The Energetic Electrons World Power Tour

Team Journal

Team Members:
Aubrey Larson
Maya Nesbitt
Chloe Lukes
Tierra Ebnet
Jasper Bailey
Abby Hovendick
Evelyn Bailey
Taylor Shaw
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Zoe Swor
David Dugstad

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1st Meeting 2/14/22 90 mins.
Engineering Design Project

For our first meeting we decided roles and we discussed the Engineering Machine Design Contest packet. We worked on the first part of the process defining criteria and constraints.

2nd Meeting 2/16/22 66 mins.

We completed the Ask and Imagine steps of the engineering design process. We brainstormed a lot of ideas for our theme. Here are our best ones:.

Best ideas:
History of inventions
Future changes
Power plant
geography/flags

The Winner was**……..Geography, a world tour**

Final slogan: **World power tour**

We will be a rock band going on a world tour!

Next we broke into groups and discussed what needs to be done.

Artist group = binder cover and T-shirt design

Designers= how many countries, build some things out of legos.

This is our favorite reflection for this Meeting (Zoe's)

Today on February 16th 2022, we accomplished what we are doing for our Power the world project. We are doing a world tour. I feel like that is a good idea and we are starting to accomplish a lot.

3rd meeting 2/18/22 50 mins.

Today we discussed some materials to get from our homes. Next we broke into groups and discussed what needs to be done and our deadlines.

Design team: practiced little things with the materials we have so far.

Material we have so far: little metal ferris wheel, dominos, bridge, air pump, scale, syringes, trimmer line, fishing line.
We watched videos to get a better understanding and ideas.

Ideas from videos: spinning marker, light up globe, water balloon, spinning popsicle sticks, funnel with water.

Ball dropping of air pump then blowing into Thomas the train where he would bump something. That was our first few step ideas.

4th meeting 2/23/22 50 mins.

Today we decided our band name: **The Energetic Electrons**
Next we looked at materials and Ideas.

Light up globe
Stage under globe

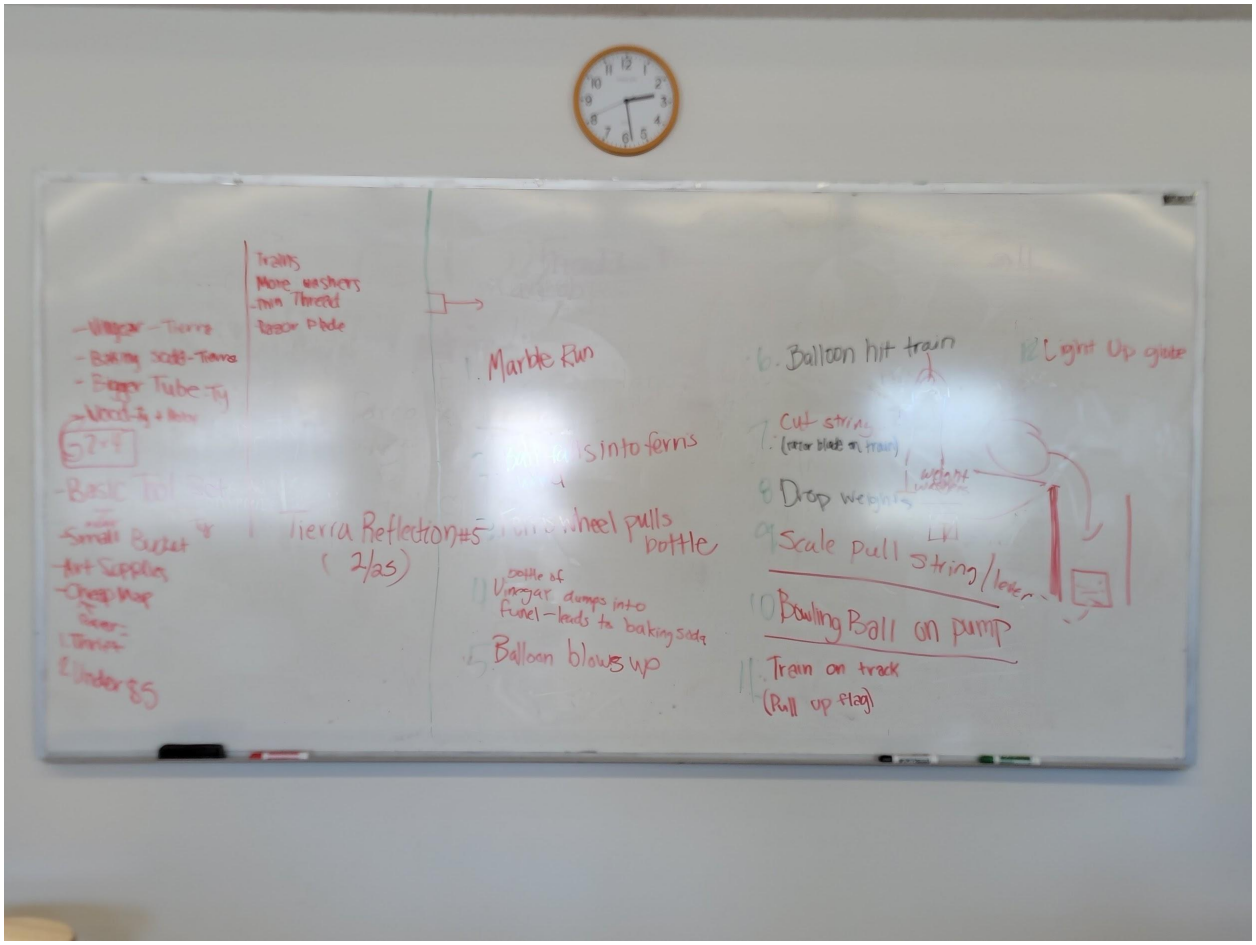
Then we discussed what we needed. We also discussed deadlines. Then we figured out some of our steps for the machine (just ideas). We used a backward design.

Here's some of our ideas:

Light- up globe with a sensor light that was pushed up by Thomas the train who was pushed down a track by the air pump to push air out.
Vinegar and baking soda

5th Meeting 2/25/22 70 mins.

First we mapped out our design and steps on a white board.



Our steps:

1. Marble run
2. Bouncy ball falls into ferris wheel
3. Ferris wheel pulls bottle
4. Bottle of vinegar dumps into funnel - lead to baking soda
5. Balloon blows up
6. Balloon hit train
7. Cut string
8. Drop weight
9. Scale pull string releasing bowling ball
10. bowling ball hits pump
11. air pump pushing train down track
12. light up globe

We discussed materials needed+assigned people to bring them.:

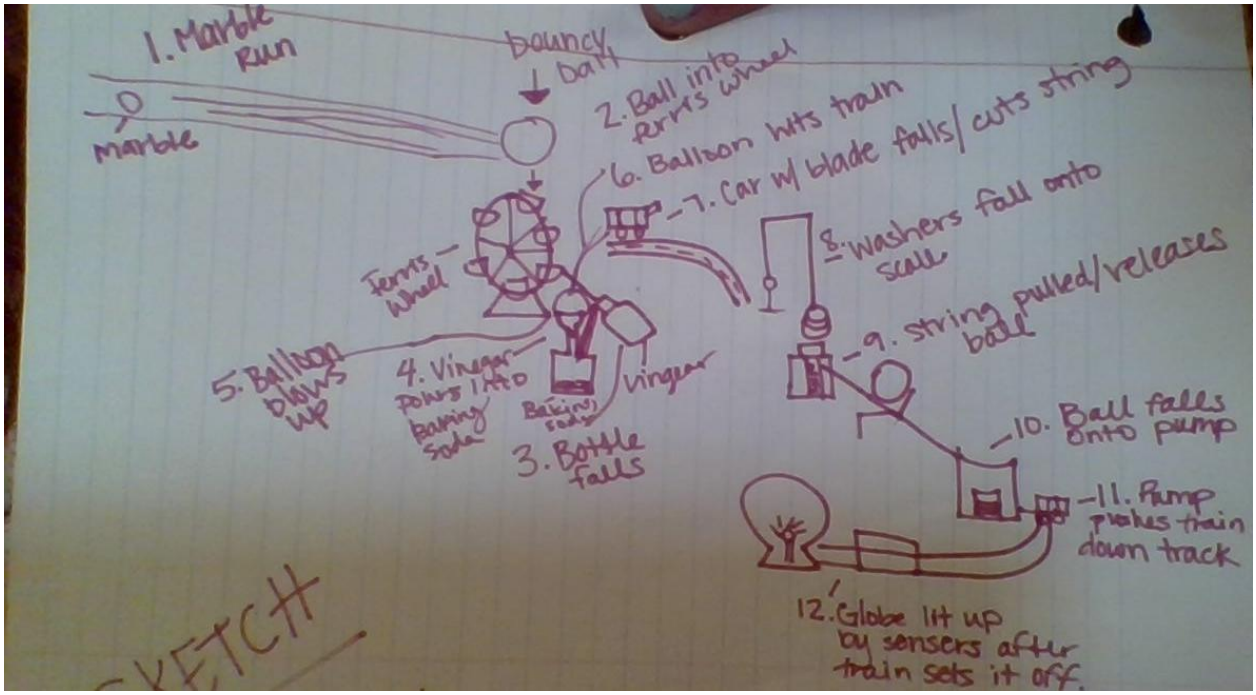
This is our favorite reflections for this meeting (Chloe/Ty)

We got a lot done! We figured out all our steps and assigned some of it. I am excited for a finished machine. We did well today. We covered the whole white board with ideas.

6th Meeting 3/1/22 40 mins.

Today we had a short lesson then got started building our machine. We discussed our platform and how we are going to fit it in a car. Then we went over our steps again. Next we talked about what supplies we still need. We talked about what we could do with our t-shirts.

We finalized our initial sketch of the machine.



Here is the reflection that we liked.(Tierra)

Today we weren't able to accomplish a ton. What we did do is decide how we are building our machine. We decided to make it small enough to break down. It was good. I think it is going to be challenging to get everything right, and keep the measurements the same. I wonder if the razor blade is going to pass.

7th Meeting 3/4/22 78 mins.

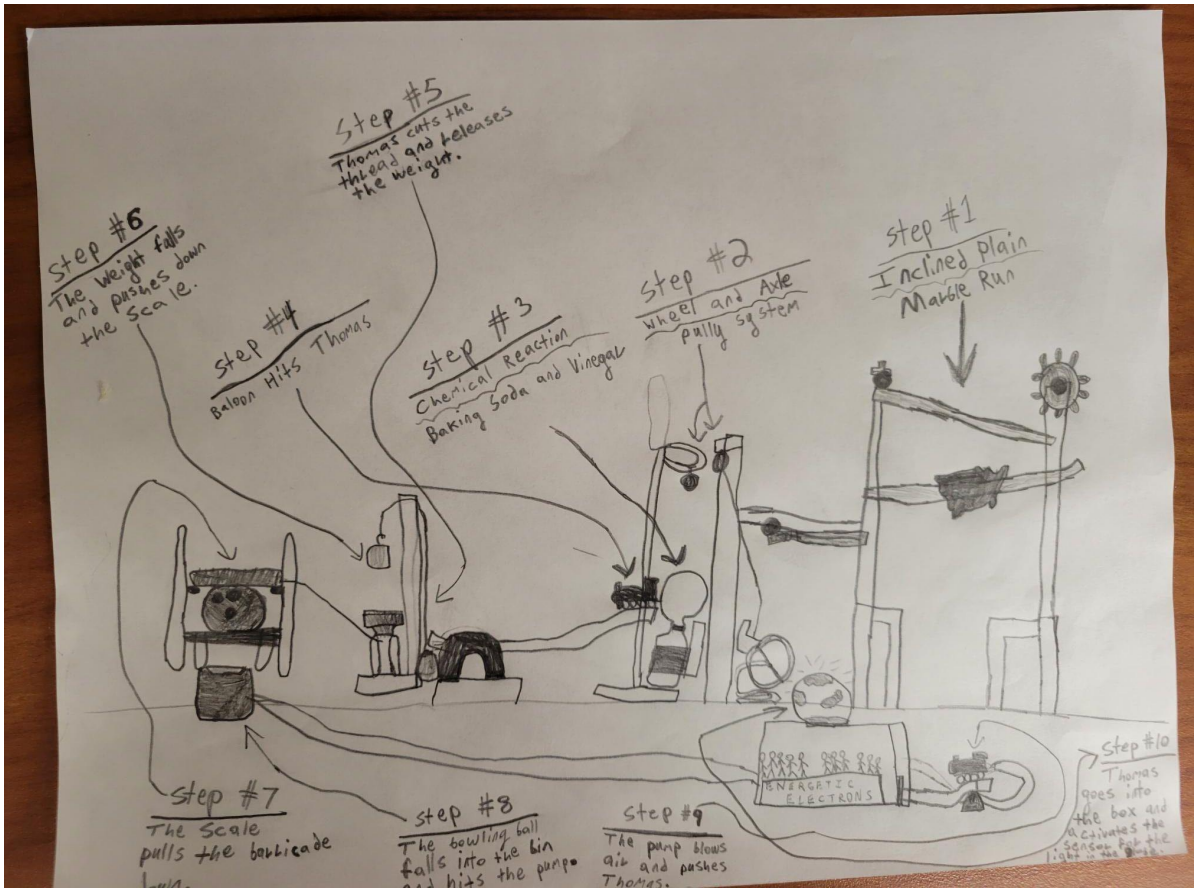
We all got started,the art group figured maps out, designers were working on design of course, and Maya and Tierra worked on figuring out what we needed. We also finished the first step to our machine and started on the second step (still working on it). The art group cut out maps of some countries so we can put them on our steps.

We decided to change our steps a bit due to it not working the way it should:

Our final steps-

1. The ball rolls down the inclined plane into a cup
2. The cup turns the wheel, pulling the string
3. The string lifts the balloon releasing the baking soda
4. The baking soda falls into the vinegar causing a chemical reaction blowing up a the balloon with captured gas *advanced component chemical
5. Balloon pushes the train
6. The train goes down the track, cutting the string
7. The string releases the weight depressing the scale
8. The scale pulls a string releasing the bowling ball
9. Bowling ball falls, depressing the pump
10. The pump expels air pushing the train *advanced component fluid power
11. The train enters the tunnel triggering the motion detector; lighting the globe *advanced component electrical

This is our final sketch.



This is our favorite reflection for this meeting (David)

Today me and my partner Ty were looking at a tin, an air pump, and a bowling ball. We were using the ball to push the air out of a small hole in the tin, this is going to trigger something apart from a motion sensitive light and it was not working how it was supposed to but we improvised and thought about how it would work. Then we did a tube that went to baking powder that was filled with vinegar. We were trying to get it to keep the air into the balloon. Iit did not work so we will try again on Tuesday.

8th Meeting 3/8/22 67 mins.

Today after we did a mini lesson we went to work on all our steps and art stuff. We got the first step to be consistent and to work and got a lot of art work down and we are working hard to finish all the other stuff. We got a lot done and our teacher is proud of us.

Challenging Moments:

We decided to change the purple ferris wheel with the yellow one. After many attempts to make it work we finally had to eliminate and start with a different wheel. Testing and improving!

9th Meeting 3/10/22 90 mins.
Today we got right to work on the machine. We are getting behind and need as much time to work as possible. We have got seven-ish steps so far almost completed and working on others. We have been working really hard and I personally am really proud of everyone.

We are having trouble getting Thomas to go down the track-

This is our favorite reflections for this meeting (Evelyn/Jasper)

Me and Chloe Did the 5-6th step of the build. And then I watched and Aubrey and Abby did the first couple steps. Then we put steps 1-8 together and we will see if they work. And Ty David had to take apart another sensor. And then they did steps 8-10. And I think we accomplished a lot today. And we are in the create stage and we had to change a lot of things in the build. We had to change step 3 and we used a hamster wheel instead of the ferris wheel.

10th Meeting 3/14/22 90 mins.

Today we got right to work. We have lots of steps almost finished and our teacher said that we made good progress. We have pretty much figured out how to position the first seven-ish steps, we did some wood work, and we painted the final piece black.

This is our favorite reflection for this meeting (Abby)

We made progress, I wrote my story for the presentation. I also got to work on the project. We connected Thomas and the marble run together. It took a lot of tries but we got it all connected. I think I'm staying after for science today so I can work on it!

Challenging Moment:

It was a challenge to get the bowling ball to roll but we are working really hard to get it to work. It is hard to overcome the inertia, but not make it too slanted so it won't be held back by the gate.

The key is adjustable screws so we can change the slant.

We are getting close to a completed machine.

11th Meeting 3/16/22 90 min.
Today the executive group had a meeting discussing what we still need to do. We worked on the journal and picked out reflections we liked and we worked on the machine.

This was our favorite reflection for this class (Aubrey)

Today went ok! We got some stuff done. We tried the machine a few more times and found it wasn't consistent but we kept trying. We also practiced other speech for the judges a few times.

12th Meeting 3/23/22

Today we are working on the consistency of the machine again. We have it all put together. We are all excited and a bit nervous. We got our machine to fully work through all the steps for the first time. It was such a sweet victory!

Putting on the finishing touches:

Final picture of Machine before regionals.


ENERGETIC
ELECTRONS

We got second place and are moving on to the Championship!

13th Meeting 1hr 20min 4/12/22

Today we got started right away on improving our machine. Me and two other students worked on adding a screw to the beginning of our machine, we accomplished getting the screw to work now we just have to connect it. We believe we might go over the 5ft limit so we need to measure a lot of things. Overall, we had a great meeting.

This was our favorite reflection for this class (David)

Today we kind of were fixing stuff that wasn't working. I helped wrap tissue boxes in paper so that they didn't look weird on our presentation. We messed with the globe and the motion sensor because they didn't work at the competition.

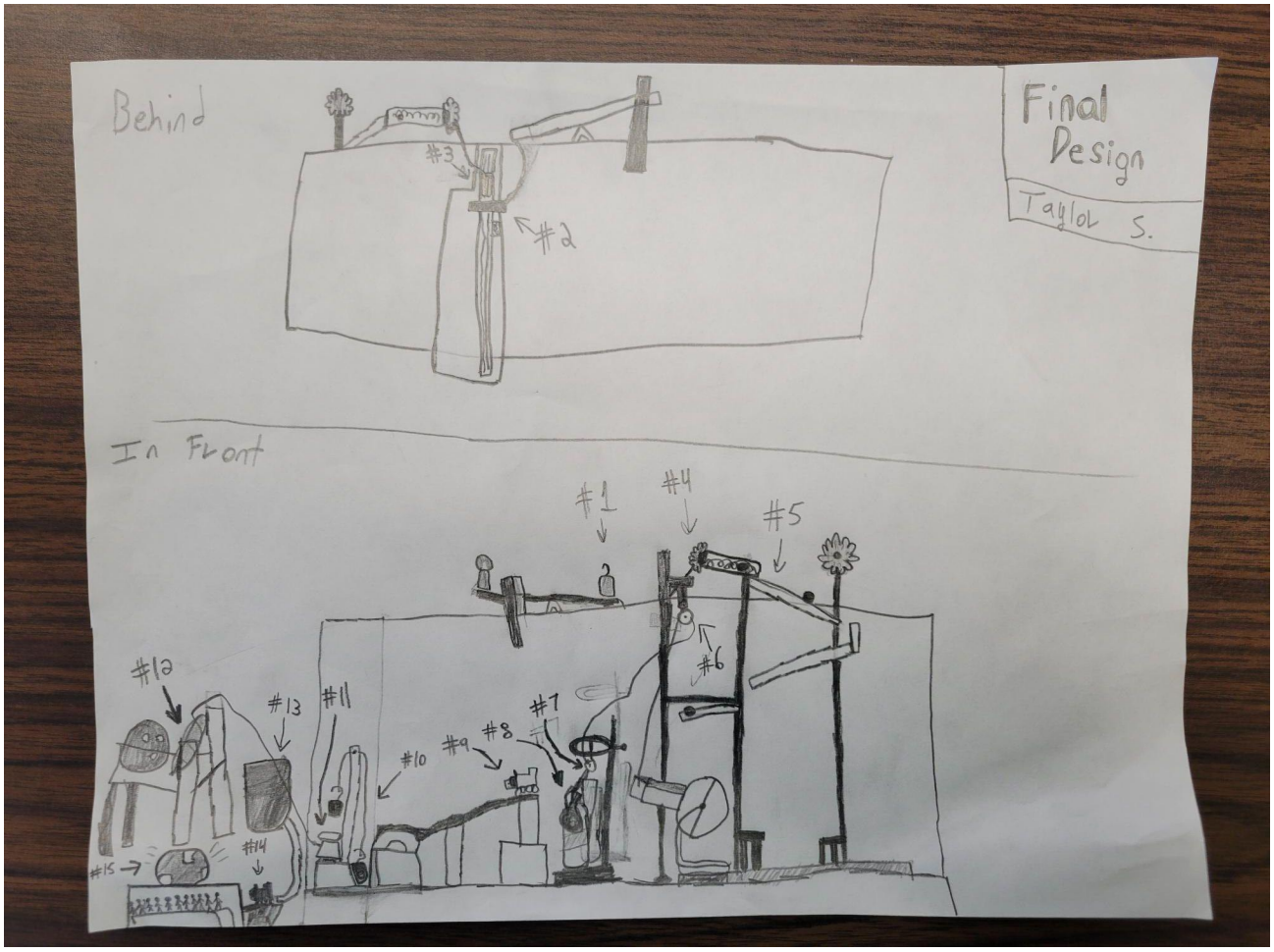
14th Meeting 11:40 4/19/22

Today we talked through what is going to happen on friday-the competition- then we talked about the goals we have for today. Next we got started on the machine and Chloe and I worked on the journal. Last time we added 4 more steps, and today we are working on combining it all.
List of steps now:

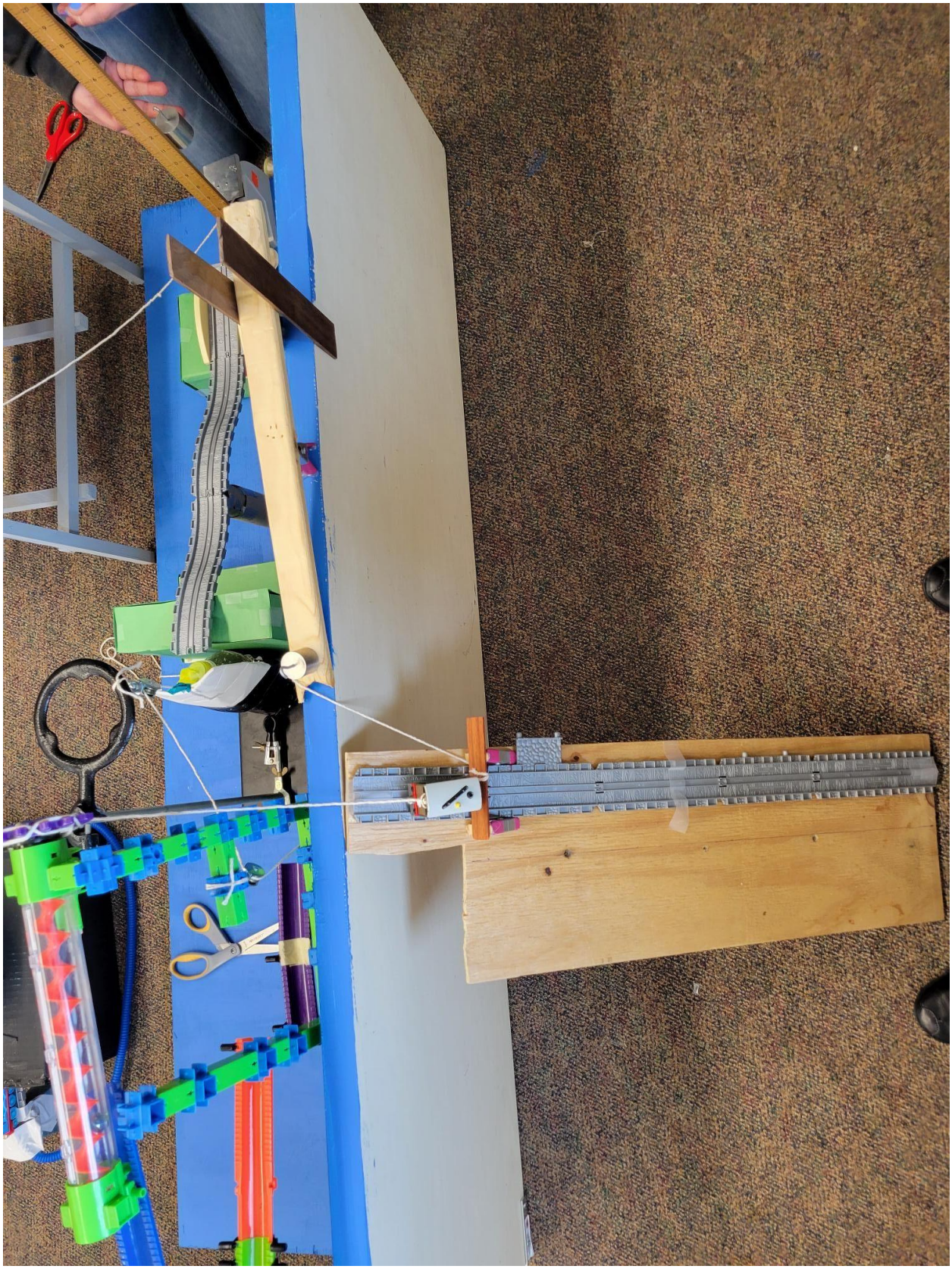
Machine Steps

1. Removing a weight from the lever causes the lever to move pulling a string.
2. The pulled string removes a gate releasing the train.
3. The train runs down an inclined plane pulling a string.
4. The pulled string rotates a screw moving a marble through the tube releasing it into a set of inclined planes.
5. The marble rolls down the inclined planes hitting two bouncy balls causing them to land in a cup.
6. The cup is attached to a wheel and axle. The weight of the balls causes the wheel and axle to rotate pulling a string.
7. The string lifts a balloon releasing baking soda.
8. The baking soda reacts with the vinegar creating carbon dioxide gas inflating the balloon.
9. The inflating balloon pushes Thomas down the track.
10. Thomas speeds into the string cutting it and releasing a weight.
11. The weight depresses a scale pulling a string.
12. The string removes a gate releasing the bowling ball.
13. The bowling ball falls, depressing the pump.
14. The air in the pump is pushed through the tube pushing the train into the box.
15. The train triggers a motion detector turning on a light and powering the world.

Here is our new final sketch.



Here is a photo of us planning our new steps. We want to incorporate a screw and a lever so we have all 6 simple machines.



Building our new additions. They worked!

We also worked on art stuff and we continued to test and improve. We worked on finding a solution to the teeter totter, the cup was too tall and it hit the fence and then stopped and it wouldn't pull hard enough to release the train. We have it all put together and redecorated. We just need to fine tune and make those little adjustments so we can have smooth runs.

Final Reflections:

As a group we learned so much about the engineering design process. The brainstorming part was fun, the building was more challenging than we expected. The time it took to test and refine our machine was considerable. If we do it again next year we will start earlier!

We learned more than just technical skills. We also learned teamwork and perseverance. These lessons are very valuable even if we do not go into an engineering job. But a lot of us are interested in making engineering a career choice.

Ty: " I loved the experience and would definitely consider a job in engineering."
Evelyn: "I want to work at Douglas Machine."
David: "I would love to be an engineer. I like to figure out how to make things work."
Tierra: 'I enjoyed the project management aspects of the project."

The Finished Machine!

Machine Costs

Item	Cost	Recycled/repurposed
Door	$5	Yes
Marble Run	$0	Yes
Vinegar Bottle	$0	Yes
Lego People	$0	Yes
Boxes	$0	Yes
World Alas	$2	Yes
Thomas the Train 2x	$0	Yes

Motion Detector	$9	No
Bowling Ball	$0	Yes
Bouncy Balls	$0	Yes
Scrap Wood	$0	Yes
Tissue Box	$0	Yes
Paper Towel Roll	$2	Yes
Measuring Stick	$.75	Yes
Small Weights	$0	Yes
Weight Scale	$1	Yes
Clear Glass Bowl	$2	Yes
Tape	$0	Yes
Black Paint	$0	Yes
Balloon	$1	No
Pink plastic box	$0	Yes
Thomas the Train set	$0	Yes
Air Pump	50 cents	Yes
Hamster Wheel	50 cents	Yes
Popcorn tin	$0	Yes
foam board	$1	No
String	$0	Yes
Hot Glue	25cents	No
ring stand	$0	Yes
pulley	$2	No
Clamps	$0.40	No
Stickers	$0	Yes
beaker	$0.00	yes
Book	$0	Yes
total	$27.40	29/34

What our machine cost:

Total cost: $27.25

We worked hard to try and use recycled or repurposed materials. Almost everything we bought was from a thrift store. We also used items lying around people's houses. 29 out of the 34 components that make up our machine are recycled or repurposed. Total percentage of recycled materials 85%.