Engineering Machine Design Competition

The Chosen Ones

Wildlands Research School

Team members:
Azura Walter, Baylee-Mae Sahr, Collin Williamson, and Reidyn Koening.

Coach:
Alexa Hurd and Emily Stangel

Materials

Cost of Machine

100% of our machine was recycled

Item	Cost	Item	Cost
Hot glue	Free	Base	Free
IV bag	Free	Popsicle sticks	Free
String/rope	Free	Wood boards	Free
IV tube	Free	Small plastic cup	Free
Marbles	Free	Small wooden dowel	Free
Wooden ball	Free	Pulley	Free
String	Free	Dominoes	Free
Moter	Free	Small wooden ball	Free
Pegboard	Free	Clear plastic bottle	Free
3d printed cup	Free	Ziptie	Free
Jenga brick	Free	Skule	Free
Hammer	Free	Clear tube	Free
Cardboard tube	Free	Syringe	Free
PVC pipe	Free	Screws	Free
2/4	Free	Clear Dish	Free
Bow Release	Free	Duck Tape	Free
Ping Pong ball	Free	Paper	Free
Baking soda	Free	Vinegar	Free
Caster wheel	Free	Scotch tape	Free

Machine Steps

(Advanced components)

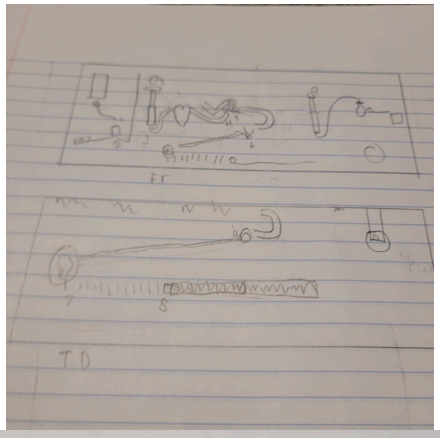
Start: having someone fill a cup with water from a syringe

Number 1: the water will way down one side of the popsicle stick releasing a ball

Number 2: The ball hits Domino

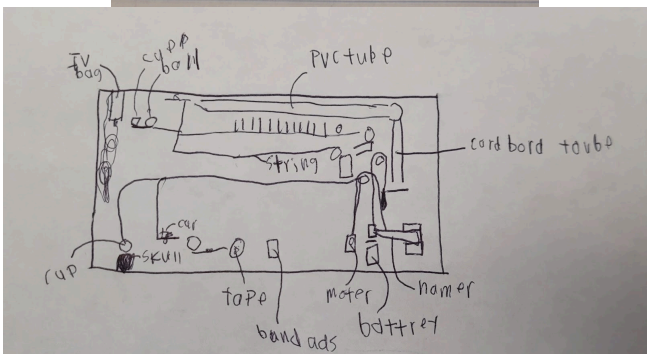
Number 3: The dominos hit a marble that goes through two plastic bottles

Number 4: The ball falls into a cup connected to a pulley system
Number 5:The pulley releases a marble that goes through a funnel system and hits a heavy ball
Number 6: The ball falls onto a bow release dropping a hammer
Number 7: The hammer starts a motor that winds up a pulley system releasing vinegar
Number 8: The pulley also releases a car that goes down a ramp
Number 9: The car goes into a cup which is on a teeter-totter
Number 10: The tape hits a box of bandages.



First Draft/Description

In our first draft, we knew what we wanted to have in our machine but we did not know how long it would take to make and build all of the things we wanted so we ended up having to redesign the machine. We changed some things as we went but this is what our first draft looked like.



Final Draft

Final Image/Description

We didn't incorporate the theme but are machine came out as well as we planned. We wanted to incorporate more of the theme but with the time we had it made it difficult. In our original design, we incorporated more of them but when we redesigned we did not incorporate the theme as much due to the time we had. But the main reason we had to change our machine was due to how complex it was. We do have an advanced component which is baking soda and vinegar but that is it.

Reflections

Baylee-mae- During our engineering project, I have learned valuable lessons and experienced both successes and challenges. This reflection serves as a chance to analyze and learn from my experiences, showing this project's key takeaways and areas of improvement. One major lesson I have learned is the importance of effective communication within my team. Clear and frequent communication has been the most important part of coordinating necessary tasks, sharing progress updates, and resolving conflicts. This project showed me how to better actively listen to team members' perspectives and demonstrate clarity in conveying ideas. Going into next year's competition, I will prioritize regular team meetings, and open conversations, and establish a thoroughly structured communication plan.

Collin- During the engineering contest we had ups and downs but in the end, we got through them all and made it. We worked extremely hard on this project with the time that we had and the materials. We planned out our machine step by step but started before it was done, but later on, we had to redesign most of our machine. We got our base, added the back to it, and gathered materials to build the steps. Once we got started we made some ground on our machine but we realized that we would not have time to follow the original design. We then redesigned some and added those steps. We started coming up with ideas as we built our machine. I think it’s due to our late start this year and the amount of time the teachers gave us and we were constantly interrupted right when we got into the flow of things. I have been stressed about this now that the competition is coming up and we don't have much time to work on it. I wish we could have followed the theme more but with timing it is difficult.

Reidyn- I enjoyed the engineering contest and it was a great way to learn problem-solving and teamwork. We started by sketching out what we wanted our machine to look like and getting our base all put together which wasn’t hard, then we used a peg board to make a back to make it easier to put steps onto our machine. We then updated our design since we were on a tight timeline and we had to make it a bit simpler. After we started getting the first couple of steps on we realized we put them a little too low so we had to figure out how to get it back up to the top so then we decided to use pulleys. After that, it was pretty smooth going, and we thankfully got plenty of time to work on it towards the end before the competition.

Azura- The engineering machine design contest went well because when we worked on it I got to learn new things and I got to make new steps on our machine. When we did engineering we had a lot of ups and downs. I have learned very valuable lessons like how to use a hand saw and also how to use a soldering iron to melt plastic. The lesson that I learned is how to communicate with my teammates so that they know how to run the machine and how to move things. Another thing is that we learned how to problem-solve. Collaborating was a huge part of the project process because each person brought their unique materials. Lastly, Throughout the engineering process, we realized that learning new techniques will help you grow your mindset in different ways and forms. I can identify different ways our group has improved from the beginning to now.

Advanced component

Our advanced components include 1 electrical component which is a motor. 2 mechanical components one is a lever and the other is a pulley system. We also have a 1 Chemical component which is baking soda and vinegar. We poured vinegar into a cup to make it react.

Engineering Project Journal

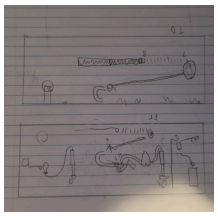
Jan 23, 2024,
Today Ms. Jen Peck came here and introduced us to the Engineering Machine Design Contest (EMDC). She started by telling us about the past years and some contest rules. We then split up into groups to make a 4-step machine.

Then we grabbed an incomplete base a group made last year.

Jan 29, 2024,
Today, our class split up into our engineering groups and did a challenge to exercise our engineering ability. The rules were that we had to build a contraption out of a newspaper that was capable of supporting a textbook for at least 3 seconds. Our idea was to make multiple rolls of newspaper to hold up the textbook, but it didn't work because the rolls didn't stand upright and were too thin, so they just collapsed. When we returned our paper was in the garbage but we wanted a photo for the journal. So we tried recreating it but in one big roll and to our surprise it held a textbook as seen in the photo

Feb 9, 2024
Today the team went to Building Hope to look for inspiration and parts we may need for our machine. We didn't find any ideas to add.

Feb 23, 2024
Today the team added the last step to our design and started tinkering.
We were going to add the pegboard to the back but needed 2 by 4s to attach it to.



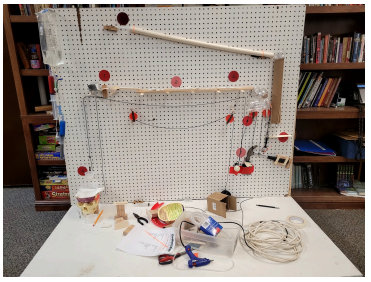
Feb 27, 2024
Today the team added the pegboard to the back of our machine and put a hook on it. We are going to start to add things to our machine in the upcoming weeks.

Mar 18, 2024
Today the team added the first step to our machine and started on the second. We had to change almost all of the design to get steps in for a working machine on the day of the competition. The first step comprised of an IV bag dripping water into a cup, the cup is placed on a small see-saw-like contraption. Then the weight of the water tips the see-saw causing a ball to roll down a ramp and hit dominos.

Mar 20, 2024
Today the team added the 4th step to our machine, using pulleys and the mass of a small wooden ball. The third step can be completed. Doing this required a lot of trial and error so that small details like the string length, and the ball weight were accurate.

Mar 21, 2024
Today the team added the 5th step to our machine. The 5th step consists of a marble that falls down a PVC pipe ramp and through a cardboard tube. We have some other steps ready to add but not set up.

Mar 22, 2024
Today the team added steps 6 and 7, these steps consist of having a hammer falling onto a button, triggering a rotating ball. This ball will then rotate with a string lifting a cup triggering step 8.



Mar 27, 2024
After multiple snow days, we were finally able to come back to school and work on our project days before the competition. At this point, we are in a tight crunch time, with the main priority being getting all our steps planned and executed.

Apr 2, 2024
Today the team worked on the machine added the last step and printed out our journal.
Also, April 2, was our engineering competition, where our team placed 4th place in the competition. We also received a golden ticket from our Wildlands Engineering Ambassadors, giving us an automatic pass to the state competition.

Apr 9, 2024
Today the team was working on making our step more reliable, and sturdy. We did this because during the competition we had a lot of point deductions from having to touch our machine. We also had point deductions from our 5th step triggering by itself, and us having to reset our machine due to it not functioning properly.

Apr 10, 2024
Today the team is going to turn in our journal online and work on a step that failed every time we ran our machine.

Bibliography

These videos were used to learn about the human body.
Human Body 101| National Geographic, published December 1, 2017. Date Accessed: March 18th

The Human Body System Functions Overview, published April 24, 2016. Date accessed: March 18th