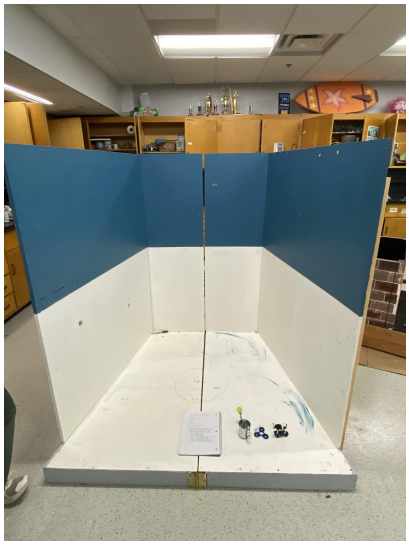
Engineer Machine Design Contest
THEME: "POWER THE WORLD"

Chatfield High School
UDDER NONSENSE

ENGINEERING DESIGN PROCESS JOURNAL

BRAINSTORMING PRE BUILD IDEAS:



11/16/21-

Theme Ideas-

- Factory
- eco friendly/sun

Machine/step ideas-

- Sun= lightbulb would turn on under dome
- Paint top sky blue
- Cow on the car that is painted green
- Magnet on green ball falls and weighs down watering can, something comes out
- Windmill, with motor?

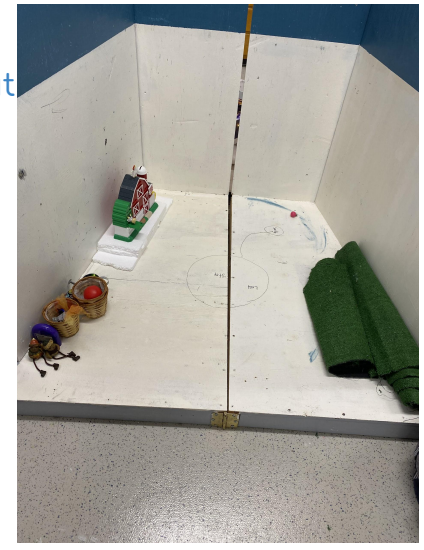
11/23/21-

Theme ideas-

- Starry night(see stars without pollution)

Machine/step ideas-

- Solar panels fall off walls with 3D items that makes marble roll
- Watering can represents garden instead of greenhouse
- Sun falls and hits fairy lights
- Green ball tips watering can, makes blue marbles fall out



11/30/21-

Machine/step ideas-

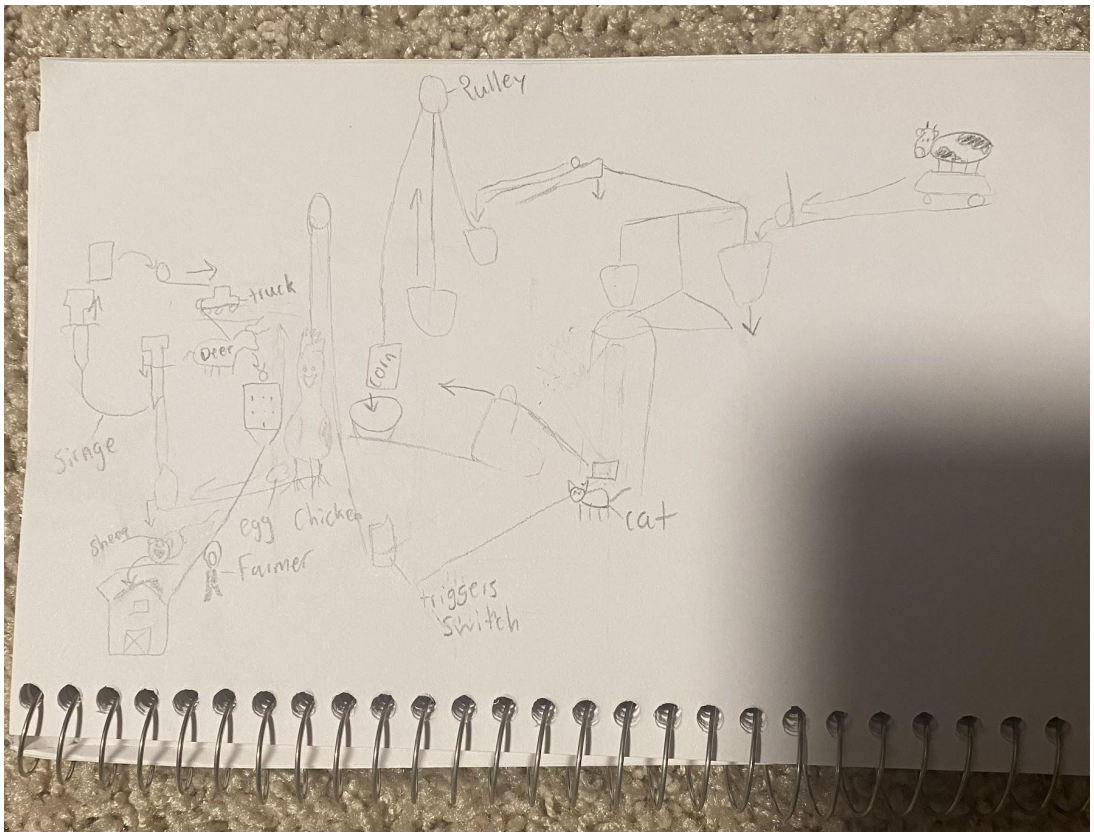
- Funny farm barn animals pop out and make ball roll
- Car runs into something
- Tabo button acts as horn
- Something has to hit tabo horn

12/7/21-

Machine step ideas-

- Cow goes down ramp
- Chemical reaction(cow gets milked)
- Cup fills up on scale to trigger "waterfall"
- Which then goes down a ramp and lands in ferris wheel
- something goes down zipline

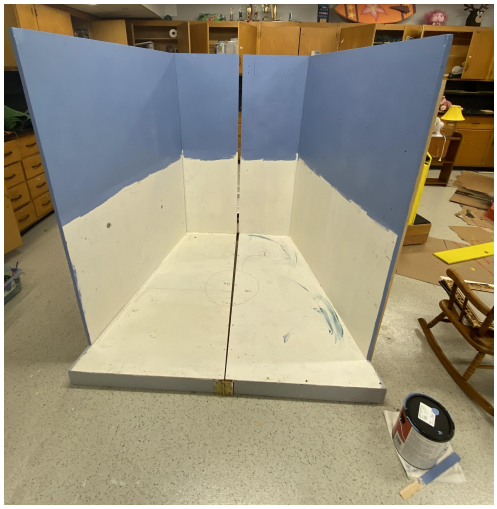
1. Initial Sketch and Description of Machine



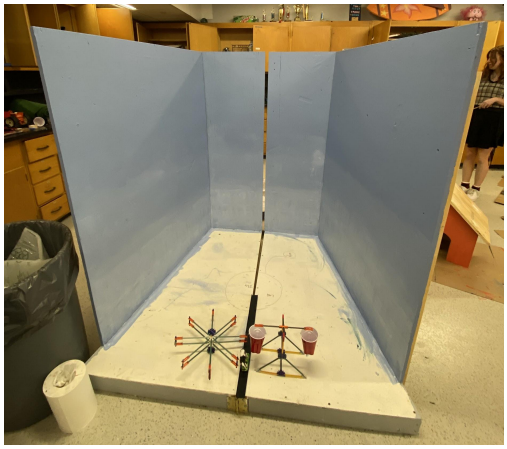
The cow gets pushed down a ramp and pushes a large marble into a scale making the scale go down pulling on a marble ramp that was attached by a string, releasing a marble that will fall into a three way pulley which makes a can of corn weigh down a dog bowl which is on the long end of a lever and makes the boot on the other end go up. Pulling a door open, releasing a cat that shoots out to trigger a button on a motor that is connected to a pulley that pulls a chicken off its egg which rolls down a ramp and pushes a heavy weight to fall off. That triggers the syringe which pushes a jenga block causing marble to roll down another ramp. The marble causes the semi-truck to go and pull the deer antler which hits the apple. The apple goes down the plinko board and pushes on the goose. The goose goes down the zipline and hits the sheep onto the barn.

2. Work Sessions and Progress Photos

12/9/21- started painting base blue

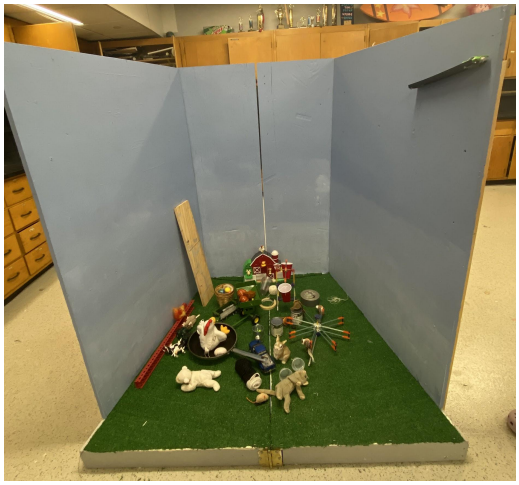


12/14/21- finished painting base blue, built Ferris wheel, built scale



12/16/21- put down turf, 20 ml water each cup on scale

1/4/22- Farm theme, put up first ramp on wall



1/11/22- Attached cow to car, put up mini wall at end of ramp

1/13/22- put up shelf and placed scale on it

1/18/22- put in silo and added marble ramps

1/20/22- attached boot to lever and put pipe and hinge on silo

1/21/21- started to work on big pulley

1/27/22- installed big pulley

2/3/22- changed all string to fishing line

2/15/22- put up ramp and chicken connected to kenex motor

2/17/22- put up signs by chicken, connected hammer to kenex motor

3/1/22- added car track in between silo and hammer

3/4/22- got rid of car tracks, added hydraulic step after chicken, and added more ramps

3/8/22- added basket for hammer to sit in, connected semi truck to deer with string

3/10/22- added plinko board after deer

3/11/22- added plexi glass to plinko board, built table to go over barn

3/15/22- painted table put in chicken food step

3/17/22- took out hammer connected to chicken, connected chicken food step with k'nex motor

Week of April 18-22- Changed the syringes for the Hydraulic step

3. Written Description and Image of Final Machine

THE STORY OUR MACHINE TELLS: (puns intended)

One day, Farmer Andy was super sick, and I mean *really* sick. He had all the things that come with a cold and more. Except, he needed to get the chores done at the farm. He couldn't think of what to do, but then he realized, the cow *did* milk himself one day, right? Maybe he could somehow get Mike **Cow**asowski to get everything going. So he gave him a little push and the chores started. Mike **Cow**asowski milked himself first, and then he put his milk into the farmer's cup of Joe to maybe give him some energy, so he got enough energy to feed the chickens. After giving Andy his coffee, he put chicken food in the basket to feed to the chicken. **Cluck Norris** took it from there. This made **Cluck Norris** ready for her egg. She let the egg down the ramp and let the weight pull the syringe. The syringe hit the log to hit a dog's ball. This ball hit the semi truck which sent it out of control, it ran into **Deery** Queen who was lounging in the road. **Deery** Queen ran into an apple tree, causing a bad apple to fall. The apple fell down the trunk and hit **Quaki Chan**, and **Quaki Chan** ate the apple, and got the energy to run to the barn. On her way there, she ran into **Bo Peep** taking a nap. **Bo Peep** got startled and ran into the barn. **Quaki Chan** realized he just completed the most difficult chore for Andy, putting the sheep in the barn.

TECHNICAL DESCRIPTION:

First, the cow gets pushed down the black ramp, then it hits the heavy blue marble into one of the cups on a K-Nex scale. The scale has a string attached with the marble ramp. The ramp moves down the smallest bit so that the marble loosens and falls down the ramp. The marble falls down a black tube into a cup on a pulley. The pulley drops a can of corn down on a lever, which moves a boot up, and pulls a string attached to a K-Nex stick. The stick becomes unattached and lets the hinge open, which allows the chicken food to fall out into the bucket. The bucket goes down, and pulls the other side of the pulley, which pulls a switch on a K-Nex motor to start reeling the chicken (attached to the string) up. The chicken releases an egg, the egg rolls down the red ramp, and hits a weight at the end of it. The weight is attached to a string, which is attached to the top of a syringe. The syringe goes down, which makes the other side of it go up. The syringe handle pushes up on a jenga block, which falls down and hits a green marble. The green marble rolls down a ramp, and onto the back of a semi truck, which has a magnet on it. The truck gets momentum to go down a ramp, and it is attached to a string, which pulls a deer antler down as the truck continues to go down a ramp. The truck eventually falls off the ramp on the other side. The deer antler goes down, and hits an apple, which falls into a plinko board, and the apple hits Quaki Chan, and the goose releases and goes down the zipline. It hits the sheep off the 3-legged table and into the barn.

THE FINISHED MACHINE:

4. Numbered Step List

PLEASE NOTE:
The red word in each step tells which object has the energy.
ORANGE is the chemical reaction
GREEN is the electric step
YELLOW is the hydraulic step

The underlined words refer to the simple machines used to create the mechanical energy transfers.

1. Udder nonsense begins when a person pushes a cow on a car down the inclined plane, turning its kinetic energy (KE) into potential energy (PE).
2. The cow transfers its KE to the earth (blue marble) which knocks an Alka Seltzer tablet into a cup of water, turning it into "milk."
3. The cup of "milk" is on a scale, a first class lever, so that the chemical reaction pulls on the input arm and lifts the output arm.
4. As the output arm of the scale is raised, it pulls the purple ramp forward,
5. releasing a marble to roll down the inclined plane and land into a cup.
6. When the cup's mass increases due to the marble weight , it releases a can of corn on the pulley to go down.
7. The can of corn depresses the input arm of a first class lever to raise the farmer's boot on the output end of the lever.
8. The boot kicks the stick out from under the feed shoot on the silo releasing the hinge (a first class lever) and the chicken food.
9. The chicken food goes into the plastic container which pulls the switch on the K'Nex motor
10. to twist the string making the chicken rise on a pulley system and lay an egg.
11. The egg tumbles down the inclined plane revealing that "Food Powers the World" and it hits a weight.
12. The weight falls and pulls down the plunger on a hydraulic syringe, forcing water to lift the other end of the syringe using fluid pressure to
13. knock over a Jenga block that releases a
14. green marble that rolls down an inclined plane and
15. pushes a John Deere truck.
16. The John Deere truck continues down the inclined plane and pulls the deer's antlers down
17. Releasing the apple to fall down the plinko board apple tree
18. and release the goose to go down the zip line inclined plane.
19. The gosses nudges the sleeping sheep off its platform to fall with kinetic energy
20. back into the barn sleep and closing the barn doors on a pulley system after a busy day on the farm "powering the world."

5. Cost of Machine and Percent of Recycled Materials

- Machine base and walls = made from recycled wood and hardware
- Toy cars = donated
- Car race tracks= donated by Ella
- Toy plastic animals= donated
- paint= approx 1/4 gallon blue $19.99 = $5.00
- wood= donated
- Plinko board= recycled wood and nails
- Plexi-glass= used during covid
- Fishing string= $3.95
- Pulleys= donated
- Chicken Food= donated by Rachel
- Plush animals= donated
- K'nex= Physical Science classroom
- K'nex motor= Physical Science classroom
- boot= donated from Christmas Machine 2020
- barn= donated by Charli
- silo= from Farm machine 2019
- Marble ramps= donated by Charli
- bucket= donated
- Jenga block= donated by Charli
- Cardboard drawings= donated by Charli
- weights= from Physical Science classroom
- turf= $8.00
- Tape= Physical Science classroom
- Foam barrier= donated
- marbles= donated
- Alka-seltzer plus= $4.89
- Plastic egg= donated
- rope= donated
- Red ramp= donated
- Black tubing= donated
- Lead balls= donated by Rachel
- paper= donated by school
- glue=donated
- screws= donated
- Nails and other hardware= donated
- hinges= Physical Science classroom
- Plastic cups= donated

*Items marked "donated" are available in our school's maker space room and are often left over from other projects in previous years.

TOTAL COST FOR NEW ITEMS = $21.84
ABOUT 95% of our machine was recycled materials

6. ENGINEERING DESIGN PROCESS - Major Successes and Challenges

Successes:

Ask: identify the problem
Our biggest success was getting the first pulley to work.

Imagine: brainstorm solutions
We started thinking of ideas of why it might not be working.

Plan: sketch the idea
We tried to make it so it would go straight into the cup and bounce out.

Create: bring the idea to life, test it
We added and took away things from the pulley

Improve: make it better
We changed the sizes of the weights to make for more room and added details to the cups.

Challenges:

Ask: identify the problem
A major challenge was starting to put the materials onto the machine.

Imagine: brainstorm solutions
We spent a few days just brainstorming ideas and trying to incorporate them into the machine.

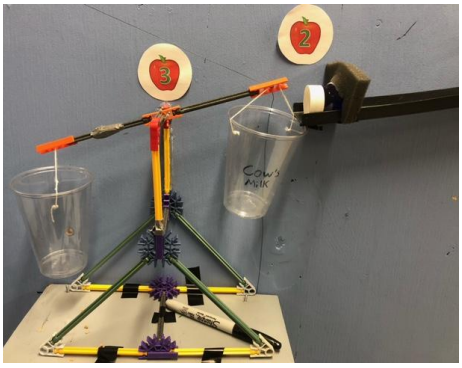
Plan: sketch the idea
We grabbed everything but kept getting new better ideas so we kept changing everything.

Create: bring the idea to life, test it
After we decided on a specific theme and had ideas we started to put things on and test them.

Improve: make it better
After a while we started changing a few things, taking things out and putting new things in until it worked.

7. Advanced Components

Chemical Reaction -

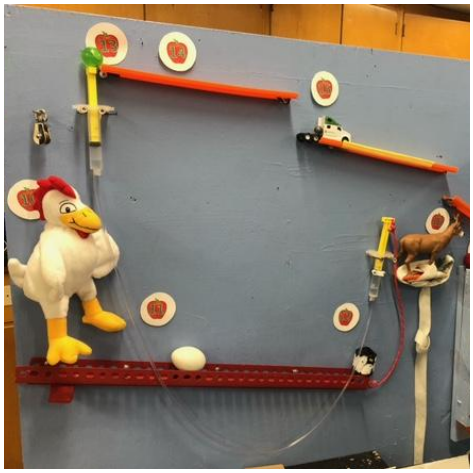


The alka-seltzer plus tablet falls into the cup and turns the water a white color (cow's milk).

Electric -

A string is pulled from the weight of the chicken food in the basket from the silo causing the battery powered K'Nex motor switch to turn on and wind up the string that lifts the roster off his nest. The motor runs on 2 AA batteries.

Hydraulic -



The weight falls which pulls the first syringe down and the second syringe gets pushed up due to the fluid Pressure. The second syringe tips the orange ramp up and releases a green marble.

8. Team Reflection

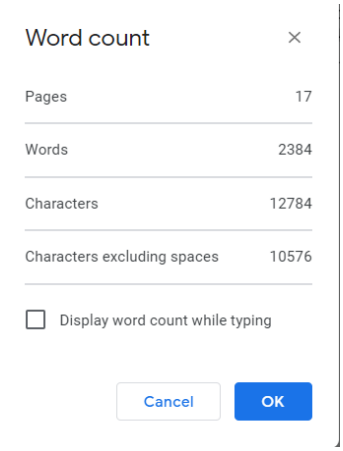
My experience doing this activity was great. I enjoyed going there on Tuesdays and Thursdays after school to go build and work on our machine. I already had good teamwork with Charli and Rachel, but I think this activity improved our teamwork skills. I enjoyed being in a room with tons of random junk and materials to basically do whatever you want with. I think the only thing I didn't enjoy was getting to a point where we thought we weren't going to finish because we thought we didn't have enough steps and the dead line was in sight. This is because it was stressful for me to think we were going to go all this way for nothing, and to take it apart and not compete. I'm glad I had this opportunity to work on this and I can't wait to see how it all ends. **-Ella Bakken**

I had so much fun making this machine and I was lucky to have my two teammates as my friends. Even though there are only three of us, we made it work. We all collaborate really well together and have a good time playing off each other's ideas. I learned a lot while making this machine and am excited to continue on next year.-**Charli Oeltjen**

My experience with this activity was amazing despite the slight lows of thinking we weren't going to finish. Charli and Ella made this experience way better. It helped us see where our strengths and weaknesses lay with our teamwork skills. Overall this experience was amazing and I would never trade it for the world.-**Rachel Johnson**

9. Document Word Count

2,384 of the limit of 2,500 words



10. Bibliography

OK GO Rube Goldberg music video for inspiration
https://www.youtube.com/watch?v=qybUFnY7Y8w