

The Factors of Technology

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EMDC Journal

1/18/23

We brainstormed ideas for machine and planned for the next day.

1/19/23

We started building a shelf to store our materials.

1/22/23

We finished building the shelf and put all of our materials on it.

1/23/23

We started drawing the blueprint for the machine and brainstormed more ideas.

1/25/23

We met with Jen Peck and talked about things we might want for our machine, and added to the blueprint.

1/26/23

We worked on designing our blueprint and filling out the materials list.

1/29/23

We worked on materials list and finished the blue print.

1/30/23

We looked for materials we would need in the future.

2/1/24

We started building the base of the machine and cut the panels for the back. We also cut some ramps.

2/2/24

We attached all the panels we cut for the base, and started making a support for the back.

2/5/24

We found a train to use for one of our steps and put some of it's parts together. We also planned on how we wanted to attach the support on the back and ordered some materials we will be using later on.

2/6/24

We cut some wood for the support for our machine and started putting it together. We ran into some troubles so we didn't get to finish but we made some progress.

2/8/24

Today, we finished building our back support which kind of works like a kickstand, and we attached it to the machine to make sure it worked. We cut supports for the ramps and marked out where we wanted to cut the ramps.

2/12/24

We cut the wood for the ramps and attached the first ramp.

2/19/24

We planned out the steps we wanted to build and attach next, and brainstormed how we wanted to build step 3. We attached step 3, 4 and decided on how we would do step 2.

2/20/24

Today we built the pendulum for step 2 and attached it to the machine. We also started building the robot head and DNA strand.

2/22/24

We attached and secured step 2 and put a plastic cup on the machine to stop a ball from falling. We also tested step 2 quite a few times to make sure it would work and it was pretty consistent.

2/27/24

Today we cut ramps for future steps, we worked on step 5, and we cut and attached platforms for other parts of the machine. We also made the robot head and started building the factory for the last step.

2/29/24

Today we ordered a pulley for in between step 5 and 6, and started building the dna strand and attached a little bit of step 6. We also worked on building the factory for the last step.

3/1/24

Today we were working on the train and messing around with how it works and how we want to attach it to the machine.

3/4/24

Today we planned how we wanted to attach the train. How we originally envisioned attaching the train wouldn't work so we had to talk about other ways to attach it. We also started to attach the ramps and tracks for the train.

3/5/24

Today we tried to attach the ramp for the train. We ran into some troubles doing this because the wood supports kept breaking and we had to cut new ones.

3/7/24

Today we attached the ramps and tracks for the train. We also got our pulleys that we ordered so we worked on that step and planned out some of the next steps.

3/11/24

Today we worked on making the train run how we wanted it to. We also made some adjustments to the train step so it works a little better.

3/12/24

Today we attached the second pulley and worked more on the train step.

3/26/24

Today we worked on fixing some steps that didn't work properly or weren't done from previous work days.

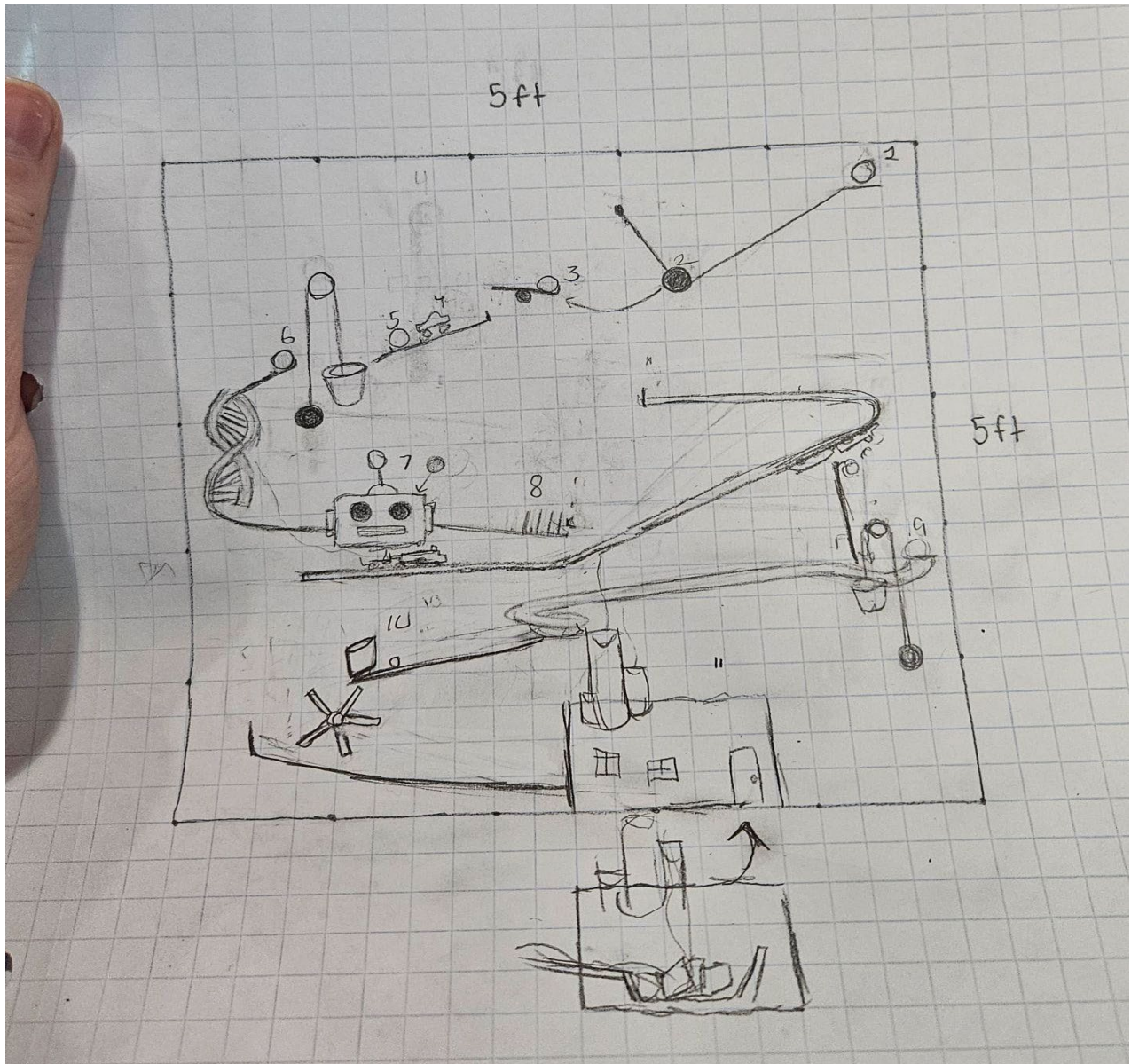
3/28/24

Today we really needed to get our machine done, so we spent practically the whole day working on this project. We made the water wheel and worked on building step 6 and 7. We also made adjustments to the blueprint and machine because a step wasn't working how we envisioned.

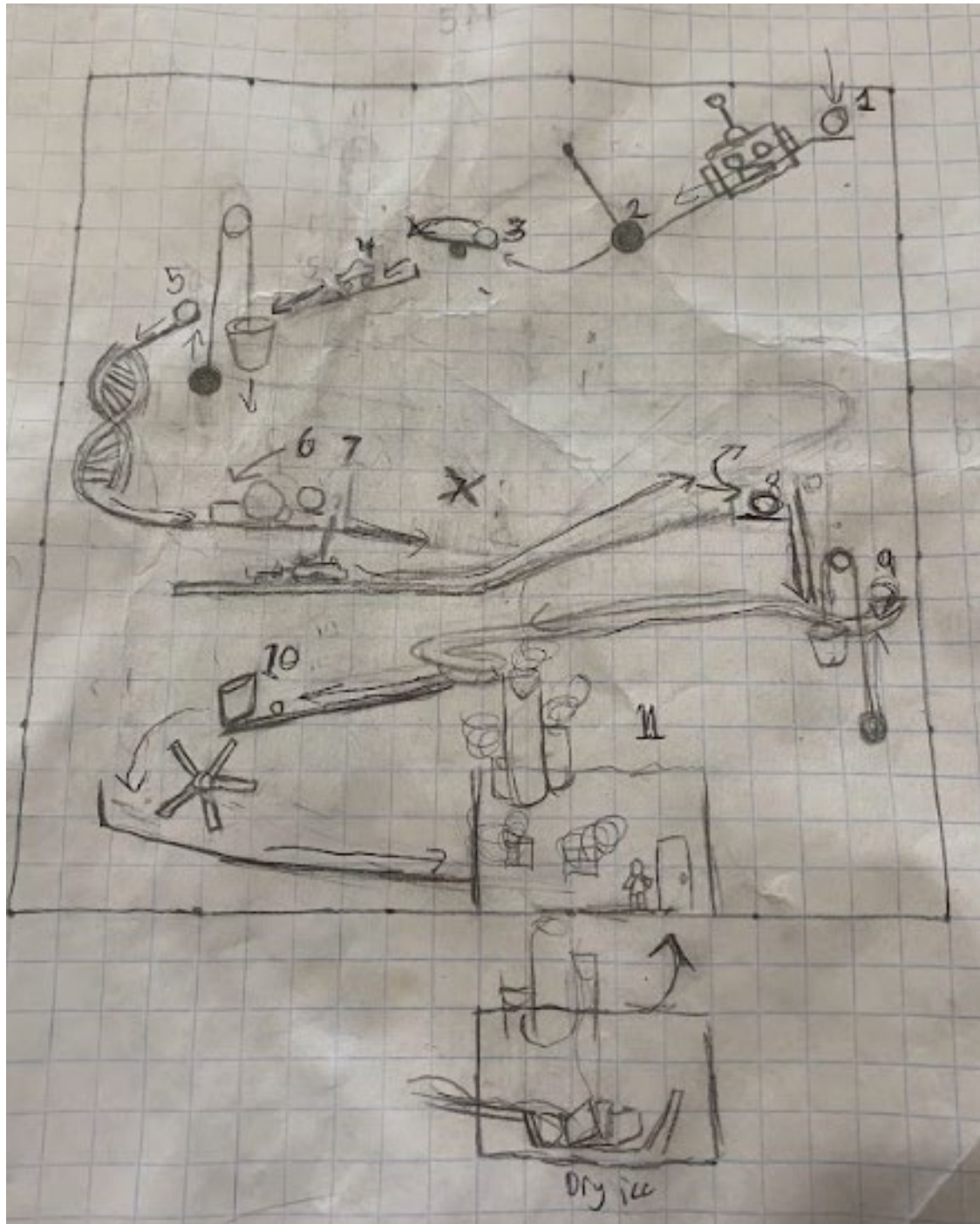
4/1/24

We got our dry ice today but we really had to finish our machine. Today we worked on making the last steps, and then we did a run through of the machine. We had a lot of trouble with steps 4 and 5, but we had to figure out how to fix it.

Original Blueprint (Rough Draft):



Final Blueprint:



Machine Steps:

Step 1: The ball drop at the beginning was our first step.

Step 2: The first golf ball hits another golf ball on a pendulum type mechanism.

Step 3: The pendulum swings and hits a see-saw and the ball on the see-saw rolls onto another ramp just below it.

Step 4: The ball from the see-saw hits a car and knocks it into a pulley system. The pulley is an advanced component and falls under the mechanical component section.

Step 5: The ball on the pulley hits a platform and knocks a marble into a DNA strand made out of flexible PVC pipe and rolls down a ramp.

Step 6: the marble hits a row of large dominoes.

Step 7: The dominoes hit a golf ball which falls onto a screw.

Step 8: The screw that just got hit goes down and hits the start button on an electric train. The train is an advanced component and falls under the electrical component section.

Step 9: The train starts moving and goes up a track. It hits a ball on a platform and knocks it into another pulley system. The pulley is an Advanced Component and falls under the mechanical component section.

Step 10: The ball on the pulley system hits a platform and sends a ball down a track.

Step 11: the ball hits a cup of water and knocks it onto the water wheel.

Step 12: The water hits the dry ice causing a chemical reaction, and the smoke from the dry ice rises out of the factory as a grand finale. The dry ice is an advanced component and falls under the chemical reaction section.

Materials list

We defined recycled materials as items that have been used before or weren't new to us.

Material	Cost/Donation	Recycled?
Wood palette	\$0 - Donated by teacher(s)	Yes
Wood scraps/ramps	\$0 - Found at school	Yes
Flexible PVC pipe	\$14.99 - Teacher Purchased	No
Pulleys	\$6.99 - Teacher Purchased	No
Dry Ice	\$3 - Teacher Purchased	No
Spray Paint x4	\$22 - Teacher Purchased	No
Cardboard	\$0 - Found at school	Yes
Electric train + tracks	\$0 - Found at school	Yes
String	\$0 - Found at school	Yes
Plastic cups	\$0 - Found at school	No
Golf balls	\$0 - Donated by teacher(s)	Yes
Marbles	\$0 - Found at school	Yes
Backboard	\$0 - Found at school	Yes
Marble run pieces	\$0 - Donated by team member	Yes
Masking tape	\$0 - Found at school	No
Duct tape	\$0 - Found at school	No
Screws	\$0 - Found at school	No
Dominoes	\$0 - Found at school	Yes
Hot glue gun + sticks	\$0 - Found at school	No

Percent of Recycled Materials: 52.3%

Cost of Machine: \$46.26

Applied STEM Processes:

1. Pulley System - One of the more major problems we had with this step was getting everything to stay in the right place and work the way we wanted it to. When we first tried to attach the cup to the string, the cup kept breaking because of the impact from the golf ball falling into it. We figured out a way to attach the string to the cup and make it stronger than the last, and we put tape over it for extra support.
2. Attaching ramps/supports - When we started this project, we wanted our machine to be more durable and secure than our previous machines, so we made our ramps out of wood and made special supports for them. This was difficult because the supports were just tiny blocks of wood and many would crack when we tried to drill into them and attach them to the machine. We fixed this by drilling a larger pilot hole, which helped a little bit, and then we started to attach them in a different way that was a little easier on the wood.
3. Chemical reaction - For our chemical reaction we used dry ice. The dry ice was difficult to work with because the ice would only last so long and we had to get dry ice multiple times so we could test the step before the competition. We also had slight problems with brainstorming how we were going to transport the ice, because we didn't want it to evaporate in the time it took to get to the competition. However, testing with the dry ice was lots of fun and we figured out how we wanted to transport the ice by talking together and talking with our coach.
4. Water wheel - The water wheel was an idea a team member had while we were brainstorming the blueprint. We knew it might be difficult to make or find the right materials to make it but we really wanted to include it. One of our team members was set on making it out of cardboard and sealing it with a waterproof sealant. We tried this and it worked okay at first, but the cardboard was slightly weak and the water found its way into the cardboard which sometimes made it difficult to work with.
5. Electric Train - We have an electric train in our machine that starts by getting a button pushed. At first we didn't know how we were going to get the train to start because we didn't know what to get to push the button. We came up with a plan, where we drill a hole in the board and put a stick in the hole. A ball will fall on the stick and push it down which will push the start button and the train will start moving.

Reflection:

This project was a fun challenge for us. At the beginning, we weren't sure how this was going to work out because our team had some challenges with focusing and staying on task. This problem gradually got better as we got to the building part where we could be more hands on and engaged with the project. For our team, building was a very fun but difficult step. We came across a lot of common problems, like not having the right materials or the materials we needed. We had to change our blueprint and machine along the way because of some of the lack of materials we had, but we improvised and adapted and made our machine work. During the planning of the blueprint, we had some problems because we wanted our machine to be unique and more interesting than last years. The amount of focus we had while planning the blueprint was very little at first, but as we got more and more ideas flooding into our brains or more people engaged in the planning, everything went smoother and faster and our blueprint turned out pretty good. Last year when we did this project, we started a lot earlier, around late November/early December. This year we started in mid-January and it was hard to adjust to the lack of time we had to make out machine. We also had a lot going on at school during February and March which took away from our worktime and made it even harder to get the machine done in time. This project will really help us build skills like building and problem-solving which will help us later on in our lifes with getting jobs or having experience with different things. At our school we have seminar and one upcoming one is building in the greenhouse, and this project would help us with that by giving us experience with power tools and building. Looking back on this project, we could have used our time wiser on some work days but overall this project was a great challenge for us and we really had fun doing it.

Bibliography:

[Oregon Coast STEM Club: Rube Goldberg Machines](#) - We mainly used this source to give us inspiration on our water wheel.

[Science Buddies Chemical Reactions](#) - We used this source for inspiration on chemical reactions.

[10 Brilliant Rube Goldberg Machines](#) - We used this source for inspiration on steps for our machine.

[Easy and Fun Rube Goldberg Machine Ideas](#) - We used this for inspiration on how we wanted to decorate our machine and a little bit for the steps.