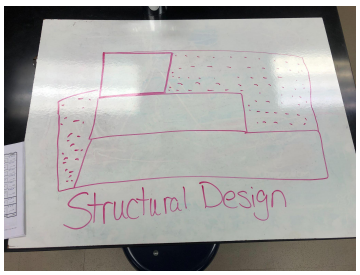
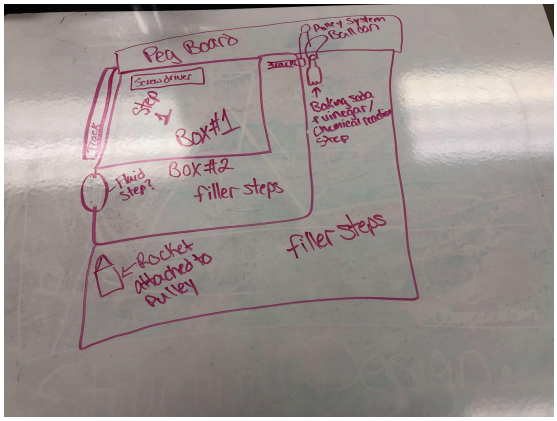
Final Notebook

Planned Machine Sketch

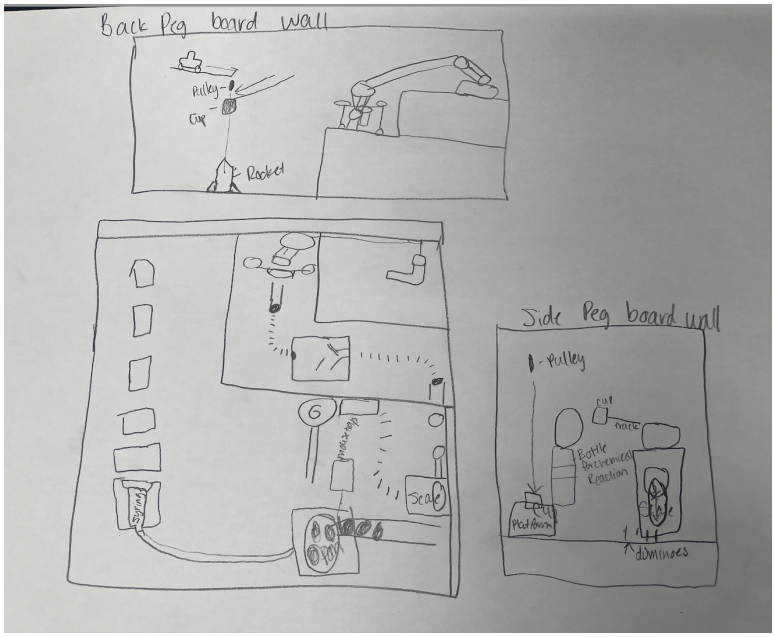


Planned Machine Description

When planning our machine we knew that we wanted to incorporate three tiers, or boxes. This would allow us ample room to add in various steps, and not have to really worry about the size of them. We also wanted to increase the potential energy in our machine. We decided we would utilize this for our advanced components. In the picture below you can see where we had plans to incorporate our advanced components. We knew that this would be a challenge for our team, and wanted to plan out the location of these. We wanted to have a goal to include one component per tier. We also wanted to start the machine with an electrical step, or screwdriver, because we knew that this would be the hardest of the advanced components to complete because none of us had a background in technology. We also wanted to have our final step be a rocket launching, and to accomplish this we wanted a pulley system to "launch" the rocket.

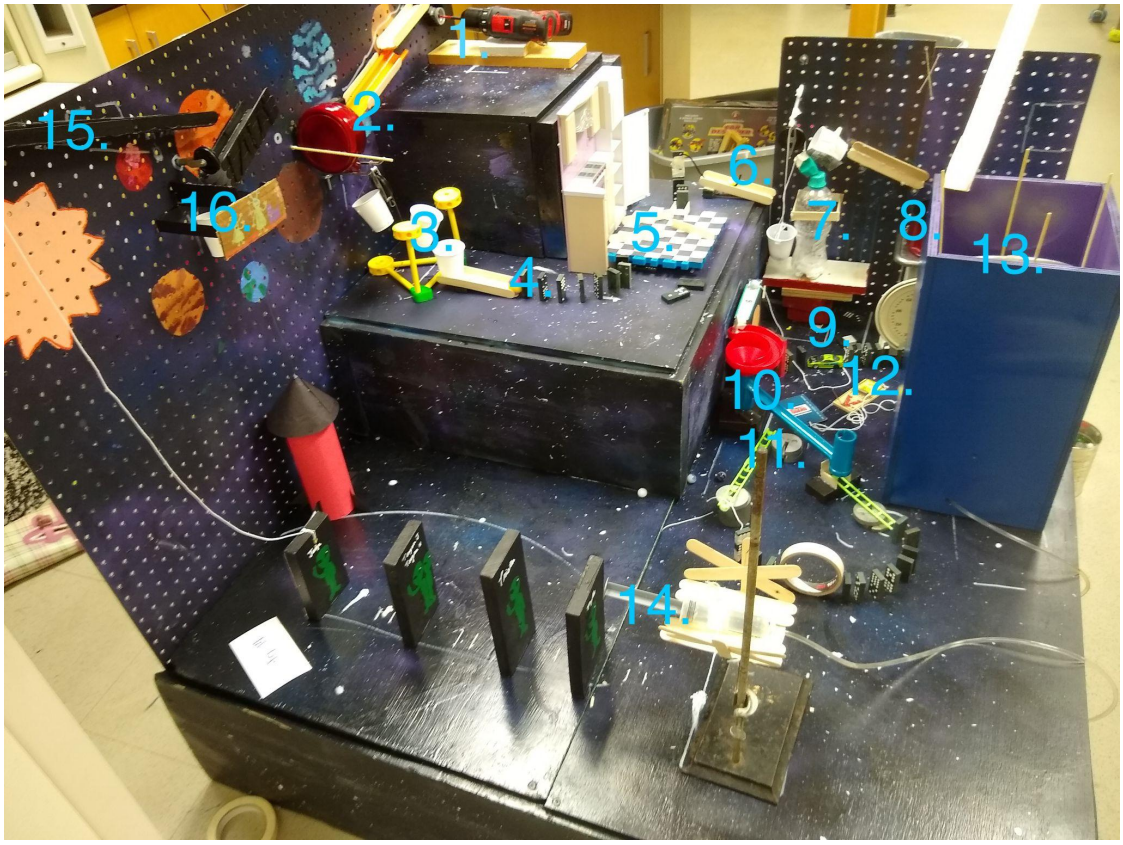


Final Machine Sketch



Final Machine Description

The final machine starts with a screw gun releasing a ball onto a track. The ball then falls into a funnel that leads to a pulley system. This then tilts a cup releasing water which weighs down a teeter totter. This causes a ball to hit dominos. This then knocks over a larger domino with a string attached to it. This releases a ball to hit more dominos and the same step is repeated, this time releasing two marbles. The marbles then fall into a pulley system attached to a balloon with baking soda in it. This causes the chemical reaction step, which is baking soda and vinegar inflating a balloon. This then hits a cup with a marble in it, the marble then rolls down a track into a bowl on top of a scale. This then causes the needle on the scale to move, knocking down dominoes. The dominos then release a marble which falls into a funnel. After this the ball goes down a track which hits more dominos. The dominos then hit a roll of tape which hits more dominos. The marble then hits more dominos which releases a marble that leads to a mouse trap. The mousetrap goes off which releases golf balls into a pot. The pot then weighs down one plunger of a syringe (fluid step). This causes the other plunger to be pushed out and this knocks over wooden blocks. The wooden blocks then release a car that rolls down tracks. The car then falls into a pulley system that then raises the rocket which is the final step.



List of Machine Steps

1. Screw gun starts a conveyor belt with a ball on it (Electrical)
2. Ball goes down track, into teapot
3. Teapot drops ball into cup which tips the water to fall into another cup
4. The cup weighs down the track and the ball rolls off track
5. Ball knocks into dominoes to release a marble onto a maze
6. Another ball is knocked into a cup which lifts the balloon full of baking soda (Chemical)
7. Baking soda falls into vinegar and reacts, then inflates to release marbles out of a cup
8. Marbles weigh down the scale which knocks over the domino
9. The dominos hit another domino attached a a string that releases a marble off of a book
10. The marble rolls into the funnel and through the track to hit a domino
11. The domino knocks over some tape, and then more dominoes. Then knocking down a marble onto a track that hits the mouse trap
12. The mousetrap releases and pulls a card that releases the weights into the pan
13. The pan weighs down the syringe (Fluid)
14. The syringe pushes the other syringe which hits a block
15. The blocks pull a string that releases a car (Mechanical)
16. The car goes down the track into a cup, and the rocket “launches”

Cost of Machine

- Balloons - $0.99 each
- Spray Paint (Donated by Studio 3) - 5 cans, $5.98 Each
- Hot Glue (Donated by NK Schools) - $4.37
- White, Blue, Orange, Brown, Red, Light and Dark Blue Acrylic Paint (Donated by Emily Abbas) - $2.09 each
- Paint brushes (Donated by Emily Abbas) - $3.19
- Construction Paper (Donated by NK Schools) - $3.79
- Tape (Donated by NK Schools) - 2 rolls, $2.49 each
- Small Plastic Cups (Donated by NK Schools) - $6.99
- Fishing Line (Donated by NK Schools) - $0.99
- Marbles (Donated by NK Schools) - $6.49
- Straws (Donated by NK Schools) - $6.99
- Popsicle Sticks (Donated by NK Schools) - $4.85
- Baking Soda (Donated by NK Schools) - $9.24
- Vinegar (Donated by NK Schools) - $14.99
    - **Total cost - $115.47**

Percentage of Recycled Materials Used

83% percent of our materials were recycled from previous years of Rube Goldberg.

Applied STEM Processes -

When we decided to do our fluid step with two syringes, we learned that it isn't a very consistent step. We were constantly struggling to get the syringe to be pressed down by the weights. We then researched ways that we could lubricate the syringe so that it will easily flow. The techniques we figured out are that we could add either vaseline or coconut oil. With this, we would need 2 syringes, coconut oil, vaseline, and a tube to connect it. We tried the vaseline, and it did work a few times, but it wasn't the consistency that we needed. Then we decided that it wasn't working as often as we needed it to, since we couldn't get it to work unless we pushed it to go first. We then decided to try the coconut oil. The coconut oil ended up being immediately rejected, because instead of lubricating the tube it would clog the spout of the tube. So to change this, we got new syringes of the same size and then used water through the tubing. This worked much better, except while thinking through the design we decided to exchange the pot for a can. The can is more direct, so that the weight is easier to be directly applied to the syringe. After more questions arose, we figured out that a smaller syringe could be more beneficial because there is less resistance.

Reflection (1,500 Word Limit) (3 or more challenges or successes you had).
Word Count: 1,487

Teagan J

A success that I had this year was incorporating a new fluid step. By this I mean one that was different from my previous years in rube. I had at first thought that using a pulley system to move water would be a great fluid step, but later discovered that it was not considered a fluid step. A bright side to this is we incorporated the use of syringes, which was also new to me. So I guess this could be considered both a challenge and a success.
Another success I had this year was learning how to properly set up a mouse trap. We had wanted to use a mouse trap in our machine towards the beginning of the design process. We would set it up, but could not use it because it was too sensitive. It turned out we were setting it up completely wrong the entire time. We then watched a youtube video to learn how to properly set up a mouse trap.

One challenge that I faced was being open to new ideas. I often found myself becoming attached to an idea. I would spend days working on it, trying to get it to work. I eventually learned that it was not productive and became more open to new ideas. In my future this will be a skill that will be a great advantage to me. Having the ability to remain open minded, and not dwell on things if they do not work will save me time, and help me be more efficient and productive in future careers.

Jadyn

There were many challenges while working on this machine. The first challenge we found was that our ideas were hard to bring to life. There was one step that I really wanted to incorporate, but the mess that it would make brought a challenge to how we wouldn't spill and destroy the entirety of the machine. This step would be teacups rolling with water inside to eventually hit a domino or other object.

Another challenge we faced was the flow of our machine. Sometimes, we would put steps together, but the steps had repeated reactions, or even a difficult plan of reaction. One step that has been difficult is our hydraulic fluid step. This step has been a challenge to distribute weight, allow the pot to slide, and to hold the pot upright altogether. Finding solutions to our problem with this step has become a difficult task, but through trial and error we have found solutions.

Time has been a major constraint, and challenge for us. We only have a 46 minute class period, which makes it difficult for us to get certain trial runs completed, and at times it would interrupt our flow of steps. Many times we have had to keep going on steps after the bell because the flow is still there, and we need to use it before it's gone.

Balloon size was a major issue while running our chemical reaction. At one point, our balloon was a 12 inch, instead of a 9 inch. So we ended up with many failed reactions, because the balloon was not expanding as much as we wanted it to. Another part of that was adjusting our baking soda and vinegar to the size that was available. We did end up buying more smaller balloons so that we would have an accurate and consistent chemical reaction as we did times before.

As a veterinarian, I will need to use many of these design processes to help diagnose patients. Not only this, but to put this process in the future will help me to become a better researcher. Especially when looking for certain things, I can be able to have an understanding and go through the symptoms and possible treatments.

Taylor

One challenge I faced was being able to help come up with ideas for the machine. I felt like every time I tried, it seemed like it was something that wouldn't work, or was something that no one wanted to add. I had a difficult time with this, since this is my first year doing Rube Goldberg.

Another challenge I faced was trying to figure out how to help with the machine. I felt like if I helped, all I did was mess up what someone was working on. However, there were plenty of times that was not the case.

One success I had was being able to work on our notebook and the final presentation. I felt like I could work on that and not bother everyone else while they worked on the machine and the steps for it since I didn't really know how to help. I found that I was able to work on different parts of the notebook and presentation much easier than working on the actual machine.

Teagan H- I feel like one of the most challenging things in this project was setting up the chemical step. The chemical step is represented by a bottle filled with vinegar with a balloon strapped to the lid of the bottle which contains baking soda in order to create a reaction. We've gone through a lot of trial and error to implement this project. The balloon began enlarging and in certain cases popped, tried to set it up for testing and accidentally activated the reaction, and had to go through the process all over again. Another Issue we've had was we've had a lot of materials that we've looked over but never used. I feel like that with so many interesting set pieces we've had, only very little of them was actually used in the final project. There were erector sets, legos, K'nex parts, etc. that I felt would've been great and interesting for this project. The final issue we've had was that when we would incorporate a huge new step, we would have to get rid or repurpose the machine. I do expect that we would have to make changes to better fit the machine, but I feel with the weighted syringe step that we were kind of cutting it close in terms of the deadline.

I think that the fluid step is one of the best contraptions on the machine, as it uses a complex pulley system which really accomplishes its goal in transferring water. We were able to work with basic materials that we've managed to make complex, like the syringe

weight. As difficult as it was to set up the idea, it was not only different from the rest of our steps, it functions and does its job. Overall It's a fun and amusing time doing Rube.

I thought the new run for the machine was better than before, but I still had a few issues with improving the machine. I had a clever idea of using a tea kettle instead of a funnel, but the issue was trying to make the marble fall through the spout into the cup. Sometimes the ball would get stuck in the kettle or go through the spout, but go the complete opposite direction of the cup it was supposed to fall into. Another problem was trying to figure out how the marble weighed the cup. The marble would fall through the spout into the cup, but then it would not weigh the cup down and release the water. Sometimes it worked and sometimes it didn't, but I've tried using less weight, which worked for the most part but still had issues with pouring the water. Now that I've tested it over and over, I have become accustomed with setting it up and improving on it, and feeling accomplished when it finally did work.

Tristen-

One success I had this year would just be the whole machine in general, because I had never done Rube Goldberg before. It was a great experience and I am very glad I was able to get this experience. I liked watching the videos of the machines from years before, but I wanted to try it for myself.

Another success I had this year was learning that the syringes we used could be used as a fluid step. When I first came to do this machine, I thought we would just use moving water for our fluid step but our teacher had told us that water wouldn't count as a step so we had to come up with a new idea.

One challenge I faced this year was coming up with new ideas, I had never done this before so I wasn't thinking very creatively, I didn't know what to even begin with when coming up with new ideas.

In the future I will use this to think more creatively and try to solve problems with the items I may have in my house. I may not always have the solution but trying to solve the problem before giving up is always good to do.

Works Cited

Chaos, Doodle. "What Is a Rube Goldberg Machine?" *Wonderopolis*,

https://www.wonderopolis.org/wonder/what-is-a-rube-goldberg-machine.

This source was used as a base of our knowledge. Many of the group members have not done a Rube Goldberg machine before, and did not know where to start. This source

provided many different examples, and a backstory of Rube Goldberg machines. This sparked some ideas for us, and also made it more meaningful and interesting for us.

Machines, Sprice. “The Lemonade Machine.” *YouTube*, YouTube, 13 Sept. 2018,

https://www.youtube.com/watch?v=Av07QiqmsoA.

This source was used to give us general ideas for steps to include in our machine. Many of us needed to see what a Rube Goldberg machine looked like in action to have a better understanding of the task we needed to complete. We also looked back at this video multiple times throughout the process of creating steps when we were unsure of what to do. This helped spark ideas, and keep the design process moving.

“Quick Tip: Sticky Syringe Fix.” *Www.youtube.com*,

www.youtube.com/watch?v=vAAxXmM09Xg. Accessed 5 Apr. 2023.

This source was used to help us solve a problem we had occurred with our fluid step. We had the continual problem of the syringes getting “stuck.” Meaning that even with a large amount of weight, after a certain period of time the plunger would not move. We knew that during competition we would not have time to pump the syringes to prevent this, so we needed another solution to this. This video described how applying coconut oil to the plunger helps prevent this. We then tried this on our machine, and it was not successful. This did, however, help us come up with ideas to further improve this step, and we were eventually successful.

“How to Make a Simple Paper Roll Rocket Ship.” *Www.youtube.com*, 23 June 2019,

www.youtube.com/watch?v=kp7ExAZL8i0. Accessed 5 Apr. 2023.

This source was used to create our final step, the rocket. We wanted to do a rocket that fit our theme, but we did not know how to build one. This allowed us to learn how to build a rocket. This also helped us decide what the step before the rocket would be. The funnel type structure at the top was perfect to fit a strong through, which would then allow us to connect it to a pulley. This created our end goal of “launching the rocket.”