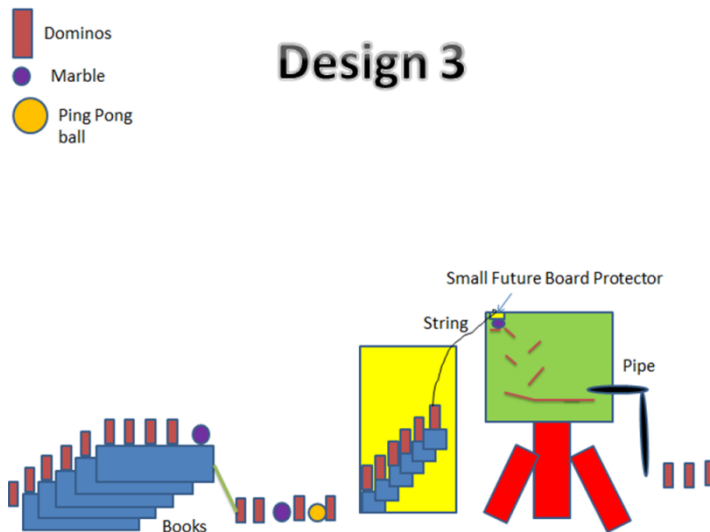
This is where the dominos fall over consistently on the staircase attached on the future board wall. On the last step, the marble will drop into box making the left-hand box heavier as it drops down meaning the right-hand box will rise up. As the right-hand box rises up, the stick attached to the box will knock the marble on the comet section (coloured in green). The marble will bounce into every wall, eventually ending up rolling into the pipe then knocking over the final dominos.

2.



The thing that is changed from the design one is that instead of the pulley, we thought of installing a spinning route around the box where the comet route is standing on to make the machine take more time from reaching to one end to other.

3.



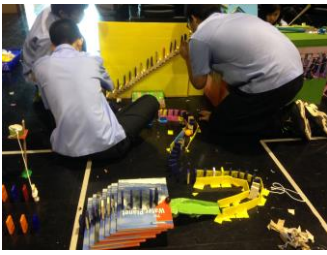
The final design will be used if our building stage is not going fast enough. This design differs from the second one are by three things. One is that the final domino is connected to the future board protector. As the last domino falls the protector will loosen the marble to make its comet movement. Second one is the domino at the bottom-centre of the picture.. We have added some marbles and ping pong balls to generate more power when it pushes the dominos. The last one is the perpendicular pipe at the end of the design. After the marble falls into the perpendicular pipe, it will smash the dominos at the bottom-end and make the rest of the dominos fall too.

We had some tough moments while choosing the most effective design. Eventually we all agreed on the third design because it is the simplest one so that we can work on a lot of time checking out the consistency and the effectiveness of the Goldberg.

While we were making the Goldberg, we realized that our group was lacking of collaboration. We thought it was mainly because some of us were completely unknown to each other, whereas some of us knew each other pretty well. However, as the time passed, we started to talk to each other and ended up helping each other out when they were having trouble over something.

We also had controversies over the certain issues such as the collapse of stacks of dominos, or the misplacement of the machines. But we didn't blame at each other. (Well, we got a bit mad sometimes but those later turned out to be jokes)

Some of our collaborations photos while working on the Goldberg.



Looking at the model we have made, we had a comparison with the theme picture in which we analyzed in the early stage. In the end, we concluded that our design totally matched with the theme “Universe”. This is because of two main reasons.

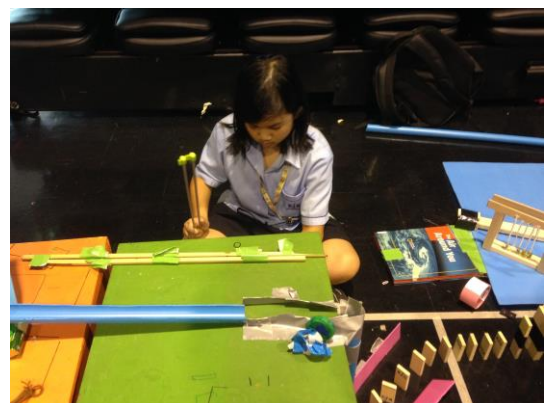
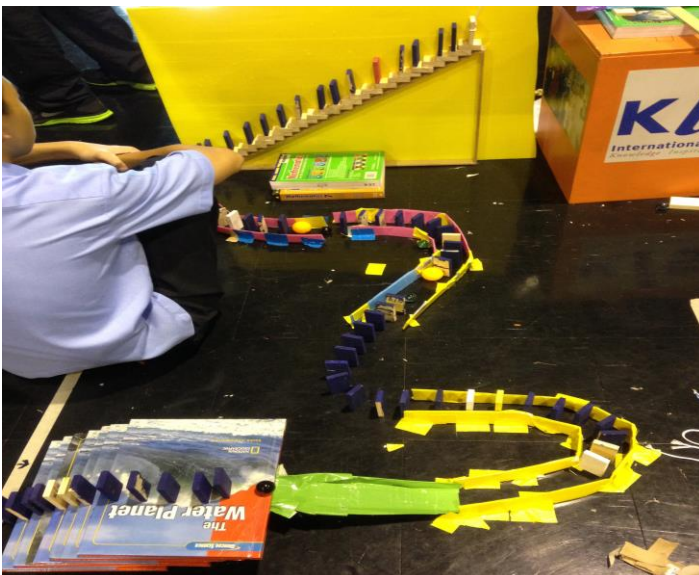
1) Up and downs

Starting from the beginning, our design has tons of parts where the marbles and dominos escalate up and down every few seconds. This is similar to the scene where the spaceships travel up upon the space, stay in a neutral position for a moment, then returning back to earth in a flash.

2) Color

On Thursday, we painted our dominos with indigo and added some white miniature dots on to it. The indigo symbolizes the colour of the space, and the white dots represent the sparkling stars spreading around the whole universe.

After making these changes, our final design is done. It looks like this.



For the final part, we made a table of comparison between our final product and the specifications by using the tests we have shown below the specifications on page 2.

**Table of Comparison (Specifications & Final Design)**

| Specifications | Success or Fail | Extra explanation                                      |
|----------------|-----------------|--|
| 1              | Fail            | The pulley was discarded because it was too complex to |

|   |         |   |
|---|---------|---|
|   |         | build it  |
| 2 | Succeed | That's what the school was looking for  |
| 3 | Succeed | Milky Route, Comet splash, Stairway to the Universe, and the universal dominos all have something to do with space. |
| 4 | Succeed | Time taken: 16.20 seconds   |
| 5 | Succeed | Things used which aren't given by the school: Peppermint can  |

Of course, there will be some moments during the construction where your group has to make some changes to the things you are making in the group. No exception for us. After few tests on the final model we have built, we were delighted about the Stairway to the Universe which we thought it will fail most of the times. In contrast, it turned out that the Stairway to the Universe and the Comet run were the most successful parts in our Goldberg.

The only problem we had was the miscalculation of finding the force pushing the dominos. From what we have tested, we saw lots of mistakes coming in the Milky Way zone. Sometimes the dominos stuck on the side walls making the rest of the dominos unable to continue, other times a lot of our teammates complained about the mistakes happening every time while setting up the dominos on the Stairway to the Universe.

We have created some solutions to the two main problems explained above.

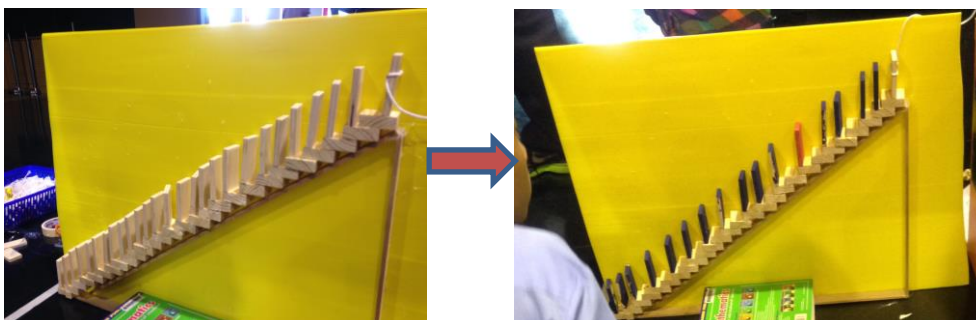
### 1. Dominos stuck?

Since it's hard for the dominos to move its way in such as narrow gap between the walls, we have decided get rid of those dominos and replace them with some more ping pong balls to roll and knock over the dominos more efficiently.

Result: It worked out very well.

### 2. Problem with construction?

Looking at the steps on the stairways, we thought it might be possible to set the dominos every 2 steps. It might look like a gamble, but we thought if this works out consistently we will be less tired setting up the dominos on every steps.



Result: The dominos crumbled down more fluently and it took way less time to set the dominos.

Finally, we thought that our design could be better (high-teched) looking by adding some of the more complex machines like most of the other groups did. We saw other groups building some kinds of skyscrapers, flying marbles, and balloon pops. Because we focused on the efficiency first, we would craft the simple yet creative machines (like Stairway to the Universe for instance). Overall, we were happy with what we have built and we hope for more developed Design Cycle Challenge for next year.