

**EMDC Journal 2024**

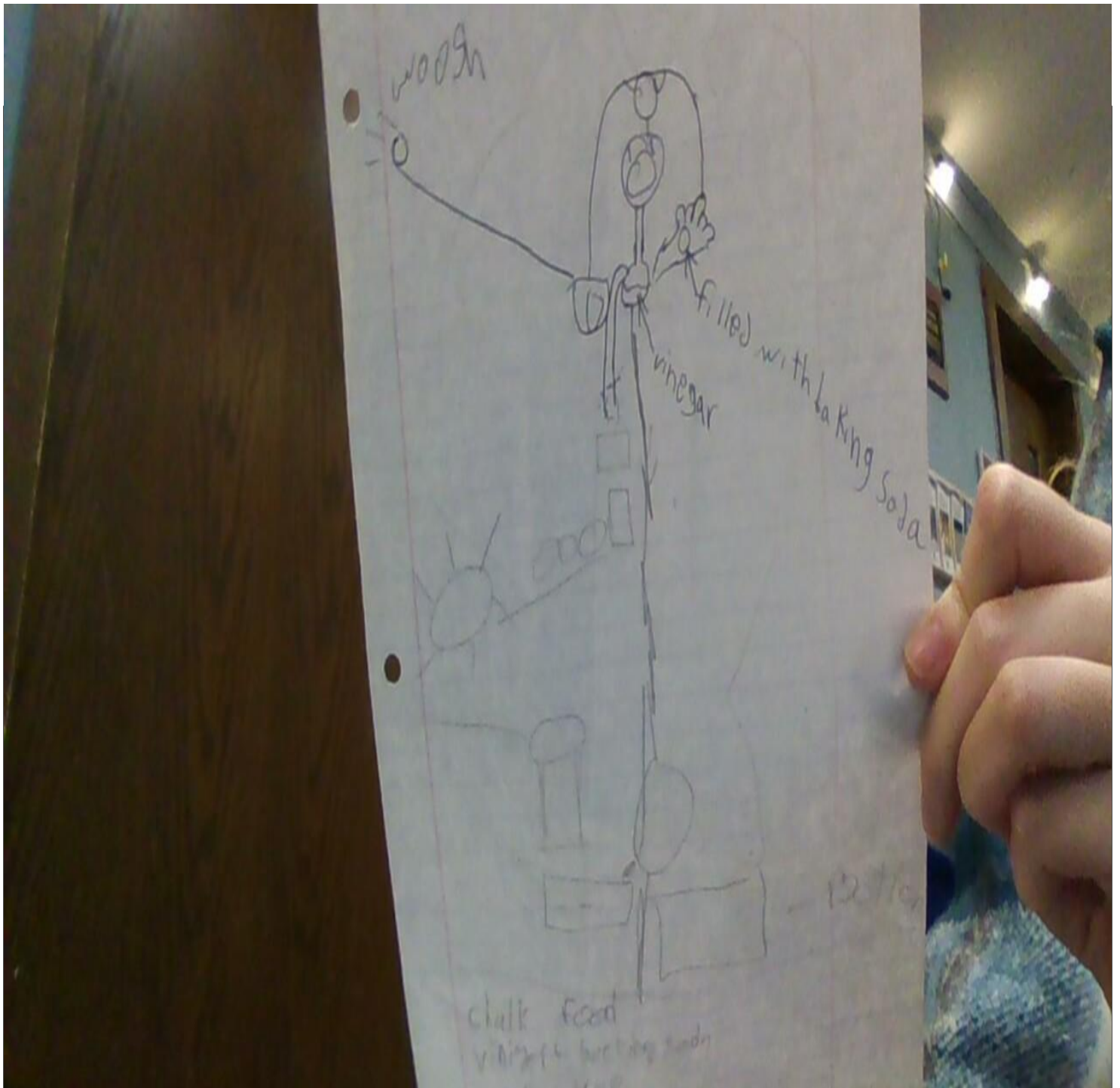
**Fabulous Frogs**

**Wildlands**

**Johna, Lyrik, Lynnsi**

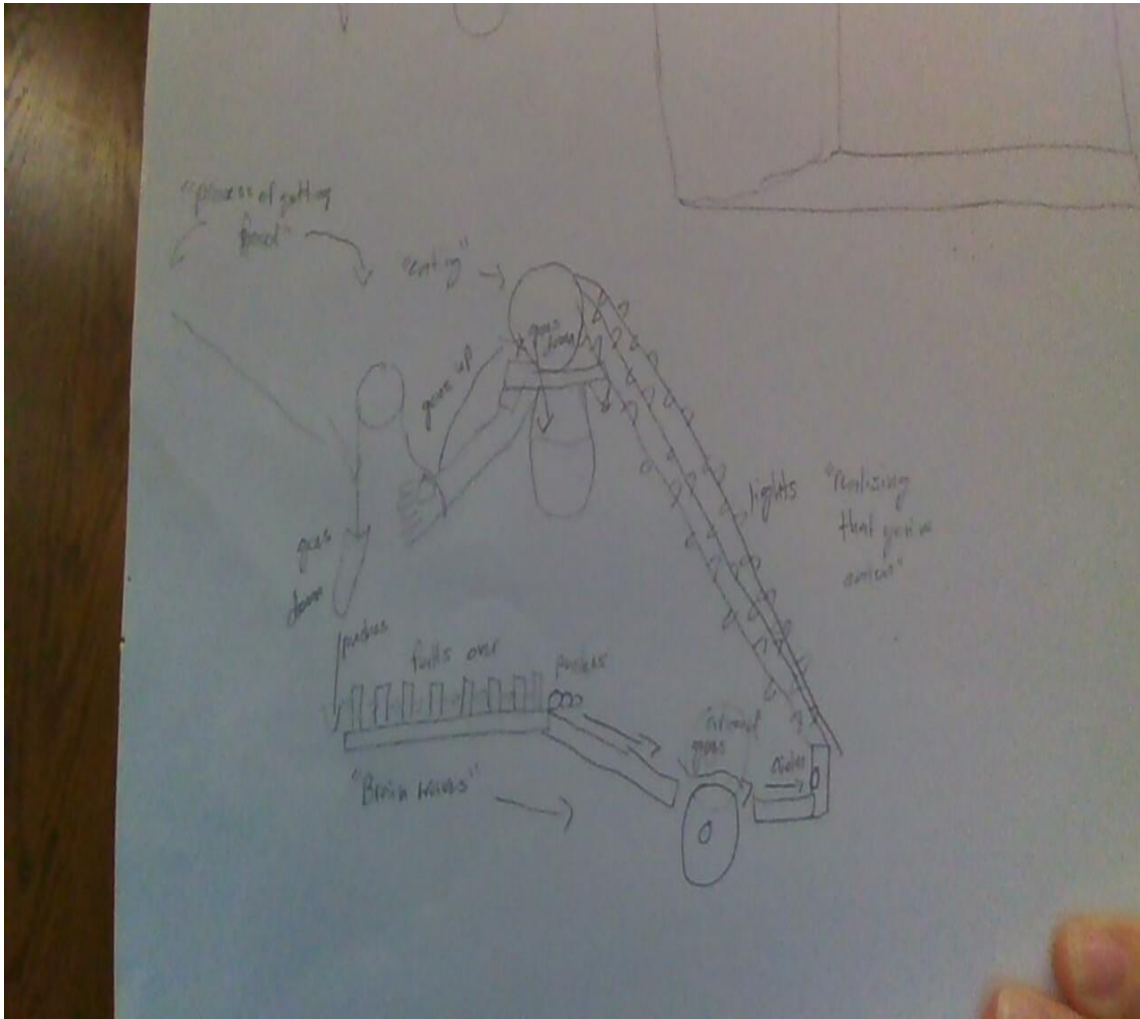
**Alexa Hurd**

## [Planned Machine Design Sketch and Description]



Our original plan was to have a marble roll down a ramp and fall into a cup, which would activate a pulley and pull a hand up to the mouth. The hand would be holding a piece of chalk that would roll down a tube and into a container of vinegar that is connected to a pulley. The weight of this vinegar would make the container fall and set off a few marbles that would roll down a ramp and fall into a wheel. The marbles would fall out of the wheel and go down a ramp and into a pulley, the puller would come up and trigger lights that would lead to the head.

## [Final (or Near Final) Machine Design Drawing/Image and Description]



To start, we lift a hand that is connected to a pulley up the the mouth. That sets off two things at one. There will be a marble in the mouth and falls down a tube a pushed some baking soda into a container of vinegar, this does not technical count towards are steps because it does not connect back the the rest of the design. While that is happening, the hand in the beginning will set off a pulley that will hit some jenga blocks which will hit a marble. The marble rolls down a ramp and hits some more jenga blocks. The jenga blocks will hit a swinging pendulum that will hit a few more blocks. (These steps are not included in the drawing). The blocks will hit a marble and the marble will fall down a funnel. From the funnel, the marble will come down into a small cup that will tip over and send the marble rolling, the rolling marble will set off the motion sensor with the lights.

## **|List of Machine Steps|**

We have a chemical component that does not count towards the steps because it does not connect back into the machine. We also have an electrical component with the lights at the end.

Step #1: Can hits Jenga blocks to make them fall

Step #2: Jenga block hits marble

Step #3: Marble rolls down ramp

Step #4: Marble hits Jenga block

Step #5: Jenga block hits swinging pendulum

Step #6: Pendulum hits marble

Step #7: Marble falls into a funnel

Step #8: Marble in the funnel falls into a cup and tips it over

Step #9: Marble activates motion sensor

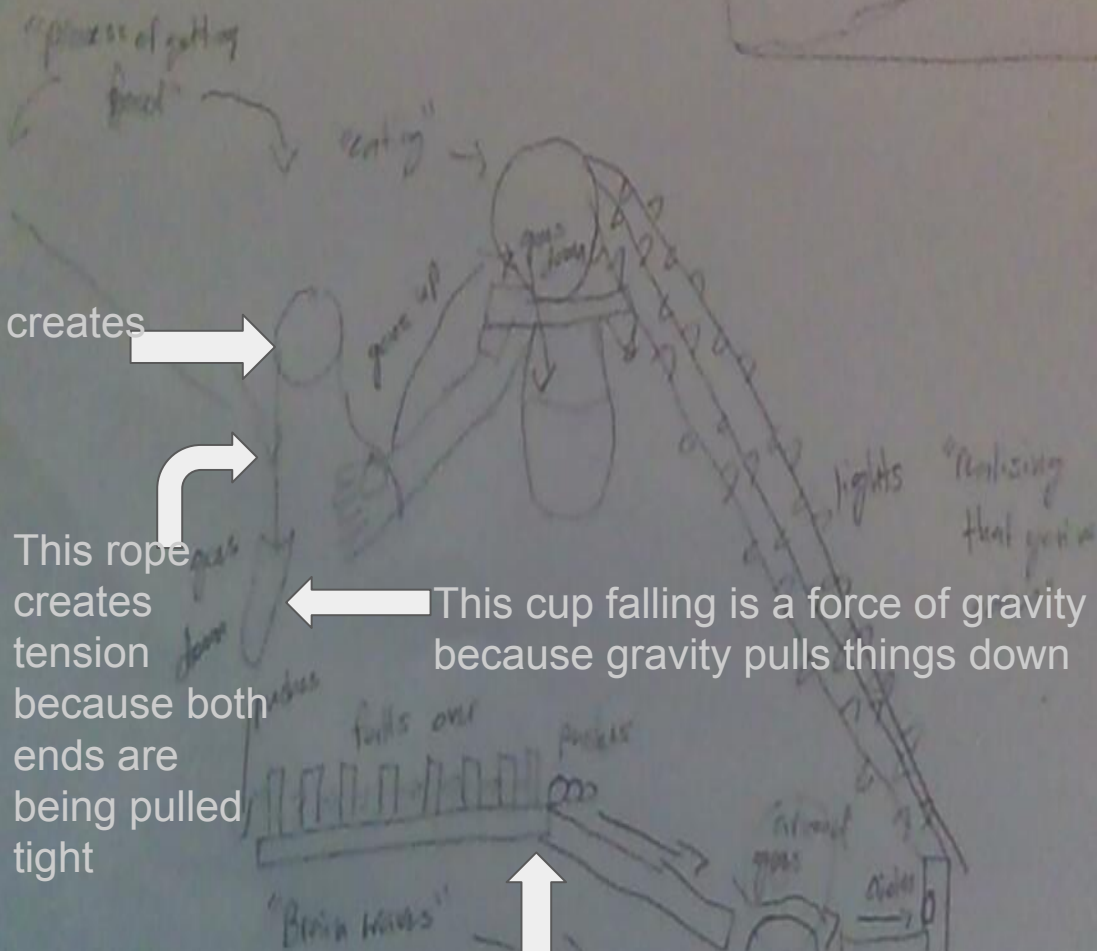
Step #10: Motion sensor activates lights

## **|Cost of Machine and Percent of Recycled Materials Used|**

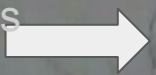
Recycled wood	Free
Fake Skull	Free
Pulley	Free
Twine	Free
Hot glue	Free
Screws/nails	Free
Plastic bottle	Free
Clear hose	\$5
Cardboard	Free
Paint	Free
Vinegar	Free
Baking soda	\$3
Jenga blocks	Free
PVC pipes	Free
Popsicle sticks	Free
Golf balls	Free
Marbles	Free
Paint	Free
Fake frogs	Free
LED Lights	\$30

Materials Cost    Total - \$38    Percent Recycled- 85%

**[Applied STEM Processes]**



This pulley creates



This rope creates tension because both ends are being pulled tight



This cup falling is a force of gravity because gravity pulls things down

The jenga blocks hitting the marble is a transfer on energy because one object in motion sets another object into motion



## |Reflection|

**Lyrik:** Comparing this project to when I did it last year, it's completely different this year. There were a lot more difficult things this time around the the last, especially with the teamwork aspect. There were some disagreements, but we eventually got over it. Time management was also difficult considering we didn't have a lot of time. The building process was really fun, but also complicated because we redesigned it multiple times while we were building. Overall this project was pretty good and I'd love to do it again, just maybe not on a time crunch.

**Lynnsi:** I think that this project was very fun to research and create. Getting things to work out on our machine was tricky, but figuring out what went wrong helped to get it right the next time. When building, it was fun to try out different building parts and what would work better for the machine. There was a problem with communicating, because sometimes people wanted to do their own thing rather than what had already been planned, but luckily we were able to figure it out and make something work for everyone. Getting our machine set up was changeling because it had to be set up in a certain way to work, and sometimes that way changed. So finding out where things need to be placed was hard to accomplish.

**Jonah:** I had a very fun time doing this project. It was especially fun researching different parts of the human body and all the different rube goldberg machines. I think my hardest challenge that I overcame while doing this project was the teamwork aspect, one way we figured out how to work together better was having a leader. After a while we started working together without a leader. It took a long while but once we got the teamwork to be better it was a great project. It was an experience I will remember for many many years to come.

## |Diary of building process, photos, team biography, etc|

### **Monday, January 29th,**

We did a mini engineering challenge where we had to make a structure out of 10 pieces of newspaper and 18 inches of tape that would hold a textbook.

Ours worked but it took a second to get it to balance because it wasn't leveled.

### **Tuesday, January 30th,**

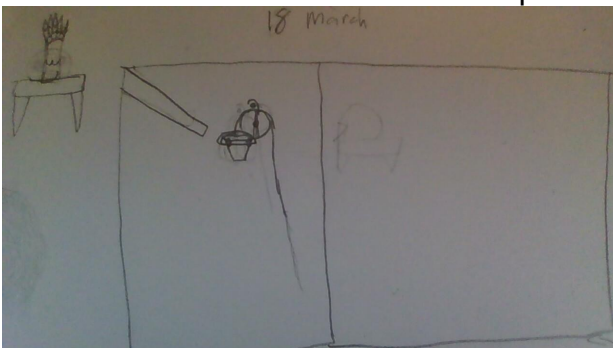
We've decided on 3 different body systems; Digestive, Nervous, and Circulatory. And we painted the base white.

### **Tuesday, February 27th,**

Today we fixed our pulley system. There was too much pull on the twine with the nail so we had to place the nail a little higher up. We also made a platform for our hand to go on as well as some supports for it so the platform is sturdy.

### **18 March**

Today we hot glued together the shelf for the hand better than the first time for the hand to sit on. We had to rebuild our pulley system which made it harder for our marble to fall in. We also figured out how far apart the head and hand have to be to be able to work. We talked more about designs and then also counted our machine's steps.



This is what our design looked like that day.



## 19 March

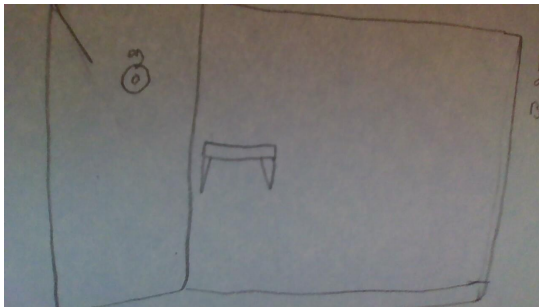
Today, we planned to glue the hand onto the platform, and planned how to make the hand and pulley system work together. We hot glued it to the back of the shelf, but struggled to make it stick. We re-planned to screw in the head. We replaced the cup on the pulley with a basket. We hot glued the shelf on the board. We struggled to get the hand attached to the shelf. Failed at attaching it with zip ties. Had to figure out how the hand and pulley system could work together. We tested pulley ideas to see which works best. We then decided to keep a ping pong ball inside the basket to keep weight. Put the hand at an angle and had to change where the head was.



(This is what our design looked like)

## 20 March

Today, we ran into a problem with our pulley system. We had to take our whole thing apart and decide ways it could work. We found out what our problem was, which was the angle the head and pulley system were. We had to cut the string off of the hand and detach the head from the board. Got it off after a struggle, and broke the shelf while taking it off. Worked after school, and got the pulley system figured out.



(This is what our board looked like that day)

## 21 March

After yesterday and we got the pulley system working, we had to drill back in the head. We switched out the basket on the pulley system to a bean can and added weight like we did for the basket. We reattached the hand back to the shelf. The pulley system was working but not how we wanted it to, the hand wouldn't go up. We struggled to get the hot glue for the cardboard sticking to the base. We had to take down the pulley system and get it to work again.

## Our Final Design:

Our final design was similar to this drawing.

