TEAM 5 (GROUP CINCO) REPORT- ANNI, JANICE, JEREMY, ANUSH AND TERNG.

ANUSH HAD TO DO THE ENTIRE REPORT! :(

Inquiry and Analyzing

- **Design Brief**

We will be using our Inquiring/ Analyzing Skills, Developing Ideas Skills, Creating a Solution Skill, Evaluation Skills, Communication & Collaboration Skills and Innovation Skills in order to create a Rube Goldberg Machine within three days in a group with five people ranging from grade 6- grade 10 (one student from each grade). We will test the consistency of our machines through tests and will use the materials provided by the school and funky materials we have brought from home.

- **How our machine worked**

Our design focuses on the dominoes, marbles and catapult. Our machine starts with a few pieces of small dominoes falling over and eventually hitting the big domino which activated the catapult for releasing the pingpong ball. The pingpong ball then hit a lot of other small dominoes which also eventually hit the big domino which fell on the other small dominos in front of it. There were two separate lines of dominos, one line fell down and activated the see- saw while the other line fell down and hit the marble. The marble travelled on a straight track which led to a ramp and the marble ended up hitting some small dominoes, the small dominoes led up to some big sized dominoes and as the last one of those big sized dominoes fell down, the air pressure caused from it caused the other small sized dominoes next to it fall down in a synchronized pattern causing a chain reaction.

Design Specifications and Test Statements

Specifications	What needs to be done?	Tests
Our machine must only start with dominoes and also only end with dominoes.	Find a way to activate the catapult with the dominoes in the beginning of the machine. The dominoes in the starting point of our machine will be connected with the ending dominos of Group #4 and the dominos in the ending point of our machine will be connected with the starting dominos of Group #6.	Check by looking and having a test run with the machine in order to check if the machine starts and end with dominos.
Our machines must not last for longer than 15-20 seconds.	Restrict your machine to a time limit by only putting the right number of materials for fitting into that time limit. We were successful in doing this. This process might require quite a lot of trial and error.	Take a stopwatch and time how long the machine works from the beginning to the end.
Our machine must relate to the our object of inspiration.	Observe the picture which is the object of inspiration and try to use those characteristics in your machine.	Test if the group members are able to communicate their ideas about how parts of their machine are related to the concept of their image. My group's object of inspiration is a picture of people jumping so our machine is going to involve 2 air-launching devices. **(Catapult and See-Saw)**
Our machine must use at least nine materials. The examples of materials are marbles, car, ramps, dominoes, ping- pong ball,books, clay, catapult and see- saw.	IT'S PRETTY OBVIOUS WHAT TO DO THERE. GET THE RIGHT AMOUNT OF MATERIALS ACCORDING TO THE DESIGN SPECIFICATIONS.	Count the number of materials used in the machine when you see it or look at the list of materials in the Design Specifications.

We are Group #5 so our machine must successfully be connected with the two neighboring teams which are Group #4 and Group #6. The machines be connected to each other my dominos.	Connect the dominos of our group to the dominos of the other two groups by keeping the dominos close to each other from both the sides.	Our machine should successfully start because the Group #4's dominos are connected to ours so when their dominos are falling, the same pattern should continue for starting our machine. The same thing should also be the case when our dominos end, and should successfully start the machine of Group # 6.

- **Research**

- Rube Goldberg Machines

It is a machine which often involves a lot and is used for a very simple task but it is a machine which is built in an over- complex style. The machine is named after a person named Reuben Lucius "Rube" Goldberg. He was an American inventor and cartoonist during the 1900's. He was famous for making cartoons of machines that performed fairly simple tasks in indirect ways with machines that were very complex and overdone. The use of this machine is to go through a long and complicated series of events in order to execute a simple action using the laws of physics and motion.

- Kinetic & Potential Energy

Kinetic Energy is the movement of objects and the energy of motion in them. All things that move have kinetic energy. Objects get their kinetic energy from the energy they produce from motion or movement. Kinetic energy will increase if the speed of a certain object increases. The other factor that has an impact on the kinetic energy of a certain objects is it's mass. Kinetic energy can be measured in joules.

Potential Energy is the energy that is stored by an object and is waiting to be released as the result of its position. A truck filled with explosives is an example of Potential Energy as it is something which is not doing anything right now, but has stored energy which could be released later.

- The Different Types of Simple Machines

Pulley: A simple machine that is usually a grooved wheel with a string through it. The objects on

both the sides of the pulley can be used to counterbalance each other and thereby lift a load. Examples include water wells, elevators and construction cranes.

Wedge: A simple machine which is a compound and an inclined plane with a double slanted surface. It has three different uses which are to detach two parts of an object, lift up an object, or hold an object in place. Examples include knife, zipper and axe.

Lever: A hard and stiff bar which usually rests on a pivo. It is a straight plan which is simply placed on a fulcrum. It useful for helping to transport a heavy or firmly fixed load with one end when pressure is applied to the other end. Examples include hammers, scissors and wheelbarrows.

Gear: A toothed object of a machine which connect with another toothed part to rotate objects, to transmit motion or to change speed or direction. Examples include clocks, drills and automobiles.

Inclined Plane: A flat surface that is slanted or sloped in order to move objects and lift loads. Examples include ramp, driveway and pyramid.

Screw: A machine which requires other machines around it in order to work. A screw can be used to split things and hold things in place. Examples include bolts, bottle caps and jar lids.

Wheel/ Axle: It is two wheels spinning around a rod and it uses rotation to make objects move. It doesn't move a long distance but it takes a lot of force to move it. Examples include bikes, doorknobs and steering wheels.

Developing Ideas

As we experimented our first design, we decided to change it. We have considered that shooting the catapults to different directions will affect other machines. We also have to figure out how to activate the catapults with the marbles. We decided to use dominos to activate the catapults and the catapults will shoot the ball to activate another set of dominos.

Design 1: It involved dominos falling over to cause a chain reaction making the catapult release a ping- pong ball which hit the other dominos. The dominos fell down and hit the car which moved in front **(no ramp)** and caused a chain reaction with a big line of dominos.

The video for this design can be viewed here:

http://kitwiz.ict.kis.ac.th/kvdo//watch_video.php?v=A99BD11KMWDA

Design 2: The design started with dominos falling over to activate the catapult to throw a ping-

pong ball towards the other dominos. The dominos hit by the ping pong ball fell down to hit the car, the car went down the ramp and hit the dominos below. In terms of performance and consistency, this design did the best.

The video of this design can be viewed here:

http://kitwiz.ict.kis.ac.th/kvdo//watch_video.php?v=WWWAK63M5U8R

Design 3: Our final design focuses on the dominoes, marbles and catapult. Our machine starts with a few pieces of small dominoes falling over and eventually hitting the big domino which activated the catapult for releasing the pingpong ball. The pingpong ball then hit a lot of other small dominoes which also eventually hit the big domino which fell on the other small dominos in front of it. There were two separate lines of dominos, one line fell down and activated the see-saw while the other line fell down and hit the marble. The marble travelled on a straight track which led to a ramp and the marble ended up hitting some small dominoes, the small dominoes led up to some big sized dominoes and as the last one of those big sized dominoes fell down, the air pressure caused from it caused the other small sized dominoes next to it fall down in a synchronized pattern causing a chain reaction.

The video of this design can be viewed here:

http://kitwiz.ict.kis.ac.th/kvdo//watch_video.php?v=5R77XSKD4W3

There were various reasons why we chose the third design to be our final design. First of all, it was the most creative of all our ideas and best match the expectation in the rubric of completing three actions. Second, this design was a mix of the previous two designs along with some other additions to it. Our design looked so complicated/ overdone and it was one of the main reasons that our final Rube Goldberg Machine worked very poorly. I (Anush) told my group members that the second design was the best because it worked the best and it also looked cool, but my group wanted to make it look cooler so they decided to make a complicated design which in the end ended up not working well. **SO MAJORITY WINS! <3**

Creating the Solution

Our team wasn't the best example of teamwork and support but overall, I think we did well. We briefly discussed the ideas that we had and about the things that we added because most of us just listened to Terng. Everybody in the group made contribution. Terng **(G10)**

was the leader and thought of most of the ideas, worked on the video reflections, he also organised/ created a lot of the machine. Anush **(G9)** helped minorly in setting up the dominos, thinking of the car idea which was the most consistent idea but removed for some reason and worked on the academic side of this challenge, which was the report. Jeremy **(G8)** thought of some of the ideas in the creation of the machine and also had major contributions helped in setting up the machine. Janice **(G7)** and Anni (**G6)** were very quiet on the first day and stayed rather throughout the whole week. They helped in stacking up the dominos and were distracted most of the times on their laptops. But, considering that both of them were still young, they did quite a good job. We would start laughing instead of getting angry and frustrated each other if any of us knocked the dominos off. We mixed everybody's skills from our group in order to build a challenging Rube Goldberg Machine.

My group's object of inspiration is a picture of people jumping so our machine had to involve materials that made it look similar to the topic. Since, we couldn't use energy from our jumping, we decided to do this by involving 2 air-launching devices. (Catapult and See- Saw). These helped us to show that there was jumping activity going around the machine.

Evaluating

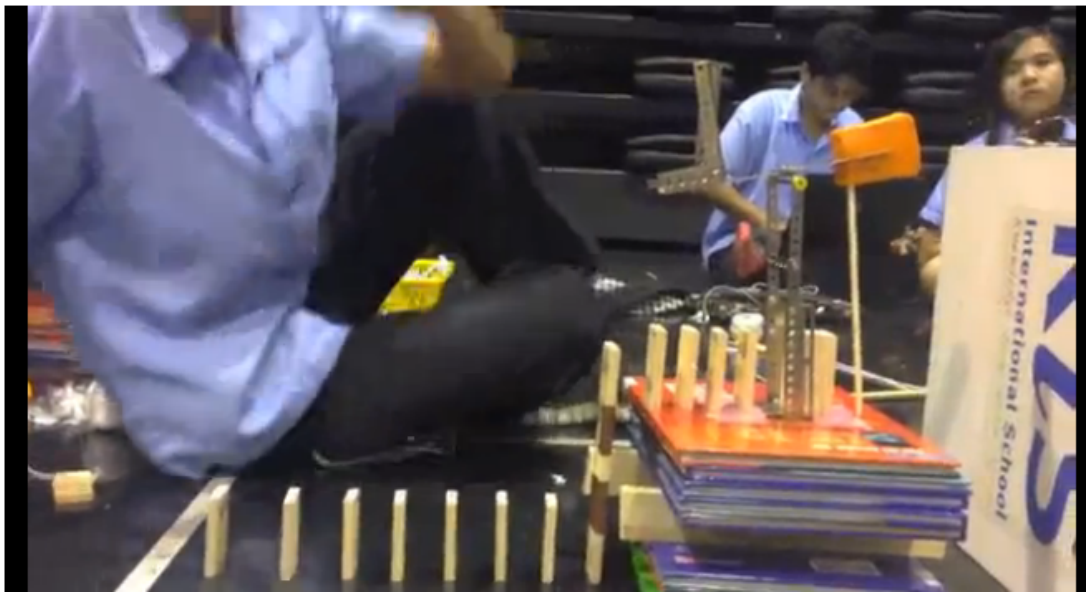
We tested our design specifications by the tests we had set for them in the overall design. We had listed that it was important that our machine lasted only between 15-20 seconds, that our machine starts and ends with dominos, our machine must relate to the object of inspiration and that it should be connected to the other team's machine by dominos. I think that we were successful in fulfilling all these requirements. We were also impressed with the amount of simple machines and materials we used such as a pulley, inclined plane, marbles, car, ramps, dominoes, ping- pong ball,books, clay, catapult, see- saw. We were also satisfied with how we were able to fulfill one of the harder/ complicated requirements of relating our machine to our group's object of inspiration picture. We had to sit down and discuss ideas for this because it was difficult to find the connections in the beginning, but after we brainstormed our ideas, we got the clear idea of what exactly we would include. We had to involve the actions of jumping activities so we added air- launching devices such as see- saw and catapult. In the end, we were also successful in achieving all the requirements/ specifications.

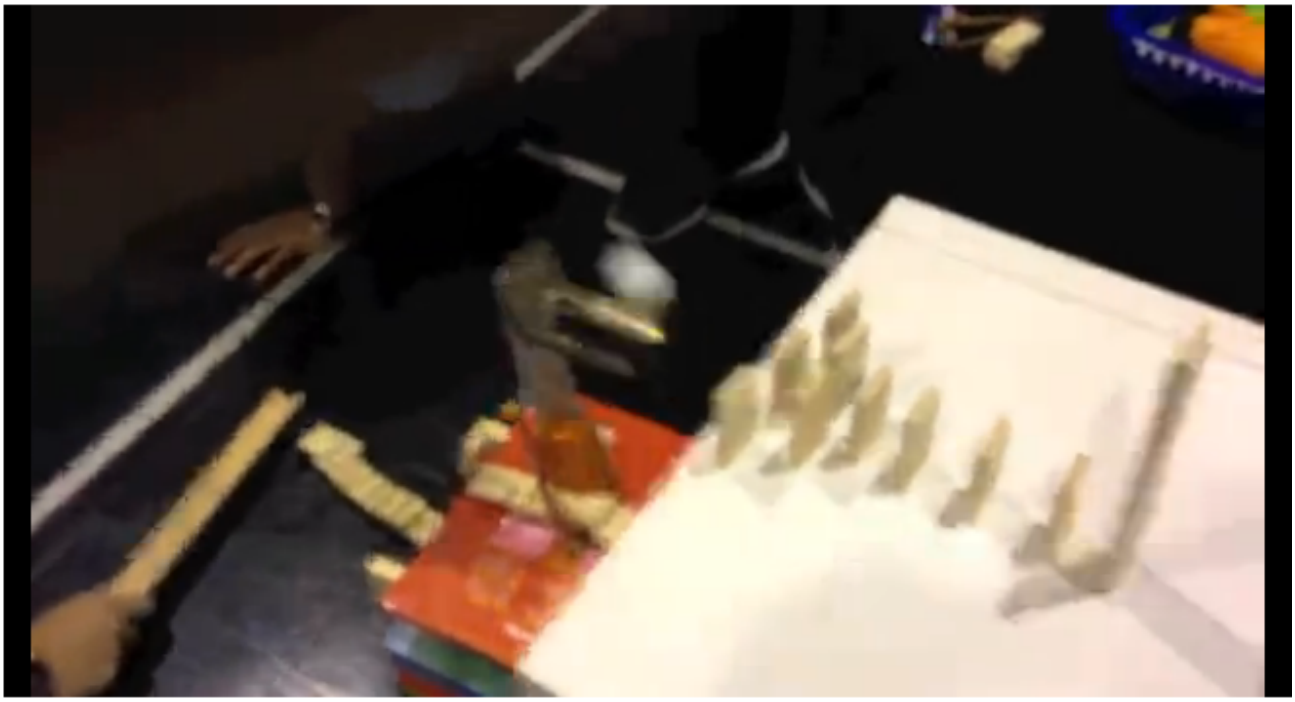
We changed the design of our machine everyday due to the addiction of making it look more complicated which in the end resulted in the machine not working at all. The 2nd design had parts from the 1st design and also some of its own parts while the 3rd design had parts from both the 1st and 2nd design along with some of its own parts. The description of each design is given above in the section of **Developing Ideas.** The 2nd design had things from the first design such as the same placement of the dominos and the catapult. The 3rd design had the

same things kept as same as in the 2nd design. The new things were the see- saw and marble instead of car for making the dominos fall down. Instead of the car hitting the dominos, it was the marble that hit the dominos and caused also the other dominos to fall. Other minor changes included car ramps, see- saw, placement of marbles and a few large dominos were added in the 3rd design.

There were many things that could help improve the machine. We could make the performance of our Rube Goldberg Machine more consistent by making the design less complex and also figuring out the mistakes in the placement of our dominos and catapult. I am happy with how we related our machine to the object of inspiration but I have a feeling that we should have done more things to make the machine related to the object of inspiration. This is because even though we were sure how we related to our object of inspiration, when the audience came around to look at our machine they weren't sure how our machine related to our group icon and we had to do a lot of extra explanation.

Below are some pictures of our machine and group working together:





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