THE LUNAR LADIES

OR002

ROADS ON MARS
MISSION DEVELOPMENT LOG

Rover Observation And Drone Survey on Mars Challenge

THE LUNAR LADIES
MARS ROVER 2020 - OREGON CITY TO MARS - TEAM OR002

Twitter.com/Ladies_Lunar

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THE LUNAR LADIES - OR002

Team Information

GARDINER
MIDDLE SCHOOL

The Lunar Ladies

Hi! We are the Lunar Ladies. The members of our team are: Ariana Nackos, 8th grade, Patricia Misley, 8th grade, Pahlychai Thao, 9th grade, Lily Kirkpatrick, 8th grade, and Sophia Misley, 6th grade. We are coached by Tom Misley. We represent Gardiner Middle School in Oregon City OR. Team number: OR002.

For this challenge, we have become *Martians*. Our leader is Marvin the Martian. On April 14, 1970, we were on our way to Earth's moon to study crater formation, and we accidentally ran into the Apollo 13 spacecraft! We were badly damaged and forced to go to earth for repairs.

Once we arrived, we each selected important people ("specimens") from NASA to help us get back to Mars. Those are the people on our badges. They weren't able to get us back, but when we heard about this challenge we knew this would be a great chance, so we joined. We are going to try our best to win so we can get a safe ride home to Mars along with the NASA 2020 Rover.

Scrapbook: Team Information

Scrapbook: Team Information

Team Attire

Sophia M
7/15/2

SESSION :

Overview of Team Attire

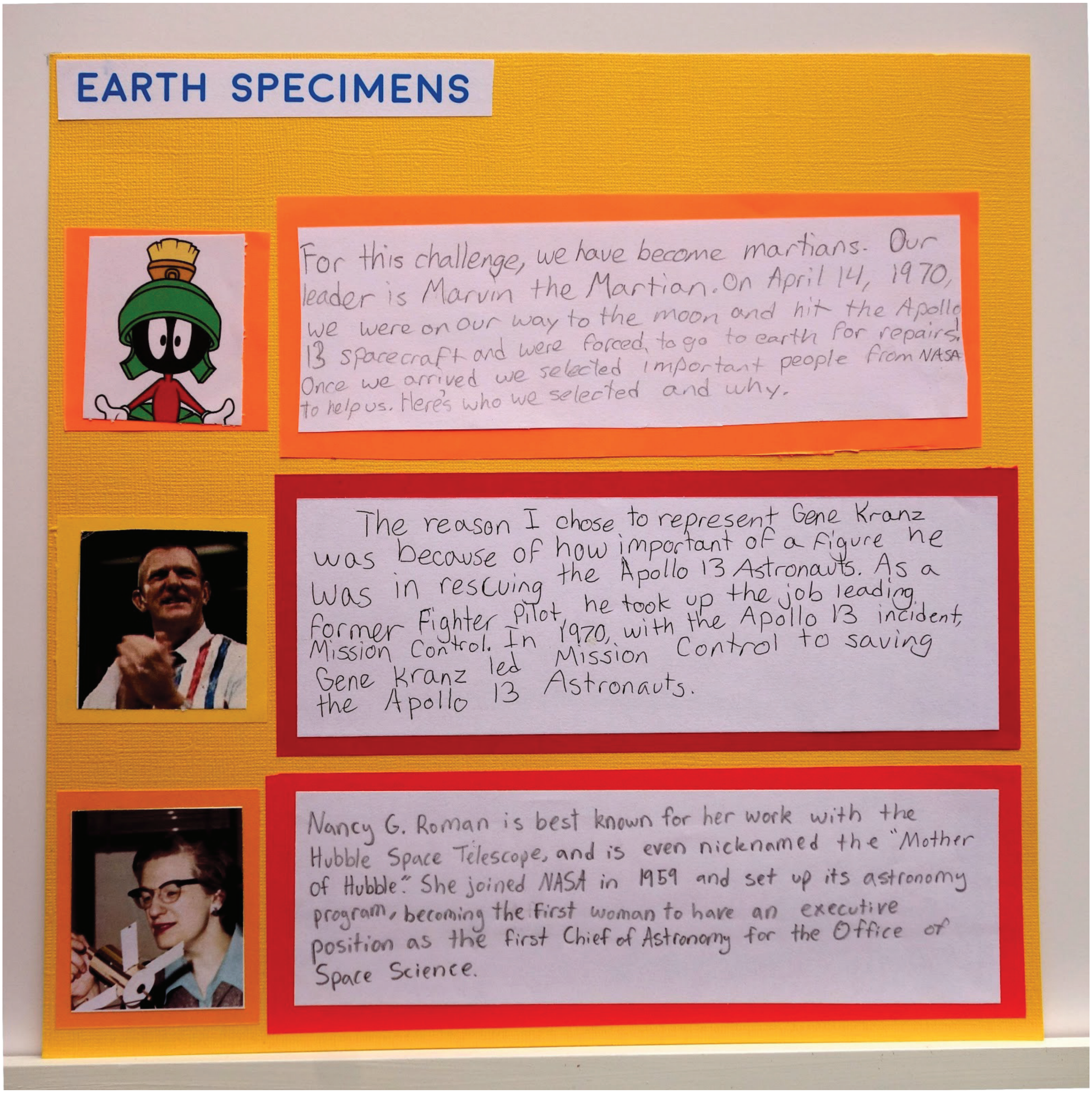
Working together as a team helps us accomplish so much and gives us so many creative ideas. This is very visible in our team attire designs because of the amazing and fun things we did. Dressed as Marvin the Martian, (an old cartoon that has also been a mascot for NASA) we all worked hard on different pieces of clothing. We got especially crafty and creative when it came to our skirts that we sewed ourselves, our head pieces which we put together out of foam, a headband, screws, and wood, and our unique "Specimen" badges where we did research on each person. Wearing our shirts with a patch representing NASA, and different colored sparkling lanyards that represent each one of us, we are proud to be an all girls team representing the community of women in science.

Scrapbook: Costumes

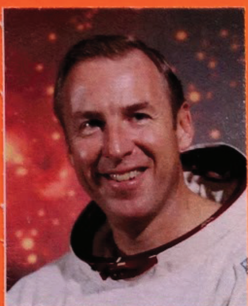
Scrapbook: Costumes

Costume: Badges

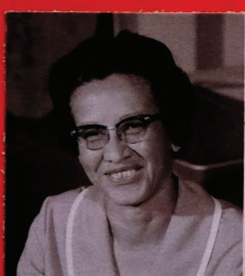
Scrapbook: Badges



Scrapbook: Badges



We chose Jim Lovell in honor of the 50th anniversary of the Apollo 13 mission. Jim Lovell was a former NASA astronaut, Naval Aviator, Mechanical engineer, and a retired Navy captain. In 1968 he was a command module pilot for Apollo 8. He was one of the first 3 to fly to and orbit the moon. He also commanded the 1970 Apollo 13 mission. Jim Lovell logged a total of over 700 hours in space.



We chose Katherine Johnson because we wanted to pick famous women in STEM fields. Katherine Johnson was an American mathematician. whose calculations of orbital mechanics as a NASA employee lead to the success of NASA putting an astronaut into orbit around the Earth. She also studied how to use geometry for space travel and figured out the path for a spacecraft to land on the Moon. Katherine Johnson overcame racial discrimination as a black woman working for NASA.

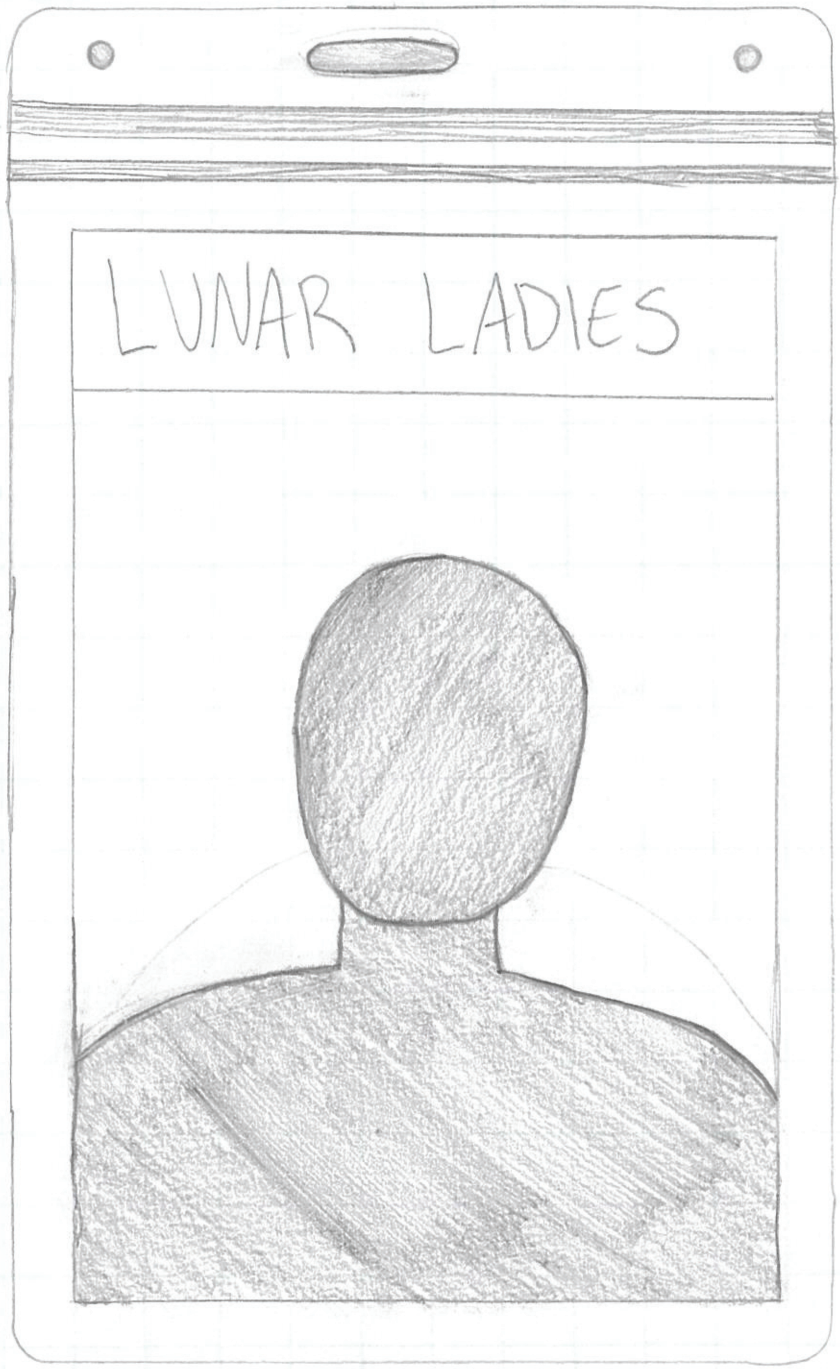
Margaret Hamilton

Hamilton was a computer scientist. She studied math and became a mathmatition. Hamilton was a computer science pioneer and developed a navigation system For Apollo. She was the leader of the team responsible For developing a software for the comand module and the lunar module.


SPECIMEN
HAMILTON
LOVELL
JOHNSON
KRANZ

Aviana Nackos 2/12/20

SESSION: Costume Design: Badges (Back of the badge)

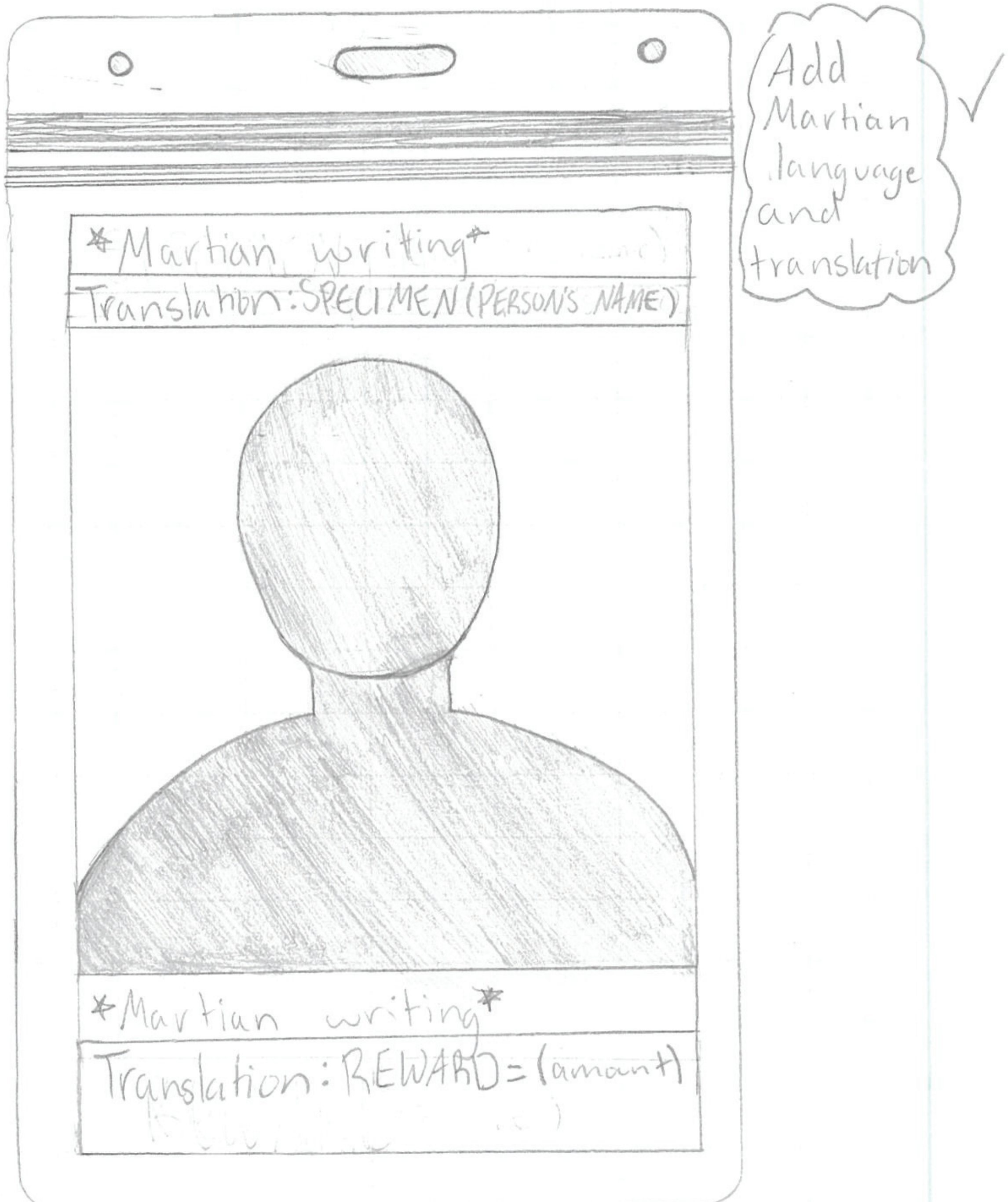


- add martian language and translation?

- picture of team member

Ariana Nackos 2-12-20

SESSION : Costume Design: Badges (Front of the badge)



February 26, 2020

Sophia Misley

SESSION:

Costume

- Today we worked on our headbands.

- First we cut the piece connecting the sponge (broom) and the headband out, with a saw.

- Next we put a hole in the headband so we could screw that piece on.

- We also put a slit in the sponge to stick the conecting piece in

- Then we connected all the pieces together to make our different color headbands!!!

PJ

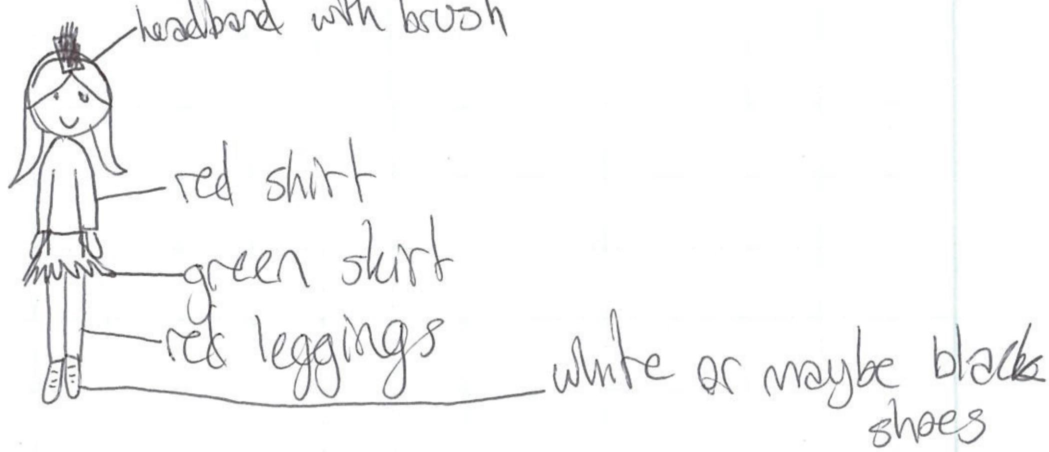
SESSION : 1/29/20

Costume

Problem: We do not have a costume that ties in with Nasa, our comunity or Mars.

Explore: We thought about being mission controllers but we did that last year. We looked at Marvin the martian and think we could have an outfit like his. We could possibley have a red shirt, pants and a green skirt and headband (instead of helmet). We found two good Marvin co

Design:

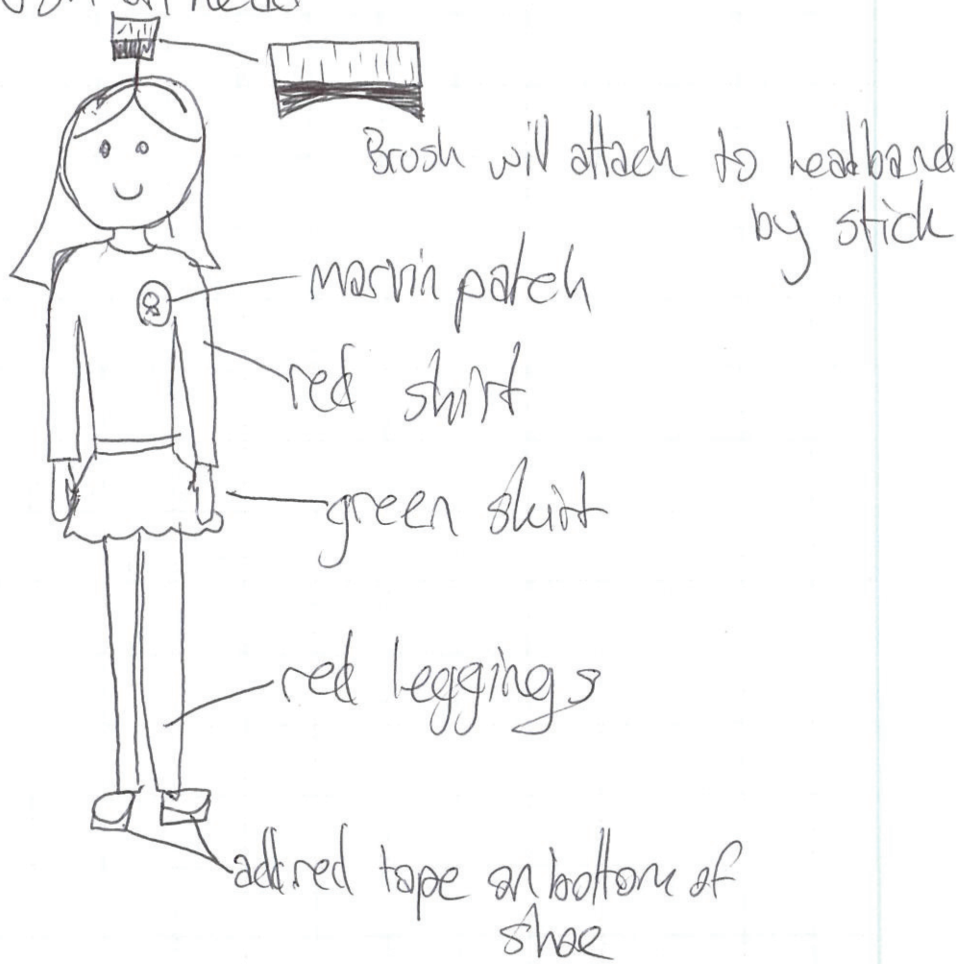


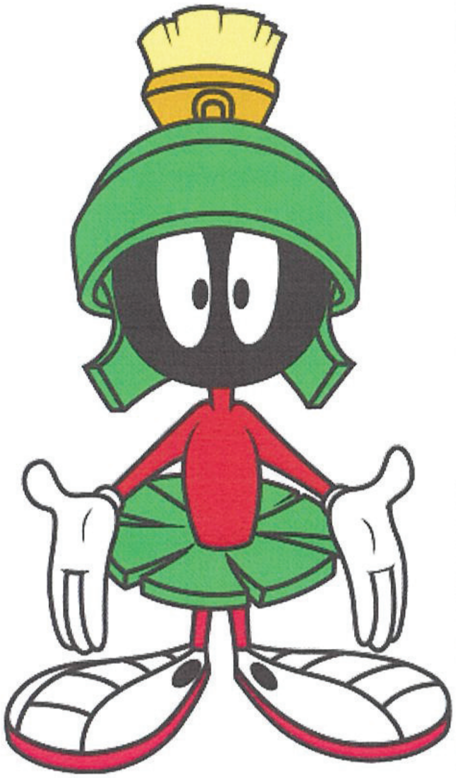
Fav. colors: Arianna: Red, Bright green, light green
Lily: Red, Blue, Pink light pink
PJ: Red, ~~Orange~~ Yellow yellow yellow
Pahlyehai: Blue teal blue
Sophie: Purple light purple

SESSION: 1/29/20

Costume

- Marvin painted on our face wearing our color
- Marvin Patch on shirt
- Put "Lunar Ladies" on back of shirt
- Use foam Brush on head






MARS EXPLORATION ROVER - A
1SLS
Red Planet Gladiators
NASA ★ BOEING ★ JPL ★ CORNELL

Mission Patch

SESSION: 29 July 2020

Overview of Mission Patch

To make our mission patch we all worked on ideas to include symbolism and meaning. Whenever we got an idea that we all liked I would sketch it out and then, similar to the engineering design process, we'd decide what we liked and didn't like and change it accordingly As an all girls team our patch shows our support for women in science and women of Nasa, as well as the Apollo 13 mission, our comunity, and the Mars 2020 Rover.


THE LUNAR LADIES
OREGON CITY
NASA
JPL
MARS ROVER 2020 - OREGON CITY TO MARS - TEAM OR002

The Lunar Ladies (OR002): MISSION PATCH

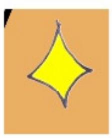
Our mission patch celebrates women in science as well as NASA and our home town of Oregon City. The following is a list of the symbols.

- **The Shield:** the shield the girl is holding represents Nancy Roman and how she pushed back against society to become the first woman executive at NASA.

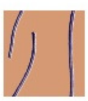
- **The Stack of Code:** On the shield are three books of software code to represent Margaret Hamilton, the team lead responsible for the on-board flight software for the Apollo program.

- **The Raindrops:** the five raindrops represent us five girls and how a collection of rain drops can start a mighty river.

- **The Lightning Bolts:** the lightning bolts are for Valentina Tereshkova, the first woman in space, and Sally Ride, the first American woman in space. They also represent Oregon City as the first long distance power transmission site in 1889.

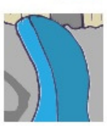


- **The Stars:** the three stars in the Mars sky represent the three Apollo 13 astronauts, Jim Lovell, Jack Swigert, and Fred Haise in honor of the 50th anniversary of their “successful failure”.

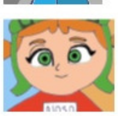


- **The Delta Dynamics:** the fan shaped lines on the surface of Mars represent an ancient river delta and a possible location to search for past life on Mars.

- **The Tower:** the tower represents the Oregon City elevator located in our home town. It is the only outdoor municipal elevator in the United States.

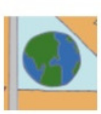


- **The Waterfall:** the waterfall is Willamette Falls in Oregon City; it also represents the ancient rivers and waterfalls on Mars.



- **The Outfit:** the girl is dressed up like everyone’s favorite alien, Marvin the Martian, who has been featured in real NASA patches in the past.

- **The Helmet:** the helmet has a circle inside a square to represent how the Apollo 13 crew needed to fit together a square “peg” filter and a round filter hose.



- **The Flag:** the flag with the globe represents all the people of earth who benefit from science and exploration.

- **NASA & JPL Logos:** the logos are included to honor the workers of the Mars 2020 rover.

Scrapbook: Mission Patch

Scrapbook: Mission Patch

Sophia Misley February 12, 2020

SESSION:

How to Paint a Line Drawing

① Scan the line drawing into a computer

② Go to the backround layer and use the magic wand tool to select the peice you want to color.

③ In the top or middle left of your screen, you can choose the color. If you want a color already on your tab or on a different one, you use the eyedropper tool to select it.

④ In the paint layer, select the flood fill tool, then click on your selected piece.

⑤ Contince to do different pieces in different colors!

PJ

SESSION: 1/29/20

Mission Patch disscussions

- OC Elevator
- Willamete River (Falls)
- rover in background
- represent Margaret H and Nancy G
- shield and sword to represent how Roman fought against society
- rain drops for us girls
- square going into a circle
- craters for astronauts
- mountains
- Mars is war + agriculture
- stars
- Earth in background
- transition line
- apollo 13
- girl is wearing vest for Gene
- aliens
- ocean to represent coast
- girl holding shield (sword not drawn)
- half girl, half alien

PJ

SESSION :

Mission Patch Page 2

Comments from initial draft:
- girl was too tall
- flag was too big

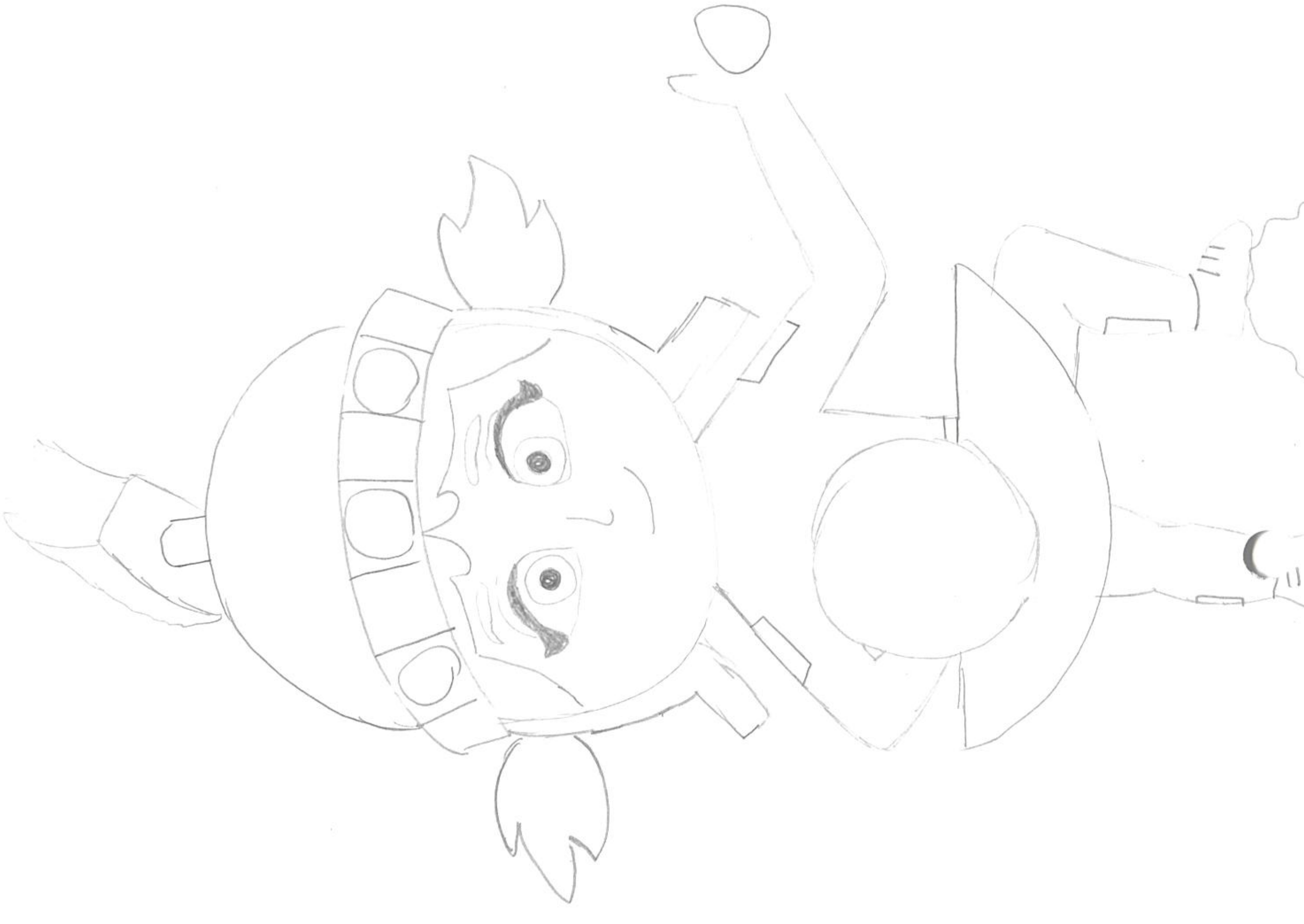
Draft 2:
- rover too small
- make elevator shorter
- make legs better
- change flag to Earth flag
-

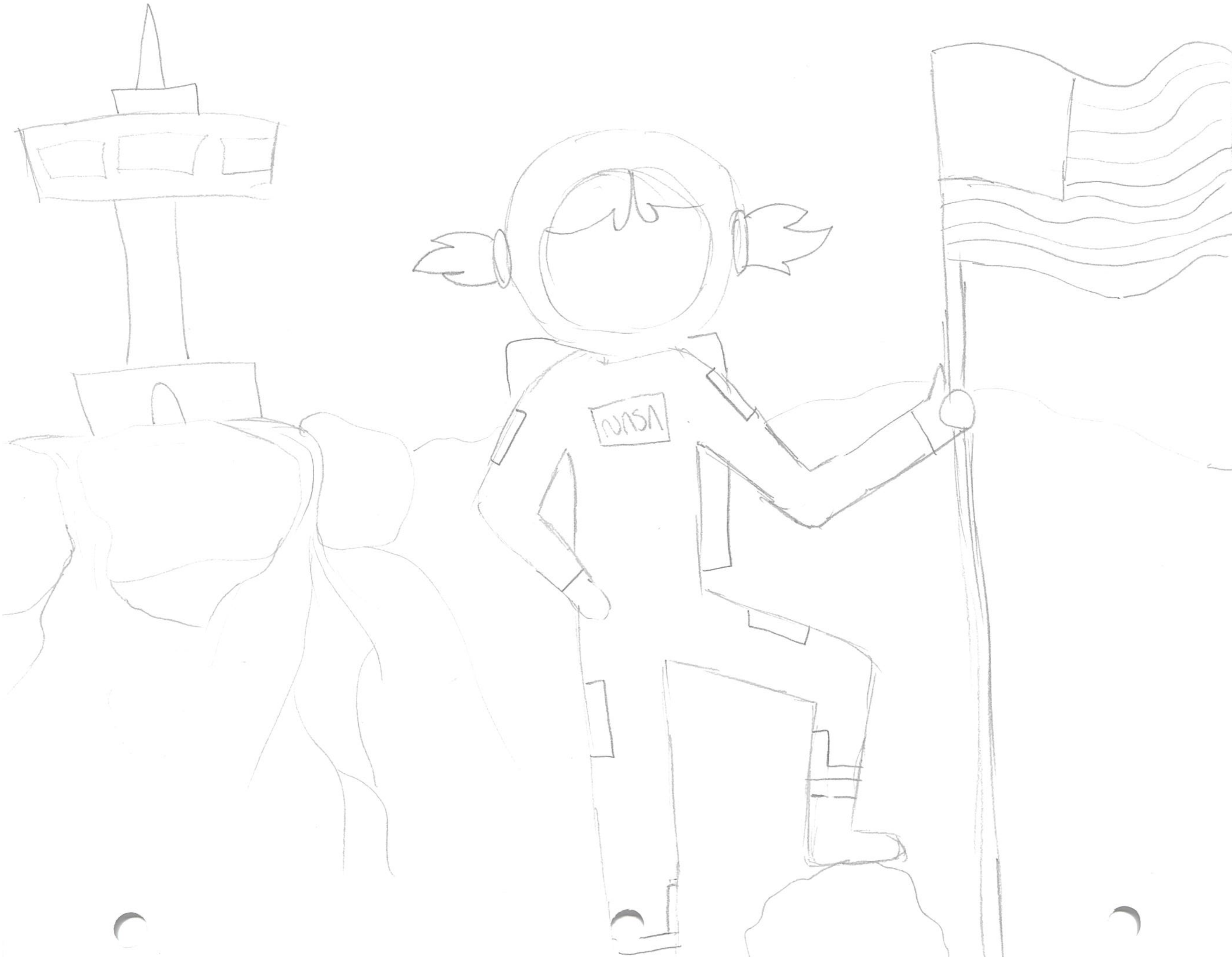
Draft 3:
- books on shield is too tall
- fix rover
- move delta to other side
- make flag bigger

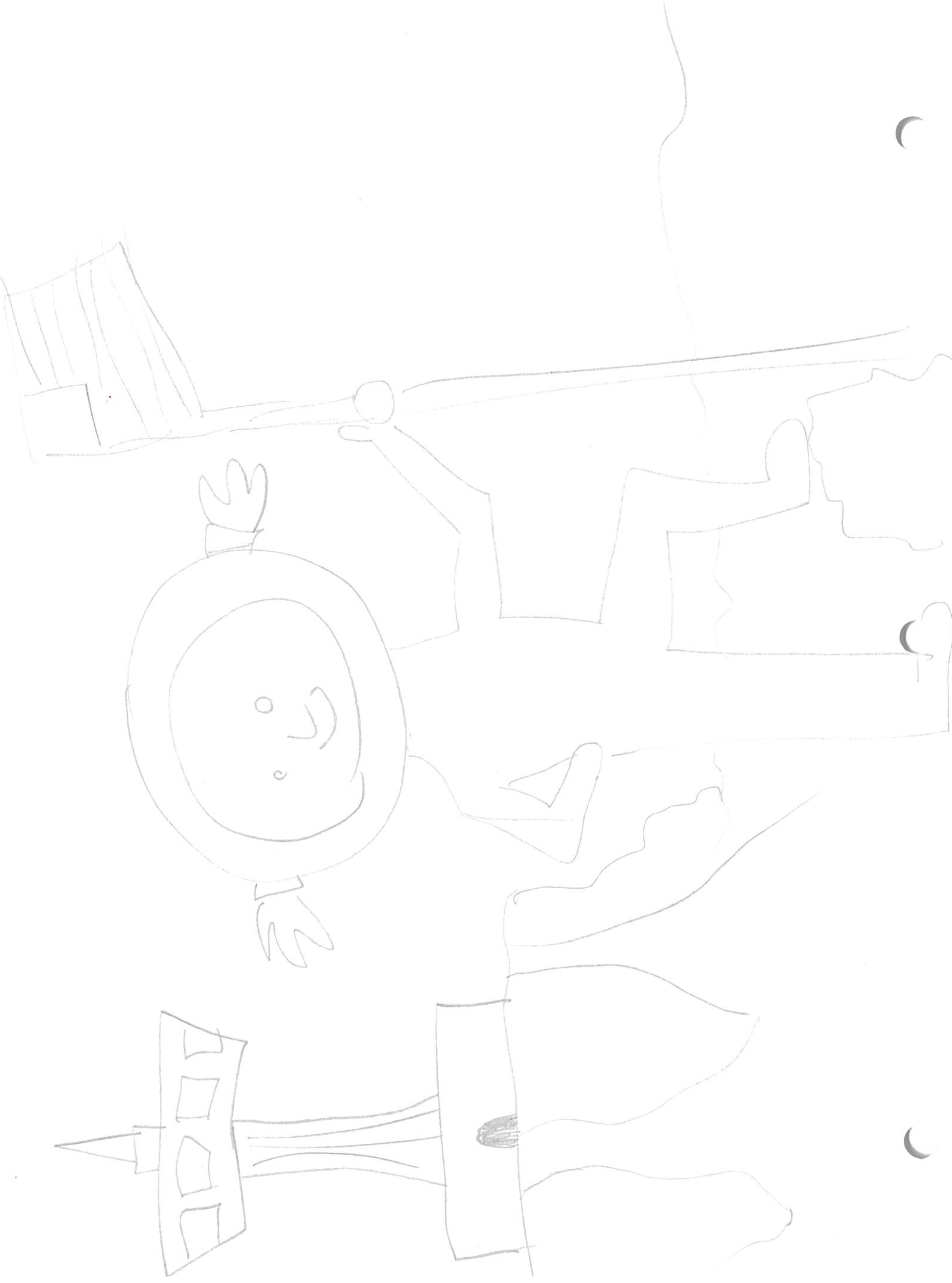
Draft 4:
- fix rover
- change books

Almost Final draft:
- change rover wheels
- add craters
- JPL sticker


OREGON CITY
NASA
JPL




NASA



Social Media

Twitter.com/Ladies_Lunar

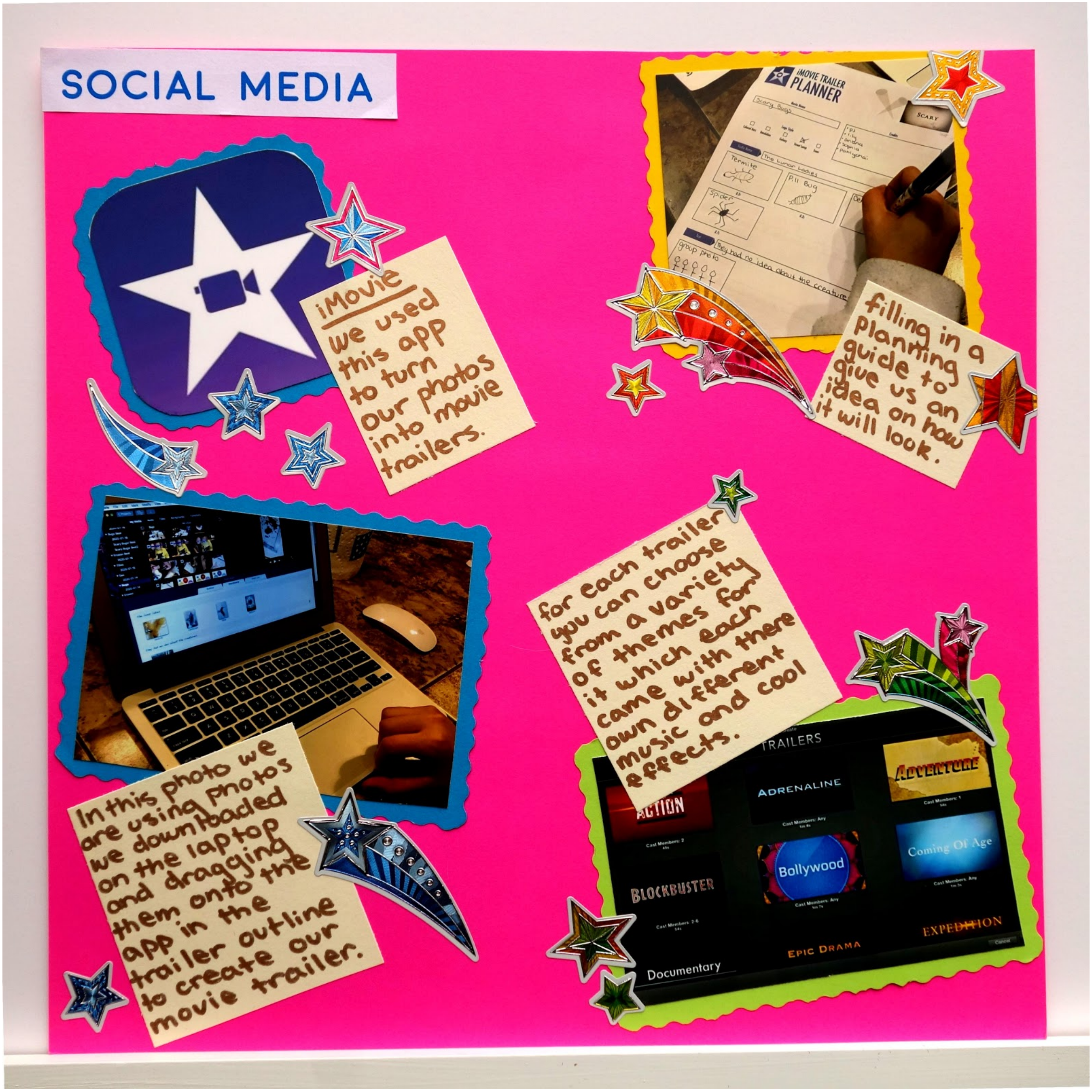
Lily

SESSION: 22, July, 2020

Overview Of Social Media

In order to create and put together our social media posts we went through various steps and a few learning curves. The first thing we did was during our mini challenges. We took videos and photos of our prep, during, and clean up of the mini challenges using our iphones. Next we found this really cool app called imovie. We used the imovie planning sheets to organize our videos and photos into each mini challenges own trailer. While putting together the trailers we learned about the Ken burns panning method to crop our photos and give them more life. One of the things we learned in the processe of making these is that we needed to save a backup of each trailer because our computer crashed and one of our trailers was lost and we had to redo it. The final step to our social media posts was to post them on Twitter, Facebook and Youtube.

Scrapbook: Social Media



Scrapbook: Social Media

Lily 1/15/20

SESSION: Imovie trailer - Gas/moisture detection and Bugs

I worked on the Gas/moisture and scary bugs movie trailer. While doing it I learned about Ken burns panning for cropping. We also learned importance of backups cause we lost the bugs trailer that I had to re-do when the computer crashed. The steps to backing a file up are: 1.) launch finder 2.) go to documents/Imovie files 3.) highlight file 4.) click gear 5.) choose copy 6.) go to backup thumb drive 7.) go back to gear 8.) choose paste. And that is how you back it up!

iMOVIE TRAILER PLANNER

Movie Name

Scary Bugs

Credits

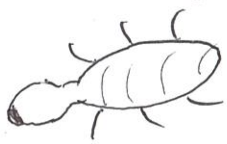
- pj
- lily
- ariana
- sophia
- panlychai

Logo Style

- [ ] Colored Bars
- [ ] Dandelion
- [ ] Galaxy
- [x] Street Lamp
- [ ] Trees

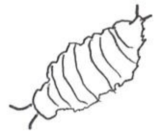
Studio Name: The Lunar Ladies

Termite



0.2s

Pill Bug



0.2s

Centipede

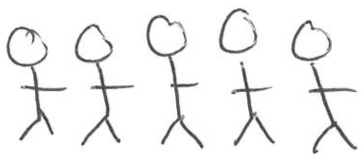
0.3s

Spider

0.7s

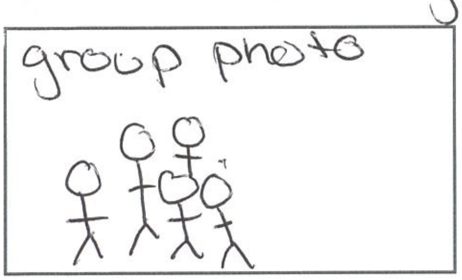
Text: They had no idea about the creatures

group photo



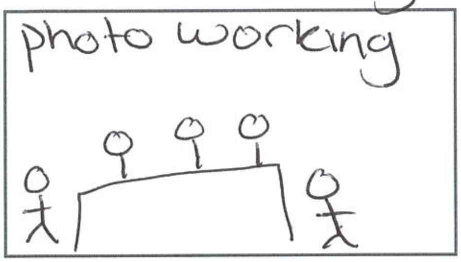
3.3s

Text — lurking beneth their feet



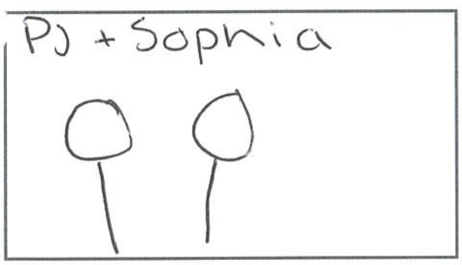
3.7s

Text — They set out to find them

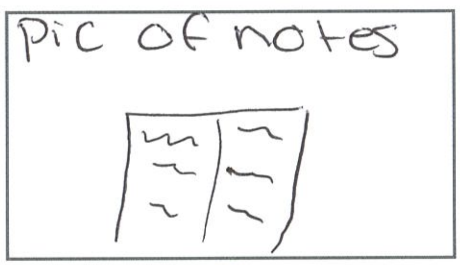


6.0s

Text — and study them... up close... too close

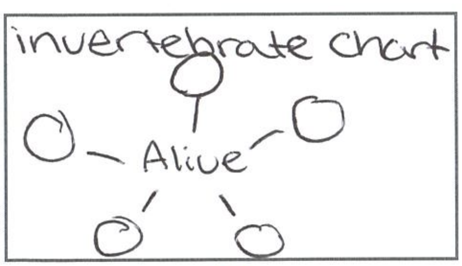


2.3s



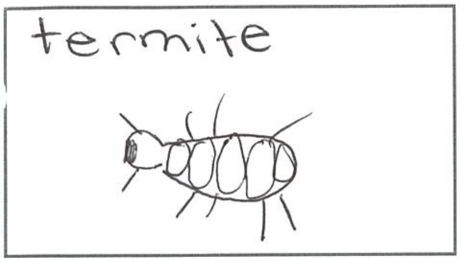
1.3s

Text — macro invertebrates everywhere

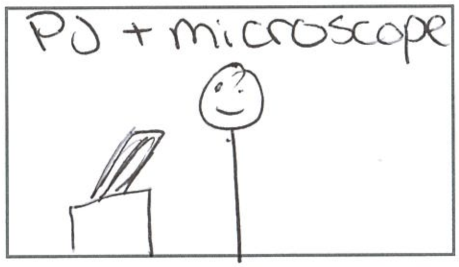


1.1s

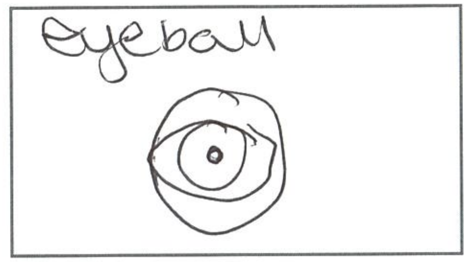
Text — So many different creatures



1.1s



0.9s



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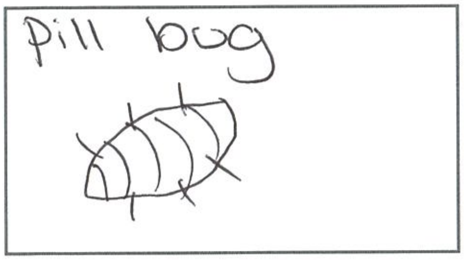

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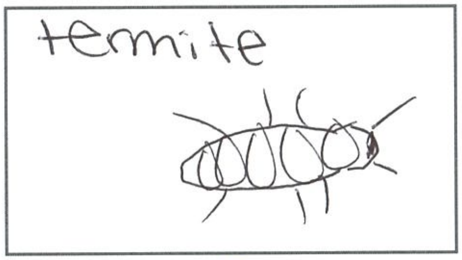

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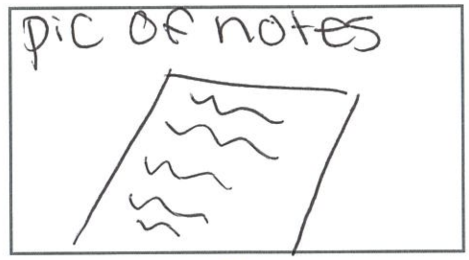

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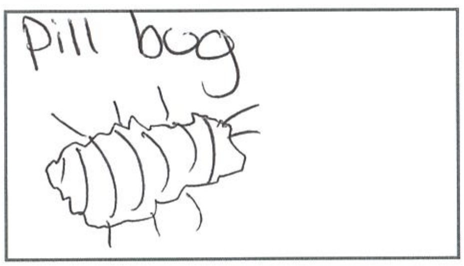

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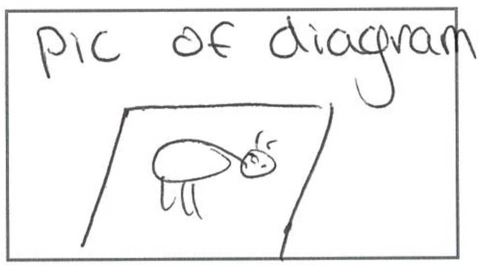

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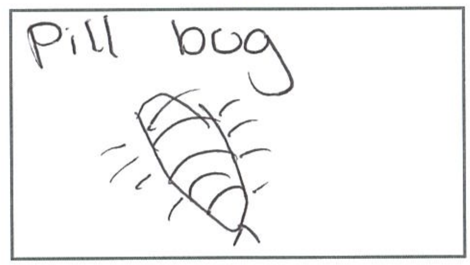

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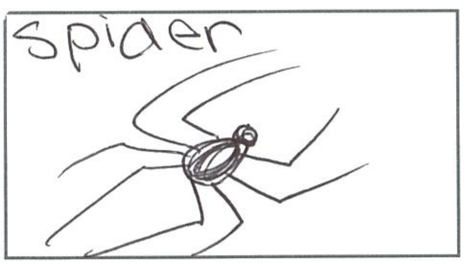

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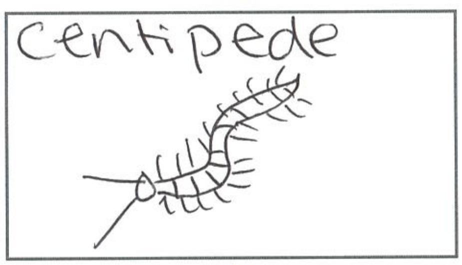
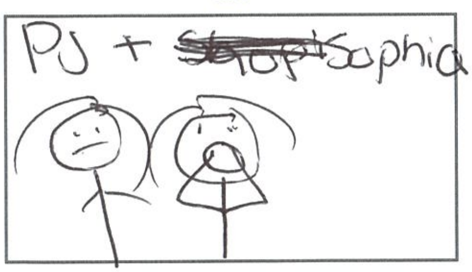


0.9s

0.9s



0.9s

Text | Scary Dogs

Credits

1.2s

iMOVIE TRAILER PLANNER

Movie Name

Erosion

Credits

Logo Style

- [ ] Colored Bars
- [ ] Dandelion
- [x] Galaxy
- [ ] Street Lamp
- [ ] Trees

Studio Name Lunar Ladies

Text ~~Attack of the~~ They weren't expecting it

2.0s

1.9s

Text The attack of the Alluvial Fan!

0.6s

Text ~~Kapow!~~ Flush!

Ariana is so cool! Wow!
-Lily

Text: Slide!

0.4s

Text: Slosh!

0.7s

Text: All ~~year~~ day, All year!

1.1s

1.1s

1.2s

1.5s

Text: The erosion is here

1.2s

1.1s

2.3s

Text

Erosion! Molding ~~[illegible]~~ ~~Earth~~ Mars!

2.2s

1.1s

1.2s

1.2s

0.5s

Text

~~A~~ Everything is changing!

0.7s

Text

rain, and floods

0.5s

Text: ~~eating away the surface~~ eating away the surface

0.4s

Text: ~~Big b~~ Big boulders becoming ~~sma~~ Pebble

Text: The surface will never be the same

0.4s

Credits

Delta Dynamics

PJ

SESSION: 19 July, 2020

Overview of Delta Dynamics

When doing our experiment we used the scientific method to solve our questions. Each of us set up an experiment to answer our question. We also made a time lapse video to go with this experiment to show what water can do to the land it runs over. In the end we all learned that roots and rocks hold dirt together, a spread out stream of water will erode slower than a concentrated stream and water will rush into pre-made canals and ditches.

Scrapbook: Delta Dynamics

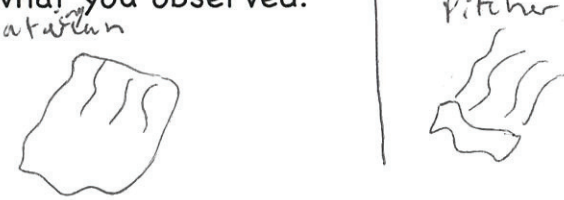
Scrapbook: Delta Dynamics

Delta Dynamics:

Delta Dynamics

Name Ariana Navkos Date 12-3-19

Scientific Method

Ask a Question	Will the erosion go faster ~~if I~~ or slower if ~~it's~~ the water is concentrated in 1 spot or like rain?
Make a Prediction (I think...)	I think the rain will ~~m~~ make a larger area erode, but it will go slower. The ~~concentrated~~ water concentrated in ~~a~~ ~~area~~ a small area will erode faster, but not erode as much.
Make a Plan and Follow it	Pour watering can, observe. Then pour normal ~~pit~~ pitcher, observe
Observe	Draw what you observed. 
Record the Results	Watering can ~~goes slower~~ erodes slower than the pitcher.
Draw a Conclusion (So...)	Watering can eroded slower.

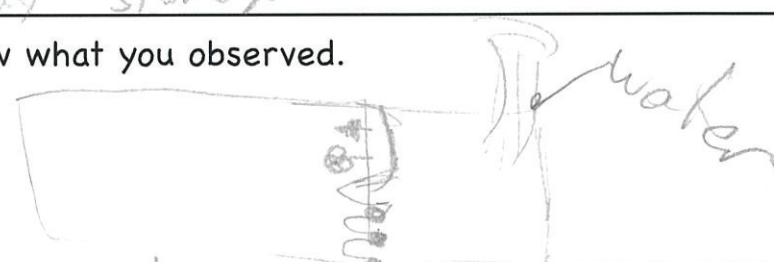
Name PJ Mosley   Date 12/3/19

Scientific Method

Ask a Question	What if there were two trenches already in the sand? Would it go for the deeper one?
Make a Prediction I think...	I think the water will rush to the deep canal instead of the shallow one.
Make a Plan and Follow it	-Pour water in the corner with two long ditches leading out of it (one deeper than the other) -record how/where the water moves
Observe	Draw what you observed. 
Record the Results	more water went in the deeper canal then the shallow
Draw a Conclusion So...	So gravity drew more water down the deep straight trench than the windy(er) shallow one.

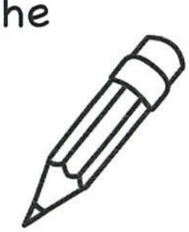
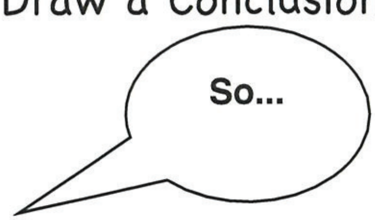
Name Sophia Misley Date 12/3/19

Scientific Method

Ask a Question	Will the trees in our model help block the water or be washed away?
Make a Prediction I think...	I think they will be washed away because ~~since they are lego trees,~~ ~~so~~ they do not have roots.
Make a Plan and Follow it	I am going to put sand in a container, and put it to one side. I will poor the water on the other side and when it reaches the trees I will see if they stay sturdy.
Observe	Draw what you observed. 
Record the Results	The big trees fell over, but the little ones were still standing. The sand was washed back between the trees.
Draw a Conclusion So...	The taller trees actually did fall over because their center of gravity was higher. In real life the trees probably would have stayed because of their roots.

Name Lily Kirkpatrick Date 12/3/19

Scientific Method

Ask a Question 	~~what are the affects~~ will boulders on the shore prevent erosion?
Make a Prediction 	I think the boulders will not stop erosion.
Make a Plan and Follow it 	1. do a test without "boulders" and see what happens 2. do a test with "boulders" and see what happes.
Observe 	Draw what you observed. the rocks made it stronger than the other tests we did without rocks
Record the Results 	the rocks made the sand last longer the sand drained while some of the sand and rocks stayed
Draw a Conclusion 	In conclustion the rocks made it stronger and kind of prevented a little bit of erosion

Name Pahlyahai Thao Date December 3rd 2019

Scientific Method

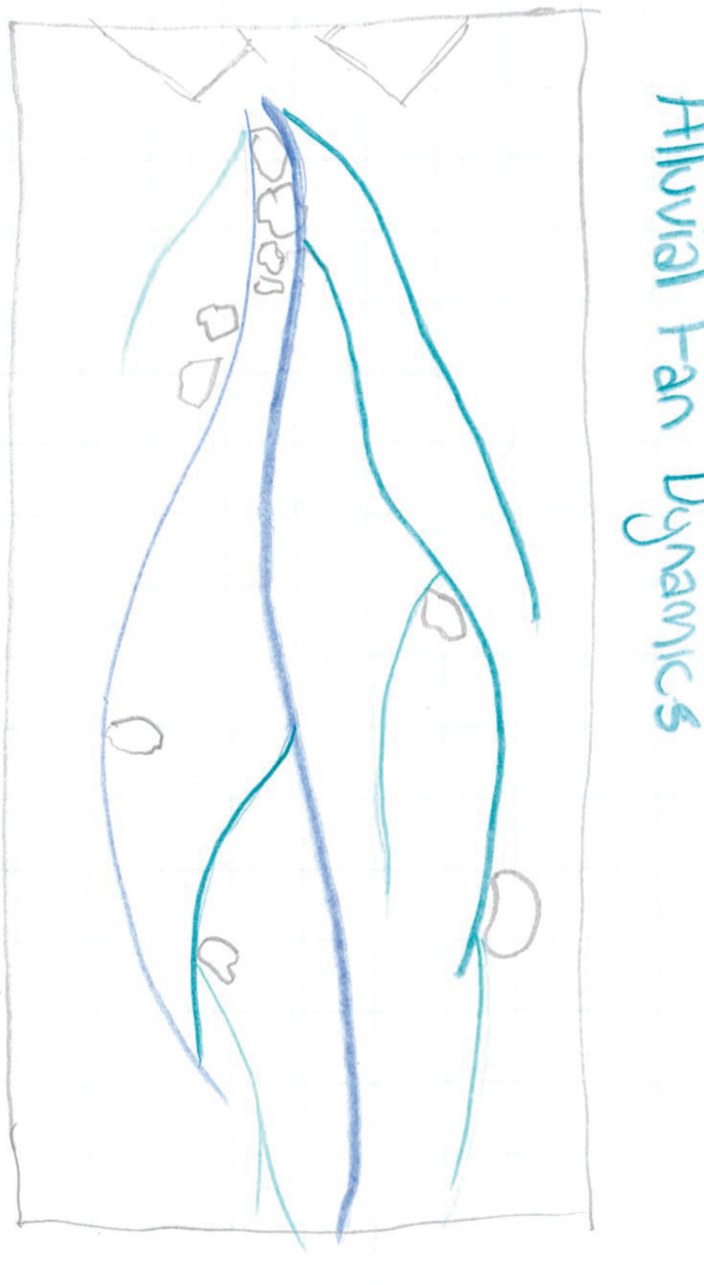
Ask a Question	If there is an empty lake surrounded by houses, and water falls before the houses, will the water fall in the divit or flood the houses and tip them over?
Make a Prediction I think...	I think the lake will fill up and only the houses on the ~~edges~~ front and back of the lake will slide away.
Make a Plan and Follow it	1.) dig a huge hole in the middle of sand and place houses around. 2.) Pour water and see what happens.
Observe	Draw what you observed. The houses right in front of the lake slid off the sand & fill lake caused the [illegible] and quickly the hole filled w/water. Eventually the [illegible] all slid off. sides to cave in and surprisingly, the ones on the right side (2 houses didn't slide).
Record the Results	Houses on the right side somehow didn't slide. The rest slide of with the sand as it slid off. 
Draw a Conclusion So...	All houses on sand slid off, building a village by a lake is bad because if the ground is tilted and it rains, the water will run to the lake, but also flood and

move the houses.

PJ

SESSION: 1/26/20

Alluvial Fan Sketch



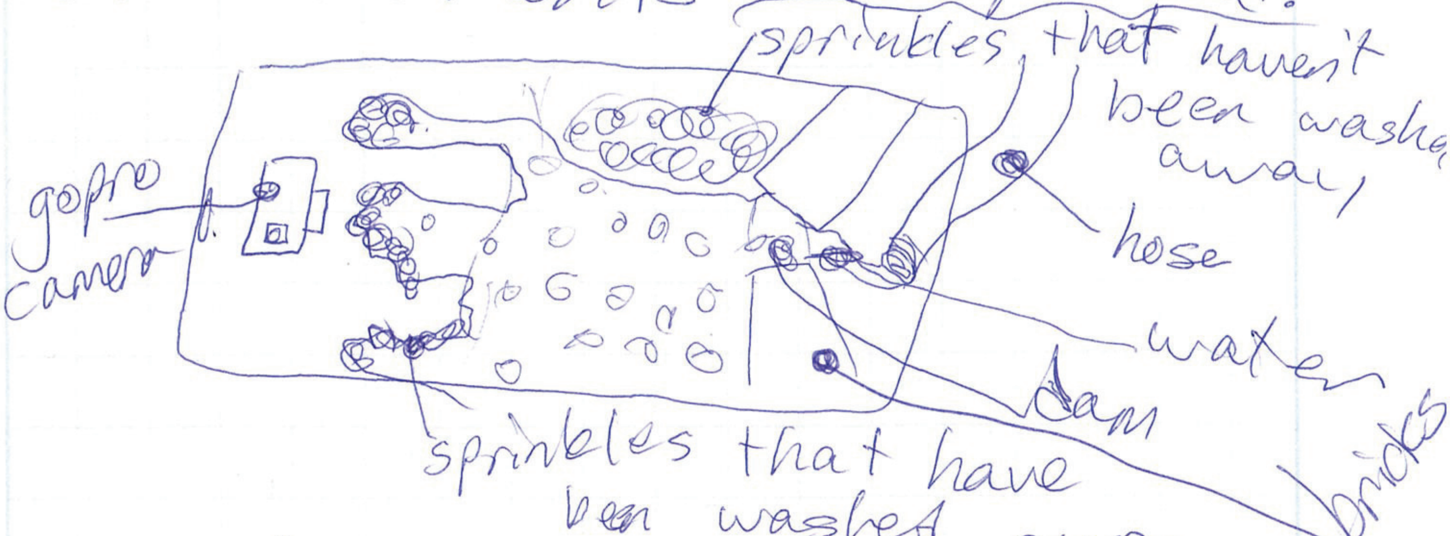
January 4, 2019

Sophia Misley

SESSION:

-Today we did another erosion ~~expirement~~ experiment, but this time with a dam at the top where the water came out to represent a glacial dam.

-We also added layers of sprinkles, rocks, and sand. The sprinkles were on top, and you could see them wash down with the water like normal soil or sediments ~~on top~~ would.



At first we had the problem of the water went under the bricks. We fixed it by putting a rag and seran rap under them.

USING THE

SCIENTIFIC METHOD

1 QUESTION

Ask yourself, "What do I want to learn more about?", or "I wonder what would happen if . . .?"

2 HYPOTHESIZE

Research to help you make an educated guess, or hypothesis, and then answer your question.

3 EXPERIMENT

Test your hypothesis by making a plan and conducting an experiment.

4 OBSERVE & RECORD

Make careful observations and write down what happens.

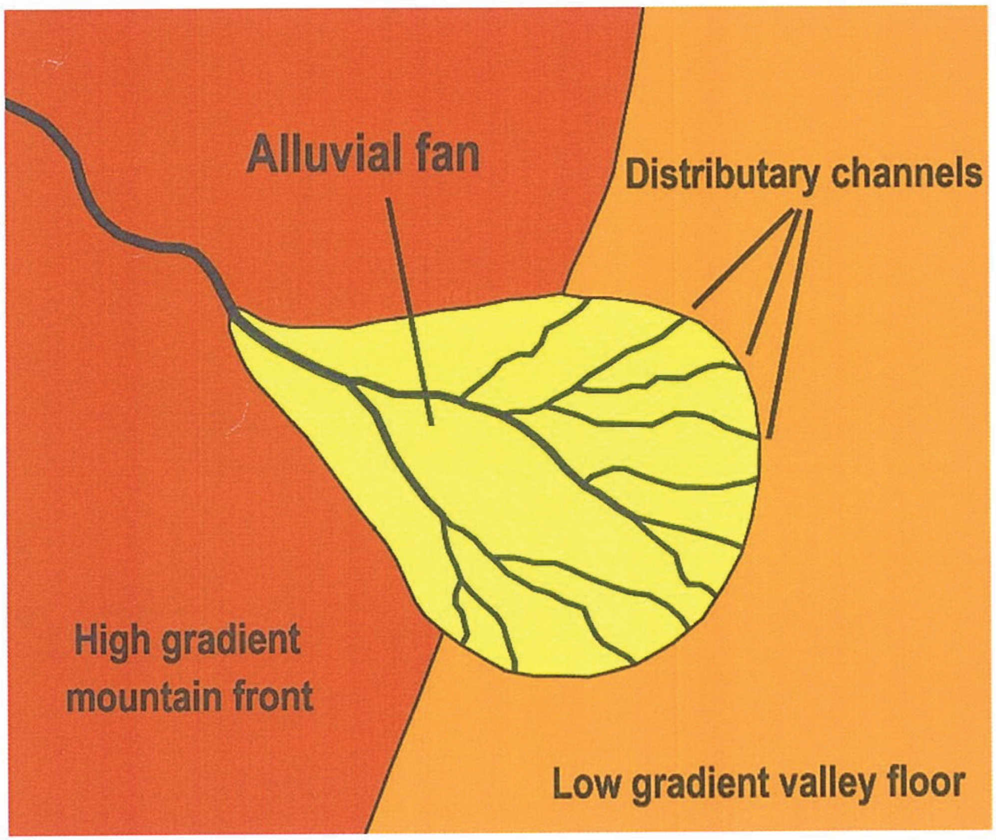
5 ANALYZE

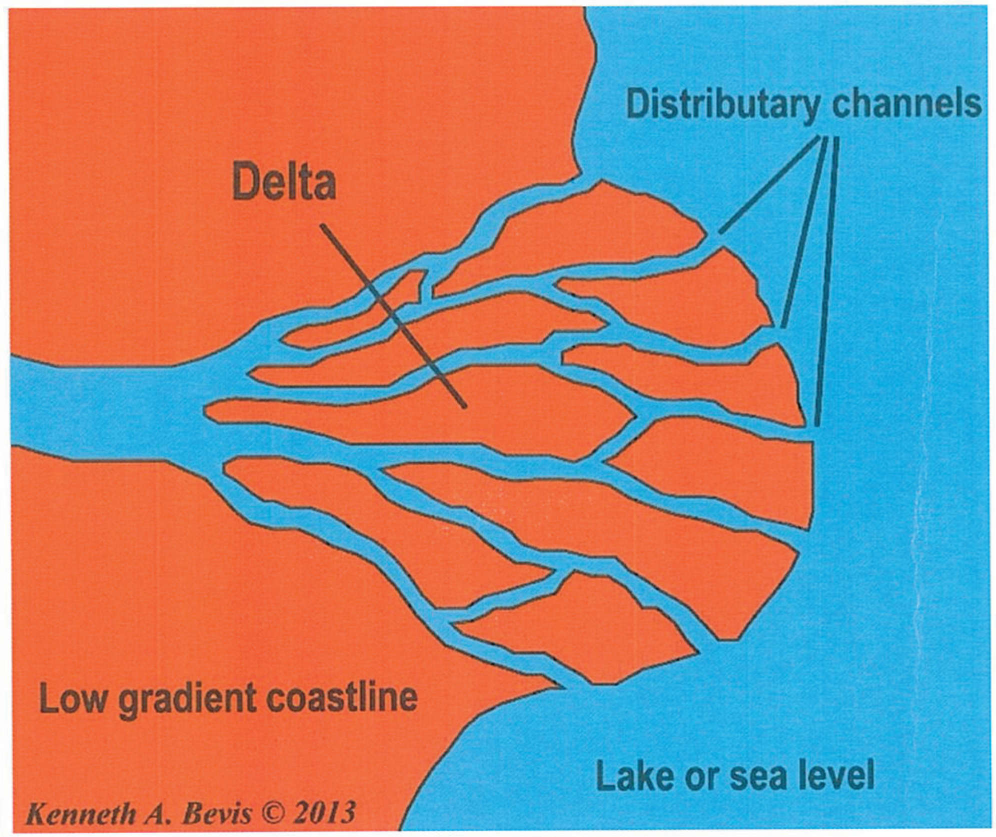
Use your information to draw conclusions about your experiment. Was your hypothesis correct?

6 SHARE RESULTS

Explain your results by presenting your experiment, observations, and conclusions.

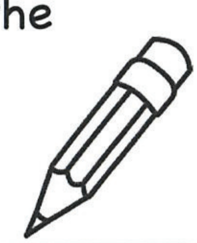
Surface Processes



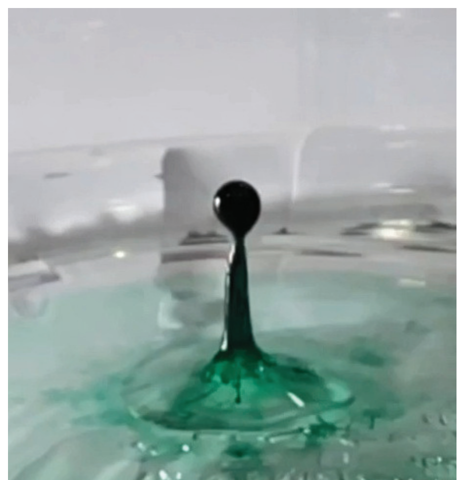


Name ______________________________ Date ______________________________

Scientific Method

Ask a Question	
Make a Prediction 	
Make a Plan and Follow it 	
Observe 	Draw what you observed.
Record the Results 	
Draw a Conclusion 	

Crater Formation



SESSION: Overview of Crater Formation

7-15-20

Ariana Nackos

To study and to better understand crater formation, each member of our team used the Scientific Method to create and conduct an experiment. First, we all created our own question about the formation of craters. Two questions we asked were: how does velocity affect ejecta width and crater depth and does the mass of a meteor affect the length of the ejecta? Then we hypothesized what we thought the answers to the questions would be and created and conducted experiments we came up with. We filmed our experiments in slow motion so we could study the impact of the "meteors" and the ejecta. During and after our experiments, we took notes and drew pictures of the craters on a Scientific Method organizer. Some of us created graphs too. Then we made conclusions. The person that asked if the mass of the meteor affects the length of the ejecta concluded that mass does affect the length and more mass = longer rays. We completed the final step of the Scientific Method by sharing our experiment results with each other.

Scrapbook: Crater Formation

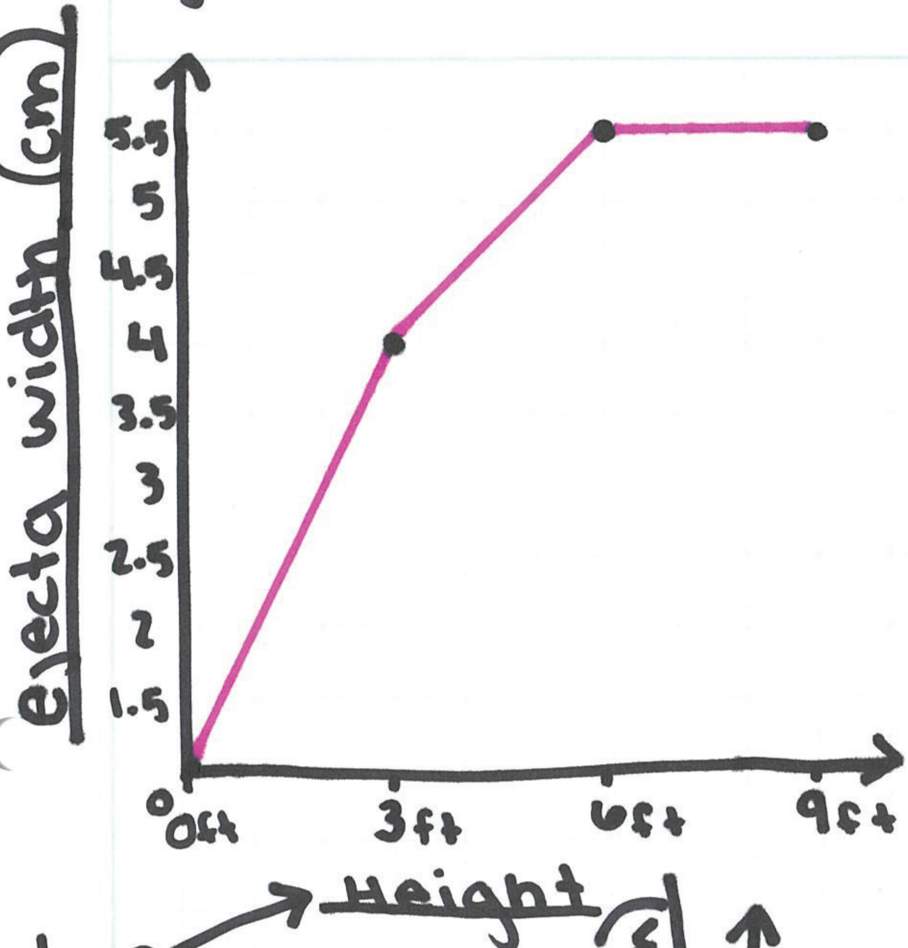
Scrapbook: Crater Formation

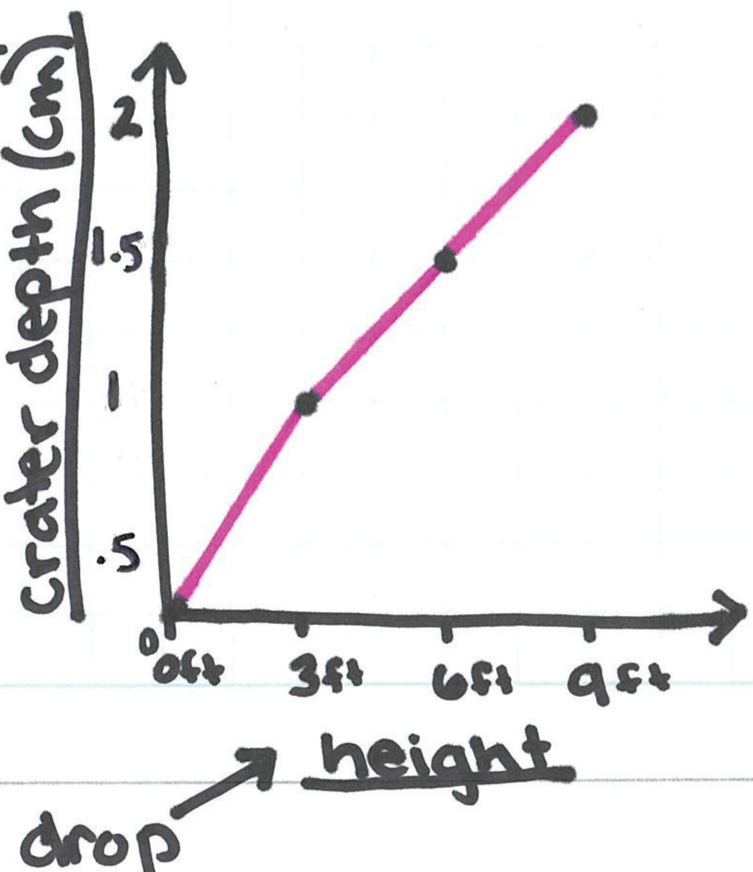
Crater Formation:

Crater Formation:

Lily K 1-22-20

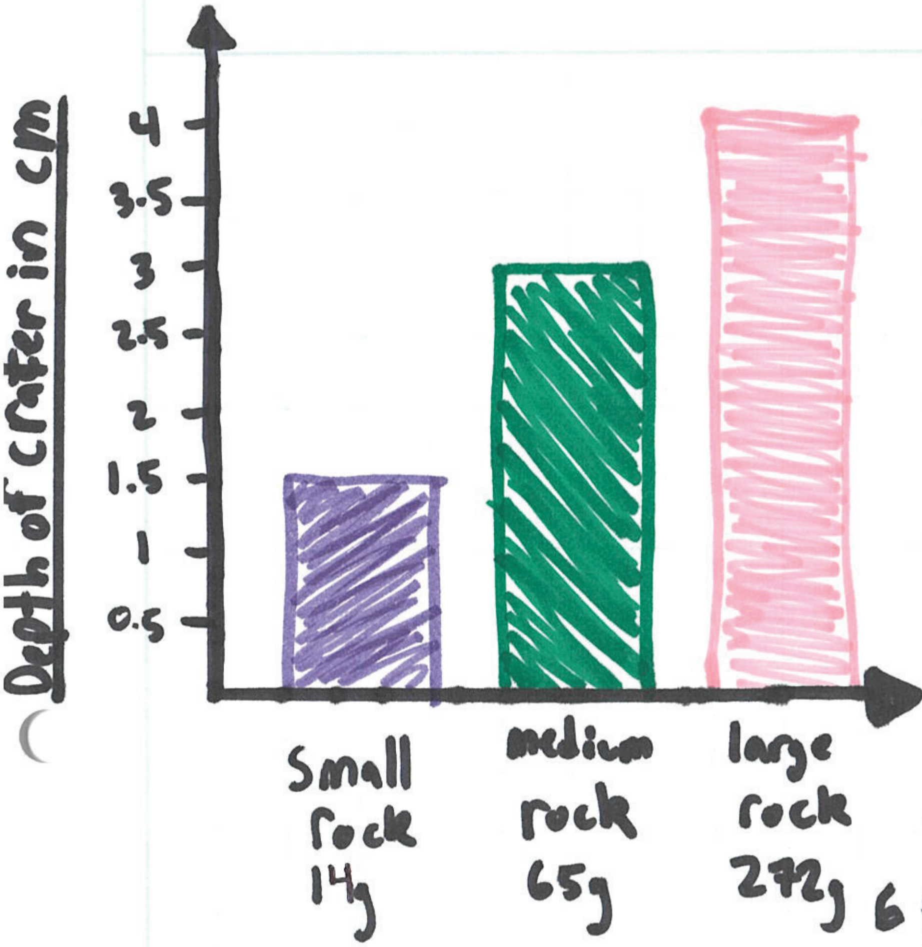
SESSION: how does velocity effect ejecta width and crater depth?

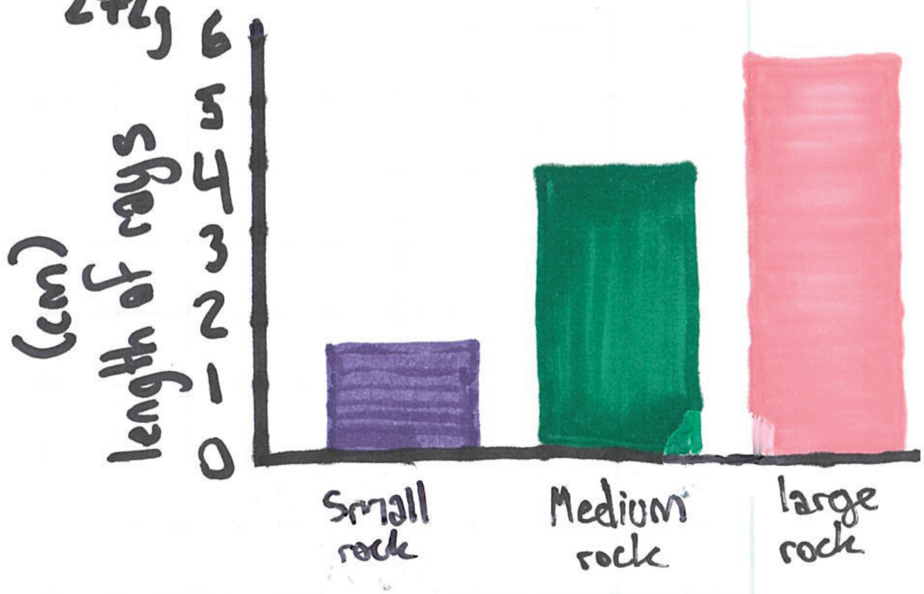




Pahlychai Thao 22th January 2020

SESSION :





Name Ariana Nackos Date 12-3-19

Scientific Method

Ask a Question	Does the material the meteor hits change the size of the crater?
Make a Prediction I think...	I think the softer the material, the bigger the crater. Also the harder the material, the smaller the crater.
Make a Plan and Follow it	3 kinds of material: Sand, sugar, mix - sugar, sprinkles, cocoa, nuts, bisquick Drop same rock onto each. Measure depth + width. Height Dropped From: 34 in
Observe	Draw what you observed. 
Record the Results	Sand: W-5cm D-0.5cm Sugar: W-4cm D-1.5cm Mix: W-5cm D-1cm Biggest Crater: Mix None had rays that much.
Draw a Conclusion So...	The materials do change the size of the crater.

Name Peyton Dodd Date Dec 3, 2019

Scientific Method

Ask a Question	Does the heavier the miteral change how big the crator is?
Make a Prediction I think...	The heavier the miteral the bigger the crator. The Faster the meteor is coming in the bigger the crator
Make a Plan and Follow it	1. first drop the nerf ball and measure how deep it is and how wide\long. 2. next drop bonce ball and measue how deep it is and how wide\long. 3. third drop the mabel and measue how deep it is and how wide\long
Observe	Draw what you observed. 
Record the Results	**nerf ball:** The nerf ball was 5cm deep & 4cm wide. **bonce ball:** The bonce ball was 2cm deep and 6.5cm wide. **marble:** The marble was 3cm deep and 5.5cm long.
Draw a Conclusion So...	In conclusion the heavier the ball the smaller the crator and the lighter the deeper the crator was. And the secound lightest had the biggest withe and the 3rd one had the 2 biggest withe

Name PJ Misley Date 12/3/19

Scientific Method

Ask a Question ?	Does the mass of a meteor affect the length of the rays?
Make a Prediction (I think...)	The heavier the meteor the bigger the rays
Make a Plan and Follow it	•drop three different meteors of varying weights •record depth of crater and length of the rays
Observe	Draw what you observed. 
Record the Results	The heavier the rock/meteor, the bigger the rays
Draw a Conclusion (So...)	So the more mass a meteor has the longer the rays will be

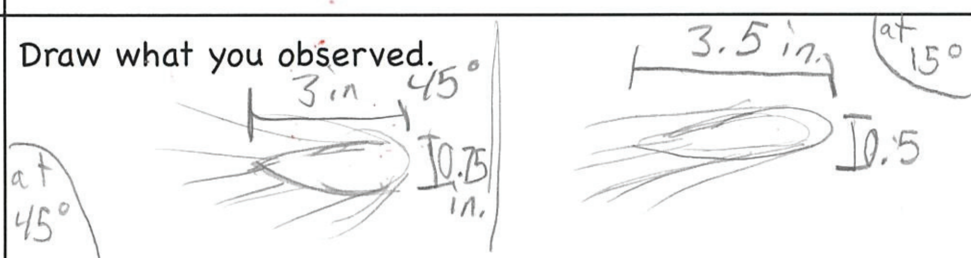
Name Lily Kirkpatrick Date 12/3/19

Scientific Method

Ask a Question ?	does the faster the rock moves determinds how big the crater is?
Make a Prediction I think...	I think the faster the rock moves the bigger the crater will be?
Make a Plan and Follow it	drop same rock from 3ft, 6ft and 9ft
Observe	Draw what you observed. 
Record the Results	3ft 4cm wide 1 cm deep 6ft 5.5cm wide 1.5cm deep 9ft 5.5 wide 2cm dee
Draw a Conclusion So...	the height made the depth greater by .5cm and the width didn't change between 6-9ft.

Name Sophia Misley Date 12/3/19

Scientific Method

Ask a Question	Does the angle of the meteor change the depth of the crater.
Make a Prediction I think...	I think the angle does matter because if the impact was diagonal at the bottom different parts would be different depths.
Make a Plan and Follow it	We threw marbles in a plate of different colored sugar, flour, and sprinkles at different angles.
Observe	Draw what you observed. 
Record the Results	The smaller the angle, the wider and less deep the crater is.
Draw a Conclusion So...	The angle did, infact, alter the depth and the size of the rays.

Methane and Moisture

5 th July, 2020
Prthlychai

SESSION: Overview of Methane and Moisture Detection.

We used the scientific method when trying to detect methane and when figuring out moisture content and retention.

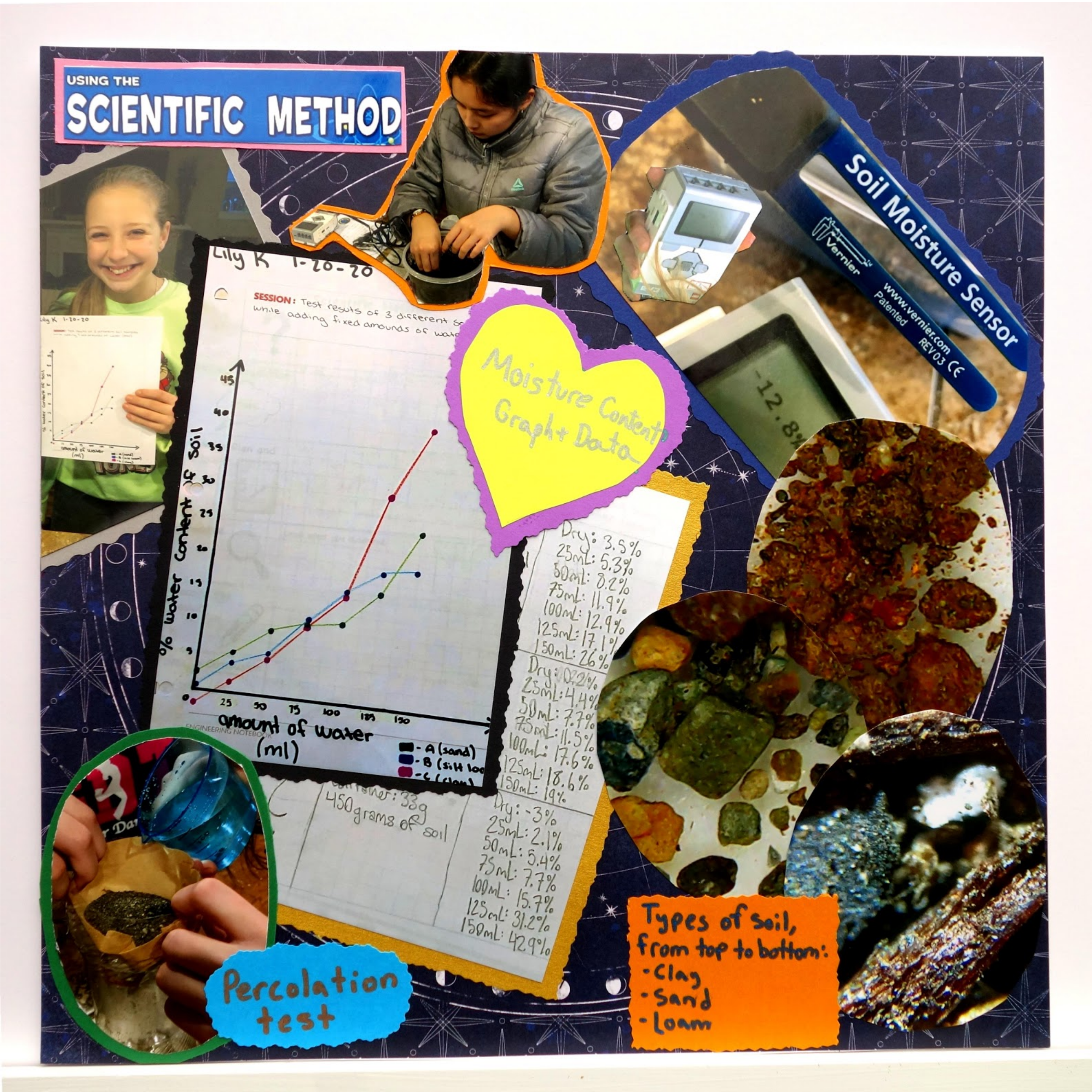
To detect methane we used a methane detecter and took it to various spots around the neighborhood because methane is supposed to be present when life processes are. We created a Methane Map to show where we went and found that we had problems because the places where it would seem obvious that life was there, didn't set off the methane detector (the trash can, the yard debris).

For soil testing we performed the percolation test. We used 3 different types of soil and hypothesised that the Silt loam would retain the most water. Unsurprisingly, silt loam retained the most water. We also completed a moisture content test and used our Vernir Soil Moisture Sensor to find moisture. We hypothesized that clay would contain the most moisture this time, and we were right, and unsurprisingly silt loam had the least moisture content.

Another experiment we did was determine what type of soil was in the yard by using the Jar Test. We were able to seperate our soil into layers and by using the Soil Identification Triangle we discovered that our soil was sandy loam.

Scrapbook: Methane and Moisture

Scrapbook: Methane and Moisture



Methane and Moisture:

Methane and Moisture:

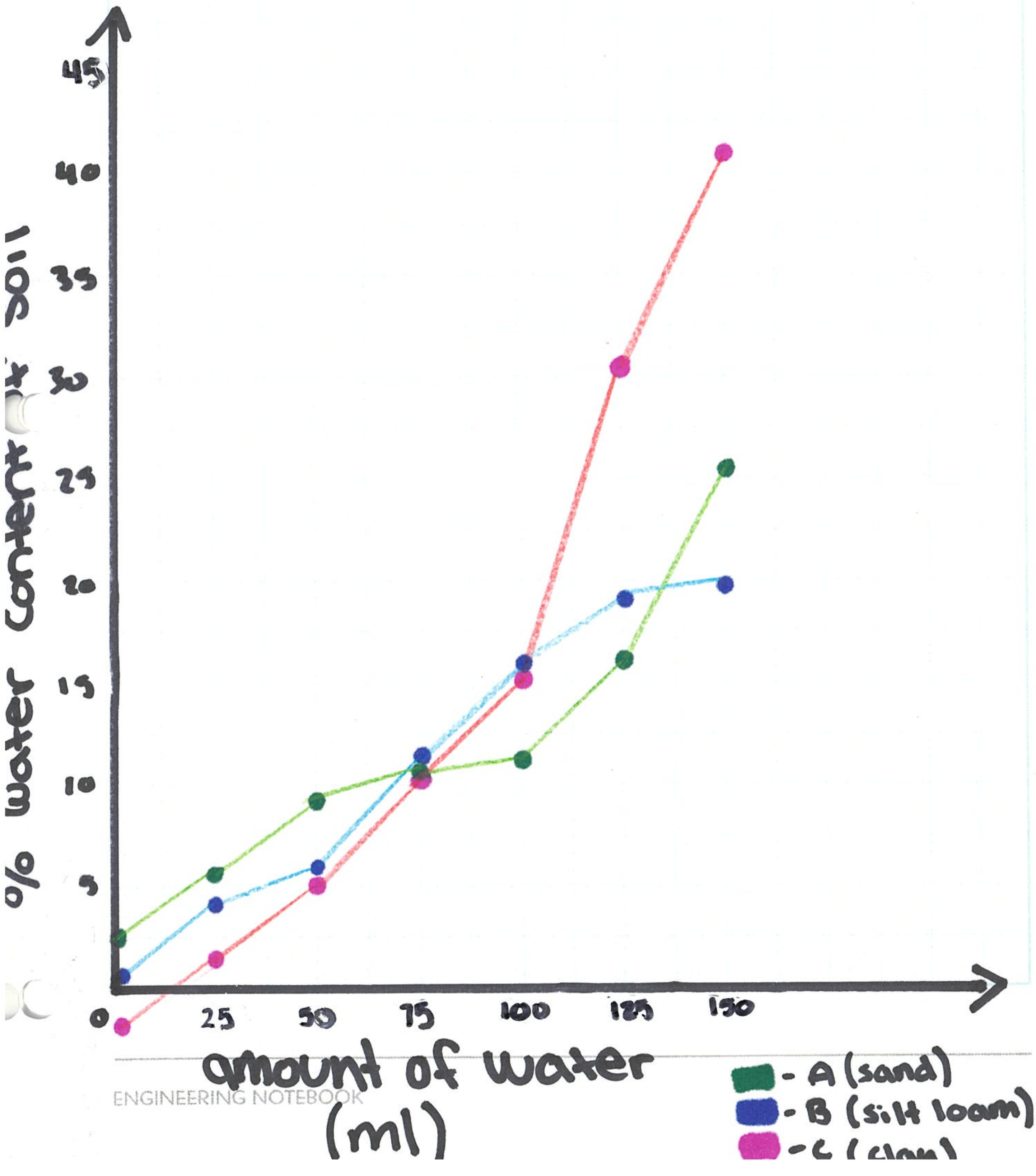
Methane Map

O = methane detected

X = no methane detected

Lily K 1-20-20

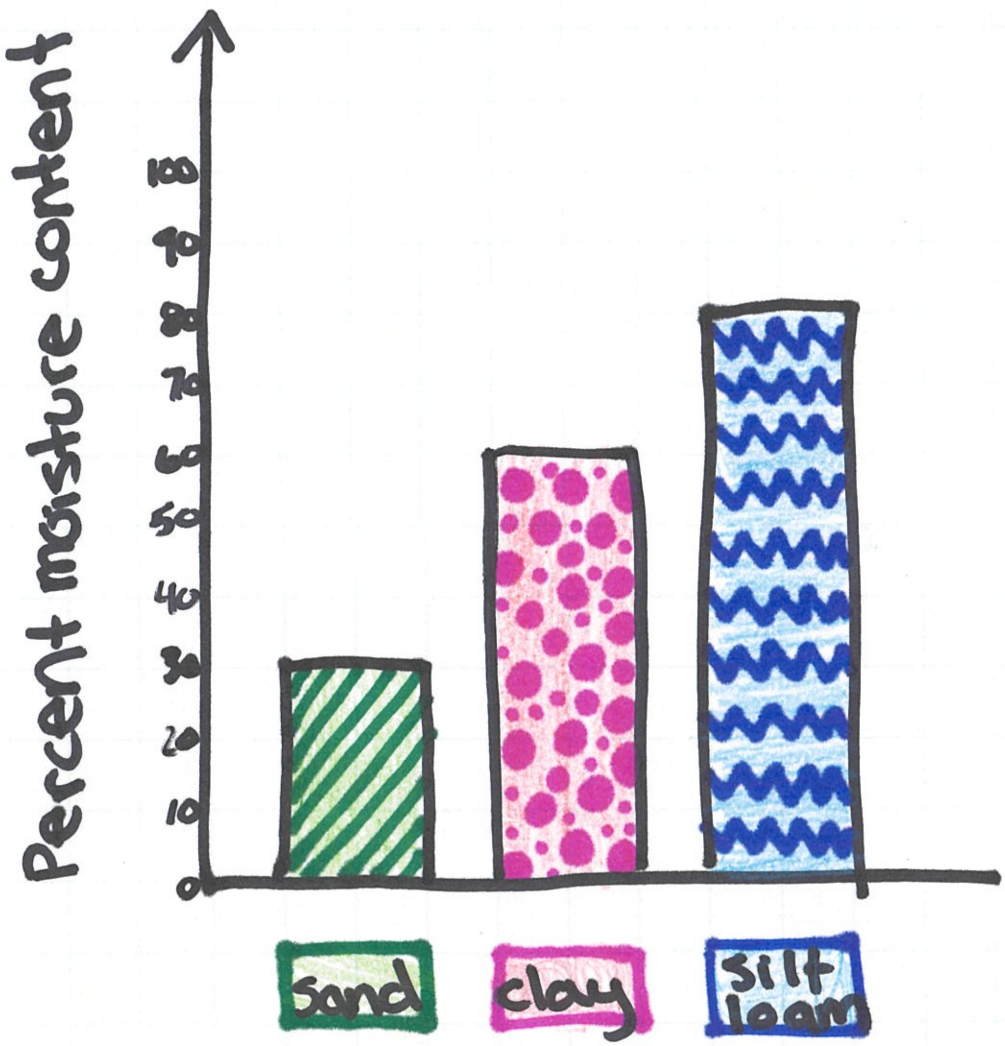
SESSION: Test resuts of 3 different soil samples while adding fixed amounds of water (25ml)



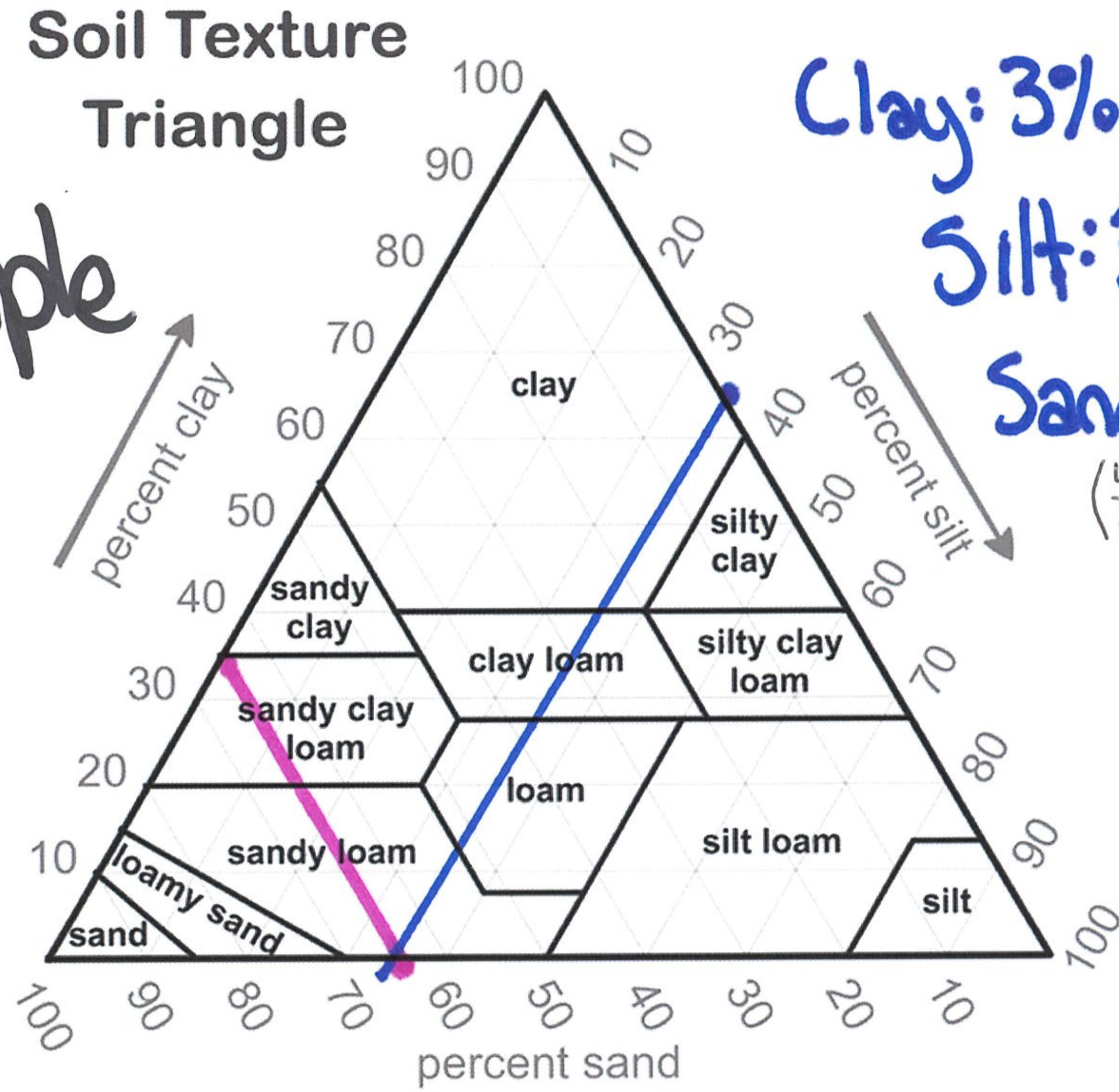
PJ + Lily

SESSION: Jan 20, 2020

measured 80mL of soil samples and determined water retained



Sample A



Clay: 3% ($\frac{2}{72}$ mm)

Silt: 35% ($\frac{25}{72}$ m

Sand: 63%

($\frac{45}{72}$ mm)

Sandy Loam

January 22nd, 2020

SESSION: Soil Challenge Summary

To begin the soil challenge, we first baked the sand, dirt, and clay we were using to remove as much moisture as we could. Using the Hand Texturing Soil Identification handout, we identified our three soils as: Sand, Silt loam, and clay. Once we knew what the soils were, we sent up an experiment with coffee filters and water bottles to test the soil retention. The silt loam retained the most water (20 ml) and dried the fastest afterward too. For our second experiment, we filled three containers with 350 ml of soil and began gradually filling them with 25 ml of water at a time. After we added the water, we'd shake the containers so the water would get mixed in evenly with the rest of the soil. At the end of the experiment, we discovered that clay had the highest % water content in soil (40%) while silt loam, the soil that retained the most water, had the lowest percent of water content (20%). We also went out into the field and used our moisture sensor to try and find the place with the most moisture. In the garden box we found the most moisture (25.1%), which was potting soil. We found the least amount of moisture in the dirt beneath grass (4.4%).

PJ

SESSION: January 20, 2020

A sand	·350 mL of soil Container: 33g 731 grams of soil	Dry: 3.5% 25mL: 5.3% 50mL: 8.2% 75mL: 11.9% 100mL: 12.9% 125mL: 17.1% 150mL: 26%
B silt loam	·350 mL of soil Container: 33g 159 grams of soil	Dry: 0.2% 25mL: 4.4% 50mL: 7.7% 75mL: 11.5% 100mL: 17.6% 125mL: 18.6% 150mL: 19%
C clay	·350 mL of soil Contatner: 33g 450 grams of soil	Dry: -3% 25mL: 2.1% 50mL: 5.4% 75mL: 7.7% 100mL: 15.7% 125mL: 31.2% 150mL: 42.9%

Pahlychni

20th January 2020

SESSION: Soil water retention

A (sand)

top Bottle cap mass = 11.5 grams

- Soil dry 89 g
- 100 ml water added
- wet sand = 112 g
- 72 ml water came out

$$\frac{100.5 - 77.5}{77.5}$$

. 30% moisture content

B (silt loam)

top bottle cap mass = 12 g

- Soil dry 29 g
- added 100 ml water
- 80 ml water came out when drained
- soil wet = 43 g

$$\frac{31 - 17}{17}$$

89% moisture content

C (clay)

100 ml water added

top bottle cap Mass = 11.5 g

- Soil dry 64 g
- Clay wet = 95 g
- 75 ml water came out
-

$$\frac{83.5 - 52.5}{52.5}$$

60% moisture content

Lily, PJ, Pahlychai

1-20-20

SESSION: Soil identification

A - gritty, couldnt be moulded into a ball so it is sand

B - not sandy/gritty, was easily deformed when moulded into a ball, so it is silt loam

C - was not sandy/gritty, was not easily deformed when in a ball, hard to deform when smeared, was not smooth/soapy so it is clay.

A - sand	B - silt loam	C - clay
		
• multi colord • some are sparkly	• mini tree branches • fibery	• rough/rocky • one was shiny • brown/red

PJ + Sophie

SESSION : 1/24/20

Results of The "Jar" Test

Sample A:

Clay Layer-2mm $\frac{2}{72}$ = 3% SANDY

Silt Layer-25mm $\frac{25}{72}$ = 35% LOAM

Sand Layer-45mm $\frac{45}{72}$ = 63%

Total: 72mm

Sample B:

Clay Layer-0mm $\frac{0}{60}$ = 0% SANDY

Silt Layer-20mm $\frac{20}{60}$ = 33% LOAM

Sand Layer-40mm $\frac{40}{60}$ = 66%

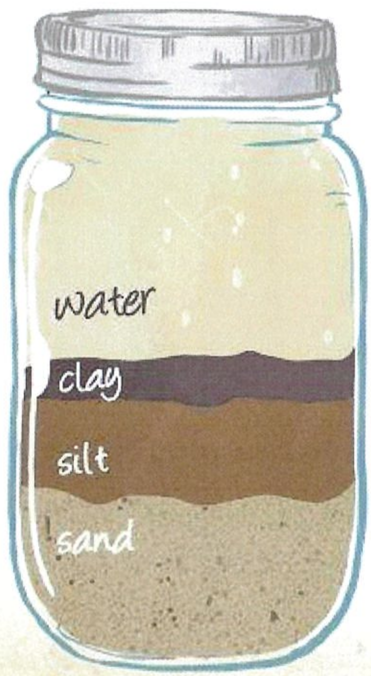
Total: 60mm

Sophia M

SESSION : 1/24/20

Our "Jar" Test

Today we did the jar test used the Soil Texture Triangle to find out what soil type our samples.



IDENTIFY YOUR SOIL TYPE

the jar test

1. Fill a clear glass jar halfway with your soil sample.
2. Fill the remaining half with water, leaving 1" of air.
3. Attach lid, then shake the jar vigorously until you have broken up any clumps of soil.
4. Set the jar aside to rest, undisturbed, overnight.

After 24 hours your jar's contents will have settled into distinct layers:

SAND **SILT** **CLAY**

By examining the proportions of these layers, you can gain a sense of what type of soil you have, and what you need to add to improve your soil. Here are some examples to use for comparison. The middle jar is ideal soil:

Lily and Ariana 1-15-20

SESSION: moister detection in soil/sand

example - 1.6% - in uncooked sand
example - 1.1% - in cooked sand
example - -0.2% - in cooked soil

Test - ~~Uncooked~~ Sand

$\frac{1}{8}$ cup of water added - 6.3% (+4.7%)
$\frac{2}{8}$ or $\frac{1}{4}$ cup of water added - 9.6% (+3.3%)
$\frac{3}{8}$ cup of water added - 13.4% (+3.8%)
$\frac{4}{8}$ or $\frac{1}{2}$ cup of water added - 15.7% (+2.3%)
$\frac{5}{8}$ cup of water added - 18.5% (+2.8%)
$\frac{6}{8}$ or $\frac{3}{4}$ cup of water added - 21.3% (+2.8%)
$\frac{7}{8}$ cup of water added - 28.4% (+7.1%)
1 cup of water added - 37.6% (+9.2%)

The sand doesn't absorb the water, the water just coats the sand and spreads throughout it.

Sophia

SESSION: Ariana Nackos 1-20-20

Soil Identification

Soil A

Description:
Small pebbles, diff. colors, sediments on the small pebbles

Drawing:

(under microscope)

Soil B

Description:
Looks like small (diff. sizes) pieces of bark, a few small pebbles (all diff. colors), sediments on it

Drawing:

Soil C

Description:
Many small pebbles, different colors, diff. sizes, some sediment

Drawing:

Ag K
-20-20

SESSION: moisture detection

hole 1 - by barrel in barkdust 15.6%

hole 2 - in potting barrel in potting soil 14.3%

hole 3 - in grass 4.4% (dirt)

hole 4 - by fairy garden in bleeding heart plants 12.4% (potting soil)

hole 5 - ~~ph~~ pile of dirt by side of house 11.5% (clay soil)

hole 6 - under wine barrel 9.1% (potting soil)

hole 7 - in garden box 25.1% (potting soil)

hole 8 - moss and normal dirt in front yard 13%

hole 9 - under brick in front yard 8.7% (soil)

Name Sophia and Ariana Date 1/20/20

Scientific Method

Ask a Question ?	Which soil will hold the most water?
Make a Prediction I think...	I think soil B, the silt loam.
Make a Plan and Follow it	We will weigh the tops of the bottles and then put different soils in. We weigh it again and poured the water through. After that we would weigh it to see how much it gained in weight because of the water.
Observe	Draw what you observed. 
Record the Results	A: ① bottle weighed 11.5 grams ② dry soil, 89 grams ③ wet sand 112 ④ water made through 72 ml — 30% B: ① bottle weighed 12 g. ② dry soil 23 g. ③ wet soil 36 g. ④ water through 80 — 80 C ① bottle weighed 11.5 ② dry soil 64g. ③ wet soil 95g. ④ water through 75 ml — 60%
Draw a Conclusion So...	The silt loam DID hold the most water.

Name PJ Misley Date Jan 20, 2020

Scientific Method

Ask a Question	What soil sample will absorb the most water?
Make a Prediction I think...	I think that sample B, the silt loam, will absorb the most water
Make a Plan and Follow it	-Put a filter in a funnel -Put 50 ml of the sample in filter -Pour 100ml of water into soil sample -When done dripping measure water as well as weight of soil
Observe	Draw what you observed. 
Record the Results	A: dry soil - 89g wet soil - 112g amount of water put in - 100ml amount of water that came out - 72ml B: dry soil - 23g wet soil - 36g amount of water put in - 100ml amount of water that came out - 80ml C: dry soil - 64g wet soil - 95g amount of water put in - 100ml amount of water that came out - 75ml
Draw a Conclusion So...	In conclution we were right. the silt loam was able to absorb the most water. It held more water than both sand and the clay.

2. 2.5cm silt

1. .2cm clay

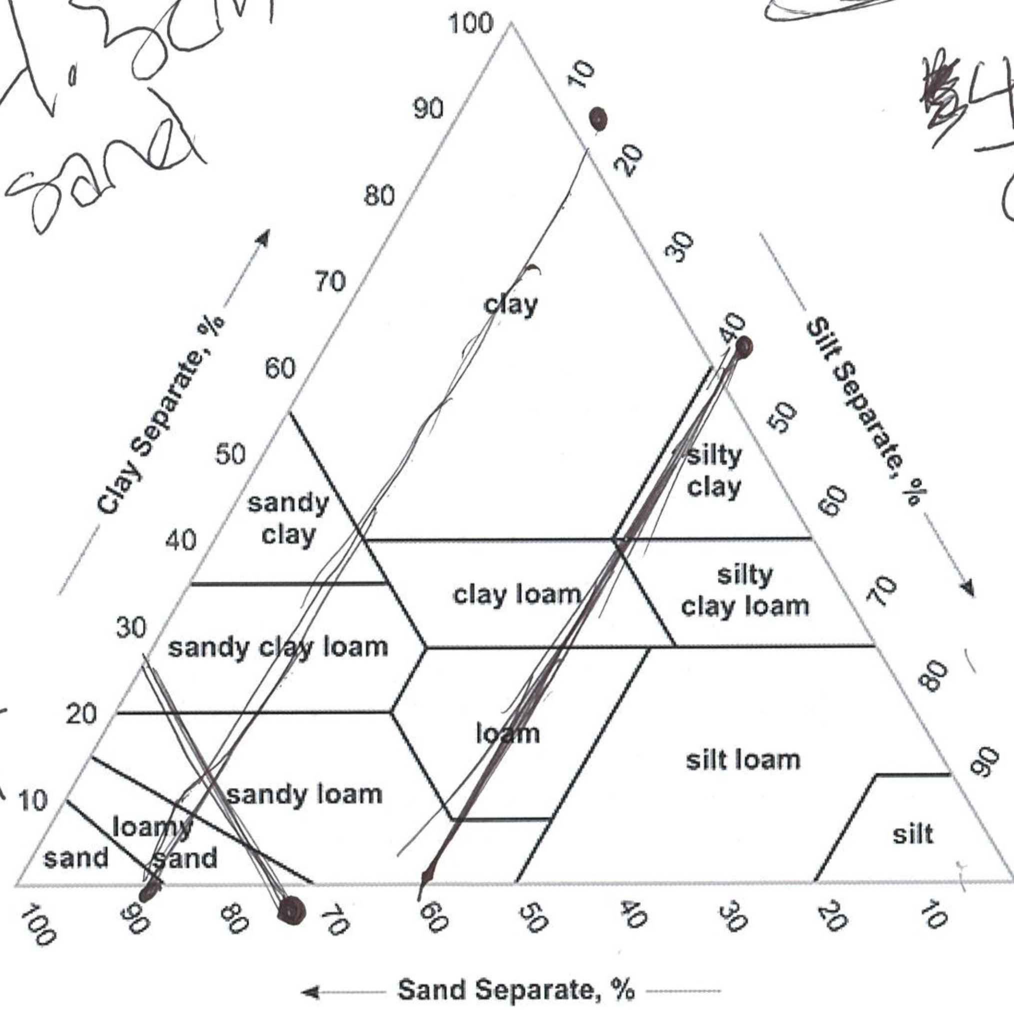
3. 4.8cm sand

$\frac{.2}{6.1} = 3\%$

$\frac{2.5}{6.1} =$ 16%

$\frac{4.5}{6.1} = 74\%$

Soil Textural Triangle



$\frac{.2}{7.2} = 2\%$

$\frac{2.5}{7.2} = 33\%$

$\frac{4.5}{7.2} = 63\%$

2.5
+ .2
+ 3.4
6.1

4 cm sand

2 cm silt

$\frac{4}{6} = 66\%$

$\frac{2}{6} = 33\%$

Soil-net.com

Factsheet: Soil Types

http://www.soil-net.com

What are the main types of soil?

Sandy Soils

Warms up quickly in Spring

Are light and easy to work

Are free-draining

Can dry out in dry weather

Tend to be low in nutrients

Can be worked at almost any time

Need liming little and often

Silty Soils

Deposited by rivers and lakes

Warm up quicker than clay but slower that silt soils in Spring

Keep water longer than sandy soils

Difficult to drain, but less likely to waterlog that clay

Tend to be fertile

Clay Soils

Warm up slowly in Spring

Heavy soils needing well-timed cultivation

Lie wet and prone to waterlogging

Tend to be rich in nutrients

Should not be worked when wet

Need regular liming

Loamy Soils

Contain a mix of sand, silt, and clay particles

Warm up fairly early in Spring

Are easy to work

Usually need draining

Should not be worked when wet

Tend to be rich in nutrients

Calcareous Soils

Come from chalk and limestone rocks

Contain calcium carbonate and flints

Tend to be alkaline

Usually free-draining

May be low in some nutrients

Do not usually need liming

Peaty Soils

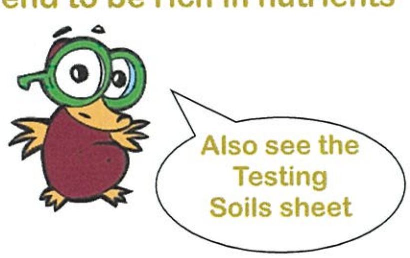
Dark in colour, so warm up quickly in Spring

Hold on to water well and can be easy to work

Come from the build up of dead rotted plants, so contain lots of organic matter

Tend to be acid

Usually high in Nitrogen



Soil-net.com

USING THE

SCIENTIFIC METHOD

1 QUESTION

Ask yourself, "What do I want to learn more about?", or "I wonder what would happen if . . .?"

2 HYPOTHESIZE

Research to help you make an educated guess, or hypothesis, and then answer your question.

3 EXPERIMENT

Test your hypothesis by making a plan and conducting an experiment.

4 OBSERVE & RECORD

Make careful observations and write down what happens.

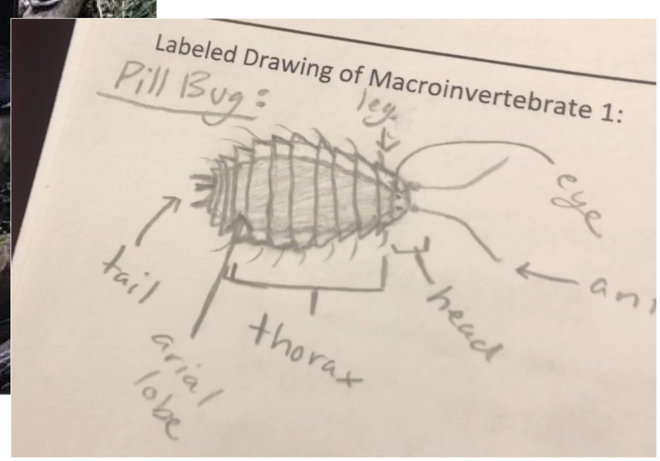
5 ANALYZE

Use your information to draw conclusions about your experiment. Was your hypothesis correct?

6 SHARE RESULTS

Explain your results by presenting your experiment, observations, and conclusions.

Small Invertebrates



SESSION: Overview of A Search for Life P.1
7-22-20
Ariana Nackos

We used NASA's Northwest Earth and Space Pipeline (NESSP) "A Search for Life" lesson, the NESSP "A Search for Life" observation sheet, and the Invertebrate Identification Guide to locate, observe, and learn about invertebrates. Before we located the invertebrates, we studied the "Alive" chart that was included in the lesson. We learned that in order for something to be considered alive it has to grow, reproduce, respond, be organized, and use energy. Next, we went to a nature trail at a nearby park to try to locate bugs with a combustable gas detector after practicing using it. Unfortunatly, the methane detector didn't help us find any life so we dug into rotten logs on the side of the trail. We discovered and captured many invertebrates that we identified using the Invertebrate Identification Guide. We collected termites, spiders, woodlice, centipedes, worms, and eggs from an unknown bug. When we got back home, we observed and drew diagrams of the bugs we found using a microscope and the "A Search for Life" observation sheet. The bugs escaped from the CD cases

SESSION: Overview of A Search for Life P.2
7-22-20

Ariana Nackos

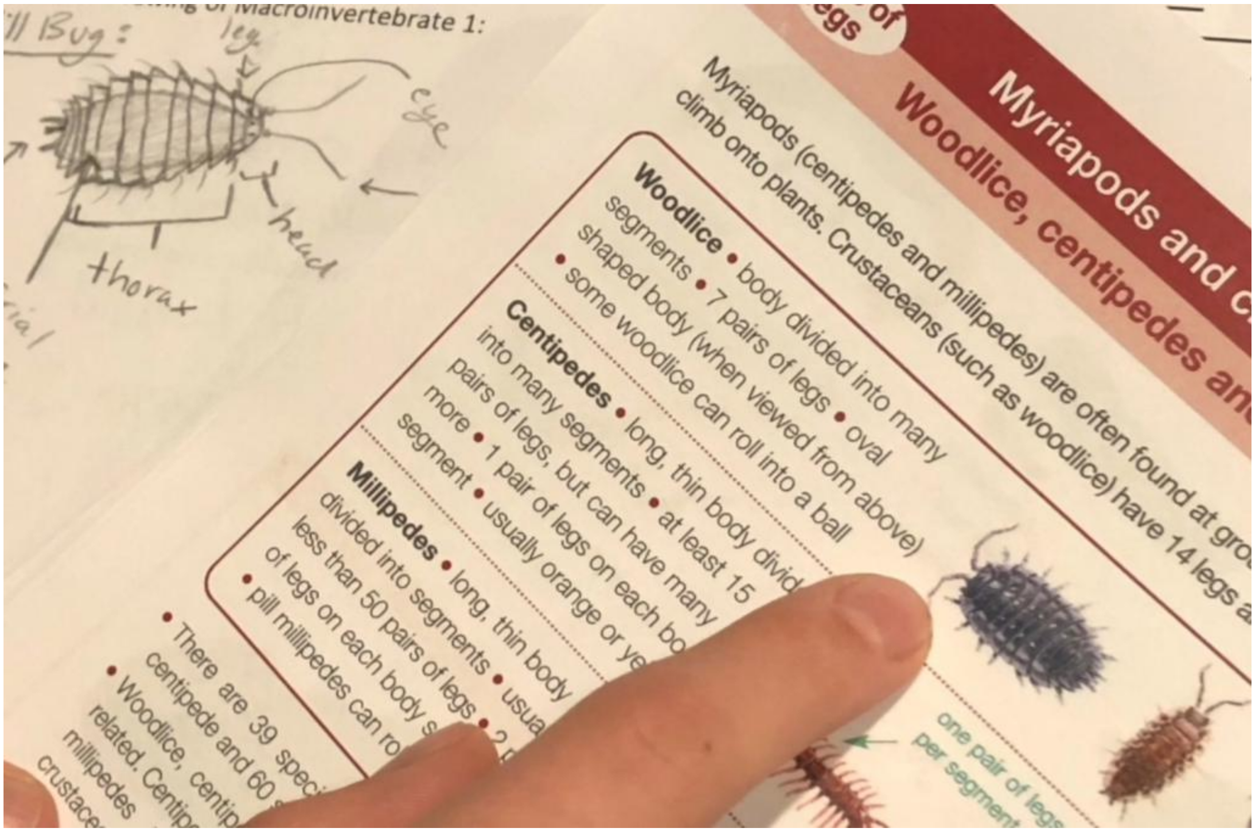
we put them in because of openings in the cases. The solution we came up with to solve our problem was to tape the openings shut. Overall, we had lots of fun with this lesson and activity.

Scrapbook: Small Invertebrates

Scrapbook: Small Invertebrates

Small Invertebrates:

Small Invertebrates:

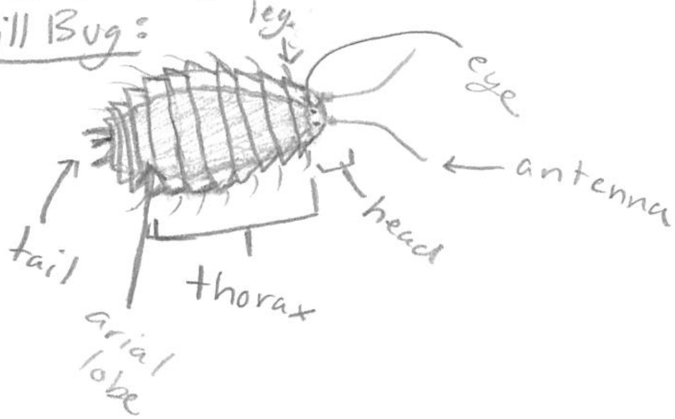


A Search for Life : Observation Sheet
NASA's Northwest Earth & Space Sciences Pipeline

Name: PJ and Arianna
Date: Jan 3, 2020
Grade: 8

Labeled Drawing of Macroinvertebrate 1:

Pill Bug:



Labeled Drawing of Macroinvertebrate 2: Centipede

5 Observations of Macroinvertebrate 1:

- this is a crustation, because it has 7 pairs of legs
- it has a overlapping shell that allows it to roll in ball and still be protected by its shell
- it has a roundish oval body
- it is grey
- we found it in a rotten log. There was a whole nest of them

5 Observations of Macroinvertebrate 2:

- each segment has a pair of legs, it had 15 pairs
- myriapod: more than 8 legs
- usually orange or yellow
- long/stretched out tear shaped
- was living in the back of a rotting log

What are 5 characteristics that all life has?

1. responds to environment
2. reproduces
3. growth
4. consumes energy
5. be organized

What are two methods or ways we might use to find life in other places besides Earth?

1. detect Flamable gas
2. searched/dug sample then examined

Draw an imaginary life form from a different planet.	**Describe** its adaptations for its non-Earth environment.
	1. long eyelashes to keep sand out of eyes 2. strong shell to protect during sand storms (it burrows in shell) 3. strong legs to run away from slow sand storms, can dig into ground to keep stationary while burrowed during storm 4. long tail to whip sand away from eyes, blocks things from hitting eyes to save all moisture in eyes 5. small mouth so sand isn't stuck in i

Agatha

A Search for Life: Observation Sheet
NASA's Northwest Earth & Space Sciences Pipeline

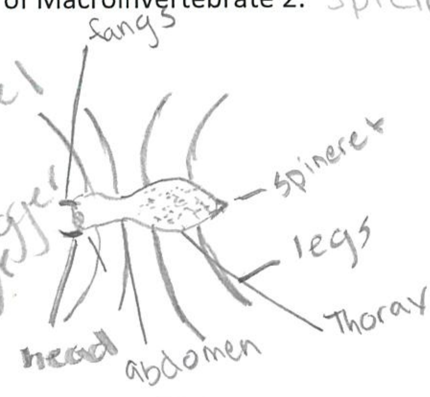
Name: Lily, Pahlychai
Date: 1/3/20
Grade: 8, 9

Labeled Drawing of Macroinvertebrate 1: Worker Termite

- found in rotten log
- actual size

Labeled Drawing of Macroinvertebrate 2: Spider

- found in old wine barrel
- massive
- little bigger than image



5 Observations of Macroinvertebrate 1:

- dark part at head by pinchers
- little things by the butt
- 6 legs, so an insect
- not really any big pinchers, but little lin things poking out of mouth
- the antenna move around a lot as it explores and the antenna extend pretty far out.

5 Observations of Macroinvertebrate 2:

- 8 legs (very long)
- dots on back
- very big
- little fang like things on top of the head.
- legs have little hairs on them

What are 5 characteristics that all life has?

- growth
- reproduction
- responds to environment
- consume energy
- organization

What are two methods or ways we might use to find life in other places besides Earth?

- We can use telescopes and or rovers to explore new places and see if there are signs of life (like water or bacteria).
- Explore it by sending humans to the place.

Draw an imaginary life form from a different planet.	**Describe** its adaptations for its non-Earth environment.
	• It doesn't eyes, but it is blind because it's really dark where it lives • has big ears because it cant see so it needs to be able to hear its surroundings, like bats • It has wings because it needs to fly away from its predator. • ~~high heels to look~~ • wears clothes to warm itself during cold days • has shoes because the ground is very rocky and the sharp rocks cut its feet so it can't walk • Sharp strong teeth so it can eat roc • antenas to sense surroundings • nose to smell hard rocks and soft rocks apart • Soft [illegible]

PJ

SESSION: January 3, 2020

Search for life

We found:

1½. -termites -woodlice -eggs

-spider -centipedes -worm

-almost got a beetle

1. •We went to a nature trail at wesley linn park
2. •dug in rotten logs and found termites, woodlice and centipedes ~~and ge eggs~~
3. •in our backyard wee found a big spider
5. •we had a macro lense and a ring light on a phone to examine the bugs and a digital microscope
4. •we put them in CD containers but there were holes so some bugs escaped so we had to tape them up and put the other bugs back
6. • the eggs didn't have many features so we used dye to see them better

PJ

SESSION:

January 3, 2020

- We went to a nature trail at Wesley Linn Park

We found:

- termites	- spider	- almost a beetle (couldn't get it)
- woodlice	- centipedes	
- eggs	- worms	

- we dug in rotten logs and found the termites, woodlice, centipedes, the ones wee focused on
- we also found a spider in our back yard which was another one we focused on
- we put the bugs in CD containers but realized there were holes when a couple got out so we taped up the holes and put them back
- to examine the bugs we had a macro lense ring light connected to a smart phone and a digital microscope
- while examining we saw that the eggs had no features or details so we used the dye to see cracks or details

PJ

SESSION: January 3, ~~2019~~ 2020

Invertabrates

- no backbone

- spounges
- jelly fish
- mollusks
- arthropods
- ecinoderms
- worms

We watched a video to tell us about invertabrates and used this to find life in my backyard

- All living things:
  - reproduce
  - responds
  - grows
  - consume/use energy
  - organized life)

Methane Detection:

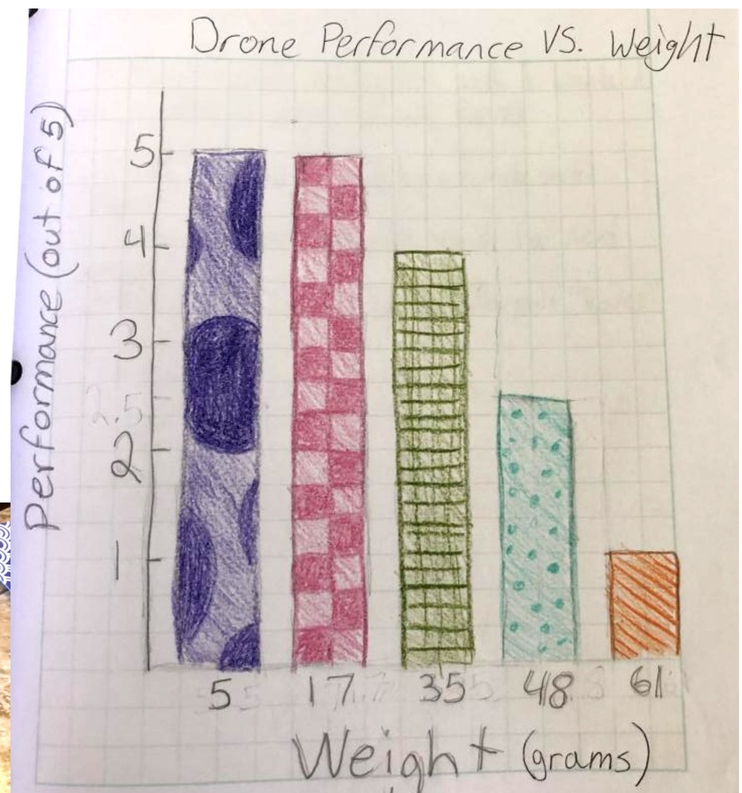
Went off:

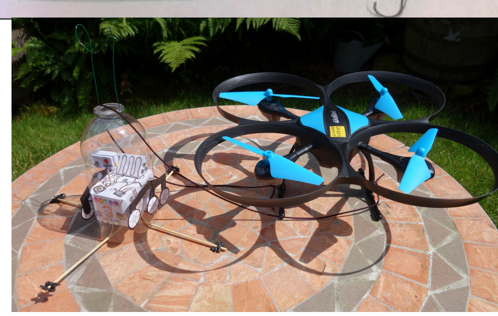
- rotting pumkin
- wine barrel
- shoes
- breath
- grill w/ gas flowing
-

Didn't go off:

- sewers
- compost bin
- trash bin
- rotting apples
- curdled milk
- rotting logs/leaves

Landing System





Lily

SESSION: 22, July, 2020

Overveiw Of The Landing System

One of the challenges we had to complete was building a landing system that was distinct from the other teams, demonstrated thoughtful planning, it also had to be structurally sound for landing saying that it should stay intact, clearly designed to be aerodynamic, and resembles a rover while displaying our team and NASA's identity. We did multipul tests and designes to narrow it down to the best combination of features, Some of our first designs had the problem of being way to heavy and not aerodynamic enough. We learned that our drone could carry 36 grams of weight and still manuver properly. We ended up putting a clear dome around our rover to redirect the rotor wash and make it more aerodynamic, and structuary sound. Also we added a wide base to prevent the rotor wash from pushing our rover

Lily

SESSION: 22, July, 2020

Overveiw Of The Landing System P. 2
across the mat. we modeled our landing system after the Mars 2020 rover including the wheels and camera mast, it also included our team logo, a NASA logo, a JPL logo, and colored sequins to represent each of us girls on the team.

July 22, 2020

SESSION: Overview of M03 and M05
Flying to Mars and Entry Descent & Landing

The lander must be hanging from the drone in a very specific way to get the best position when dropping. The string hanging down from the drone must be hanging from the outer part of the drone legs and the string must be wrapped around the wire hook of the lander tightly so that when the drone takes off, th string will be hooked by the lander's hook.

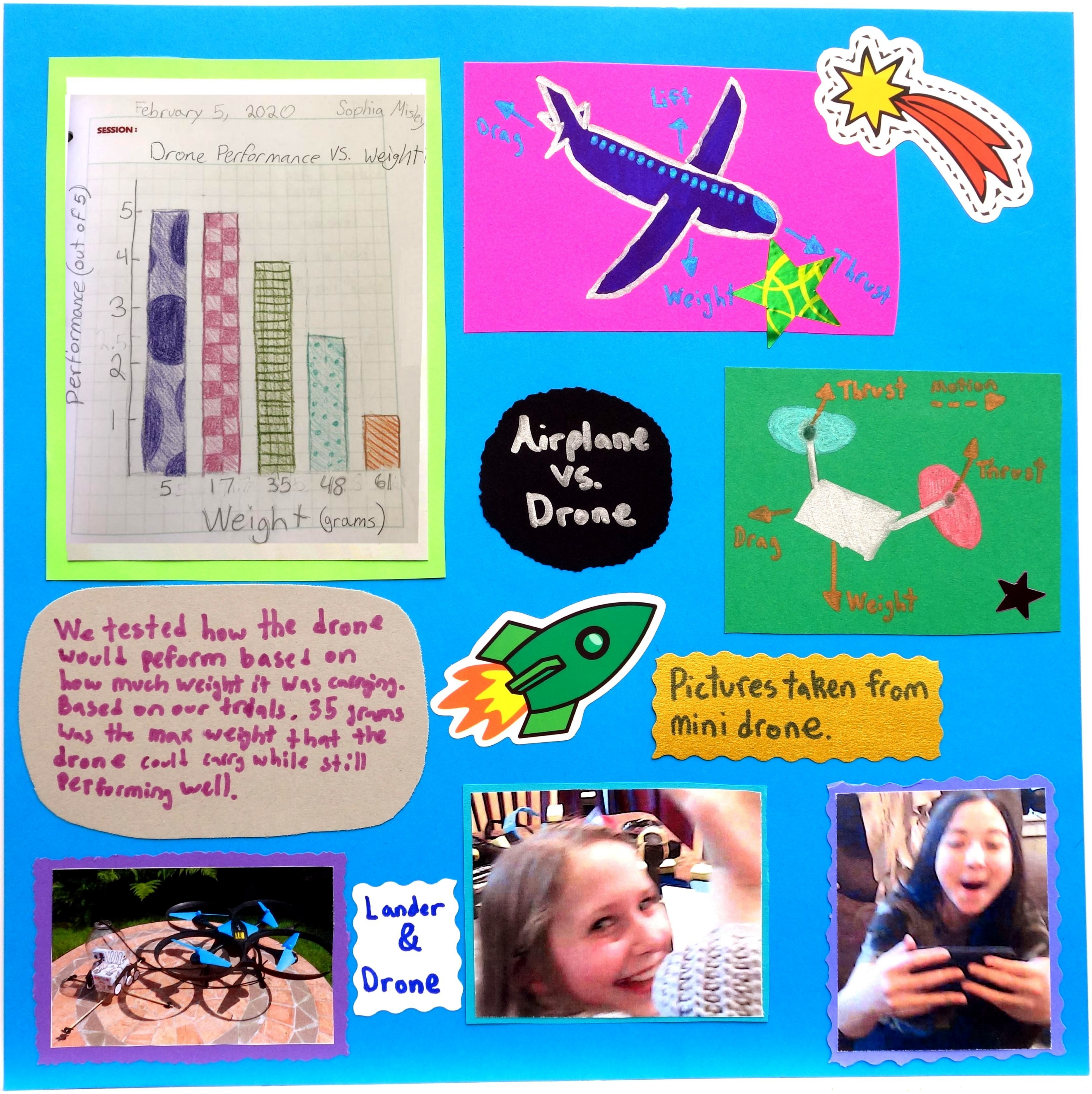
When circling Mars, the drone should fly in an octogon like shape to fly smoothly and to make sure that the lander does not hit Mars. Once the com. dish has been set up and the signal recieved, the drone will fly to the landing target and adjust its position until everything looks right, then land the lander. Because the max weight the drone can carry with the best performance is 35 grams, we made our lander weigh about 30g. But because the lander is heavy, the drone performance drops sharply when the battery is almost dead or when the drone is adjusting its pitch and yaw, because then the drone will start to dip down. This is why landing the lander is a bit tricky and why during the descent the drone must fly down quickly and then slow down just as the lander touches down to ensure that the lander doesn't tip or move too much. Because the hook on the lander is designed to curve back facing towards the pilot, once the lander has been landed the drone can simply just fly backwards and land in the landing zone.

Scrapbook: Landing System

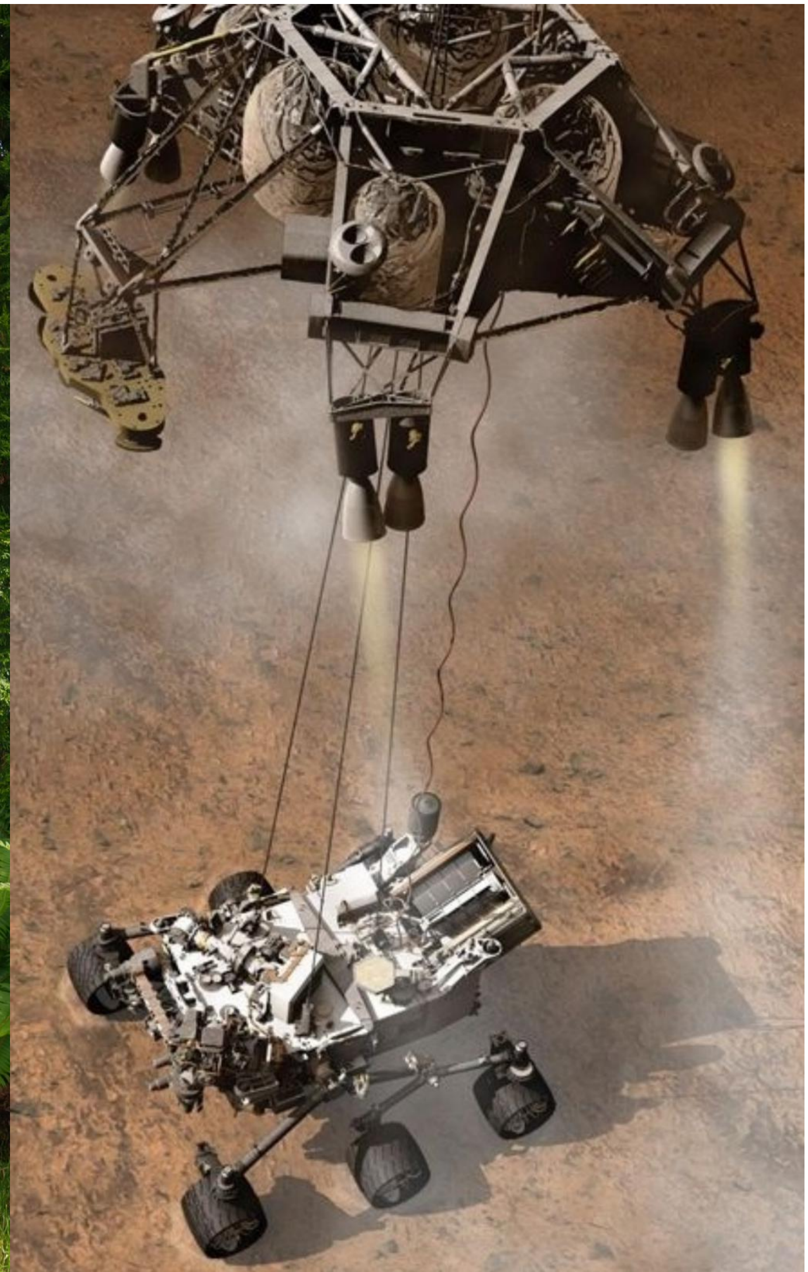
Scrapbook: Landing System

Scrapbook: Drone and Sky Crane

Scrapbook: Drone and Sky Crane



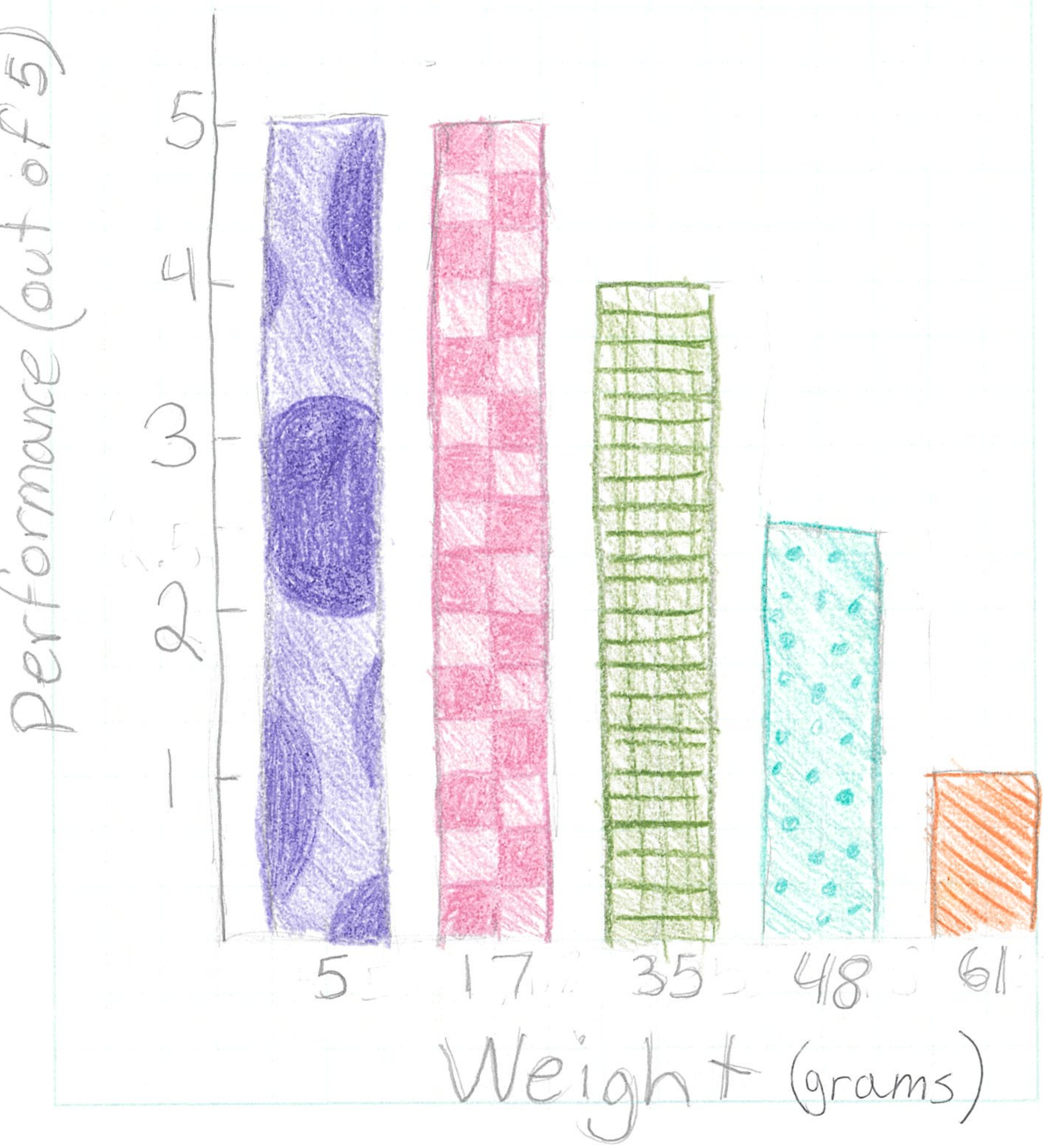
Landing System:



February 5, 2020 Sophia Misley

SESSION :

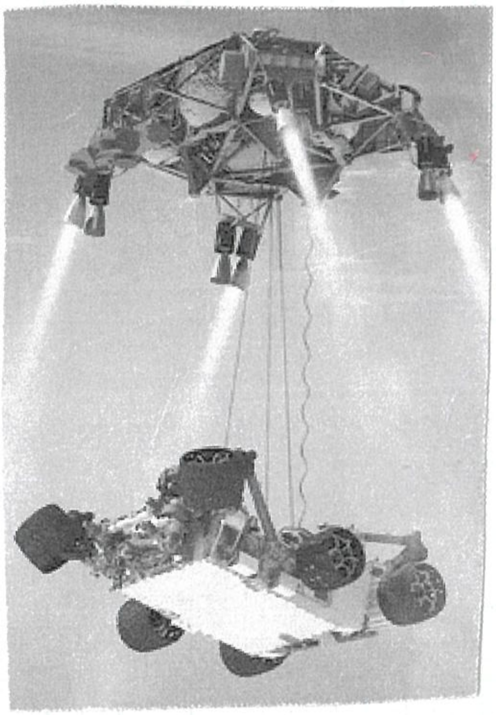
Drone Performance VS. Weight



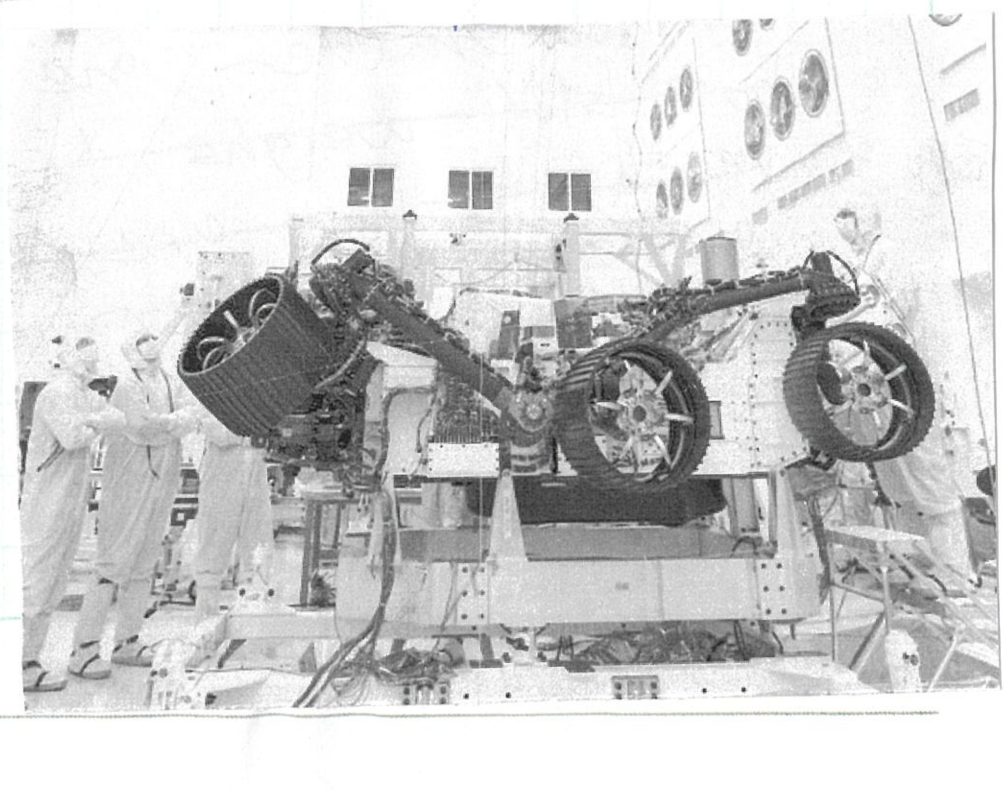
SESSION :

Landing System Configuration

Example of Rover Being lowered



Example of the wheels ~~being~~ stowed up to save space.



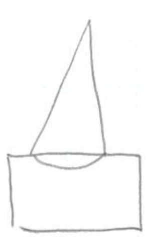
PJ

SESSION: 6 March, 2020

Landing System

- when a drone flies up it pushes air under it
- we began to notice it was hard for our drone to fly
  - this is because our rover has a big surface area

the air pushes right on top of our rover so we thought of a way to reduce the drag



adding a cone
- cones are airodynamic (air goes around them easily)
- we think this will reduce the drag downward

March 17, 2020

Sophia Misley

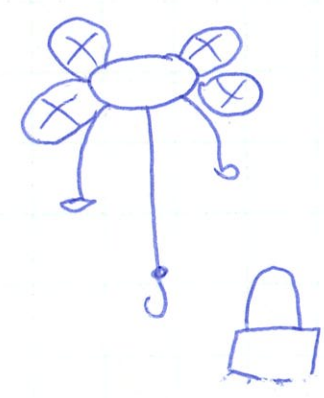
SESSION: Landing System

Engineering Design Process

With our landing system, we had many problems. We faced challenges like weight, twisting, rotor wash, and aerodynamics. Over time we have come up with a design that looks and functions it's very best.

The Evolution of Our landing System:

Model 1: Lego hook on drone connected to single string → Hoop on lander



- hook would twist
- it was hard to tell the direction of the hook
- lander twisted
- hard to hook on takeoff

March 17, 2020

Sophia Misley

SESSION: Landing System

Engineering Design Process

Model 2: Lego hook on drone connecting to two strings attached to legs → Hoop on lander

* doesn't twist as much
* you know the direction of the hook
- still hard to hook on takeoff

Model 3: drone has one string connecting to both ~~sides~~ legs to make a loop → Single wire hook on rover/lander

* much easier to hook on take off
- swings forward and backward

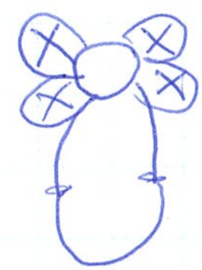
March 17, 2020

Sophia Misle,

SESSION: Landing System

Engineering Design Process

Model 4: drone has 1 string connecting to legs in a loop → wide hook



side view

Front view

★ reduce swinging significantly
★ easier to hook on takeoff
★ doesn't twist
★ consistent hook direction
– rover model was pushed down by ~~rotation~~ rotor wash
– rotor wash would blow model accross mat

← air blows on cube figure and is pushed down.

March 17, 2020

Sophia Misley

SESSION: Landing System Engineering Design Process

Model 5: NEW FOCUS: weight + rotor wash
rover model needs to divert the wind from the rotors

-rover model is rectangular block, not aerodynamic on top.

We tried different shapes, and we ~~fea~~ researched the best (see attached paper) (attachment 1)

cone worked well

bottle on top worked better than cone

March 17, 2020 Sophia Misley

SESSION: Landing System

Engineering Design Process

Model 6: arrow dynamic, ~~[illegible]~~
we tried putting it in the bottle

* aerodynamic
- too heavy
- didn't fit in bottle

Model 7: We made a smaller model to fit in the top of the 2L bottle

* fits in 2L bottle
- weighs to much, drone can't carry it well

Model 8: We made a lighter wire

* less weight
- still heavy
- when on ground, the rotor wash blows it accross mat

March 17, 2020 Sophia Misley

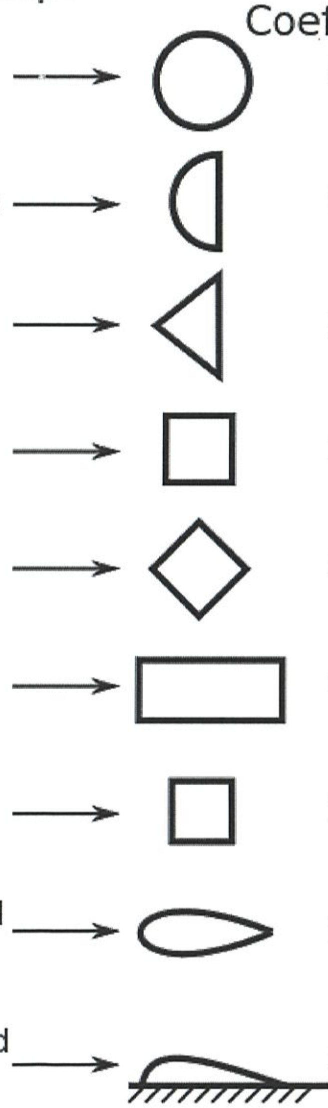
SESSION: Landing System

Engineering Design Process

Model 9: We are making an even smaller rover base with a 1 Liter bottle, and added legs so it has a wider base

*weighs less
*doesn't slide accross mat

Attachment 1



Shape	Drag Coefficient
Sphere	0.47
Half-sphere	0.42
Cone	0.50
Cube	1.05
Angled Cube	0.80
Long Cylinder	0.82
Short Cylinder	1.15
Streamlined Body	0.04
Streamlined Half-body	0.09

February 7, 2020

Sophia Misley

SESSION :

Sky Hook

① Identify the problem: ~~When~~ ~~we~~

- the sky hook spins while only attached to one string

- the hook wouldn't stay on the loop when launching

- wouldn't detach so module was dragged.

② Explore

our last year idea:

Other teams idea:

~~both doesn't solve launching problem~~

← this idea will really help with detaching and launching

February 7, 2020

Sophia Misley

SESSION :

Sky Hook (page 2)

③ Design:

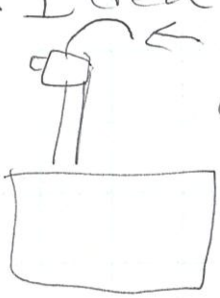
our design

hook on rover

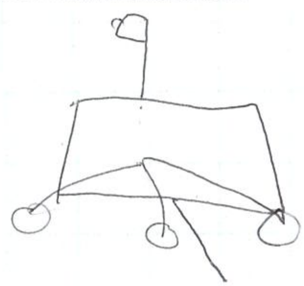
~~desi~~ loop with string

☆ Idea!

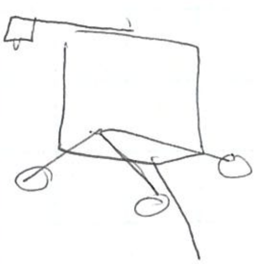
← Hook coming out of camera



If camera comes up when landed, we could do that



← off ground



← when ground stick is pushed up and so is camera

stick

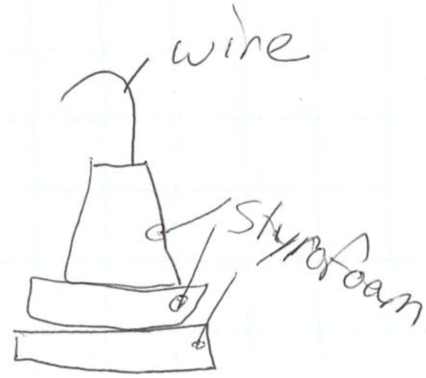
February 7, 2020

Sophia Misle

SESSION :

Sky Hook (page 3)

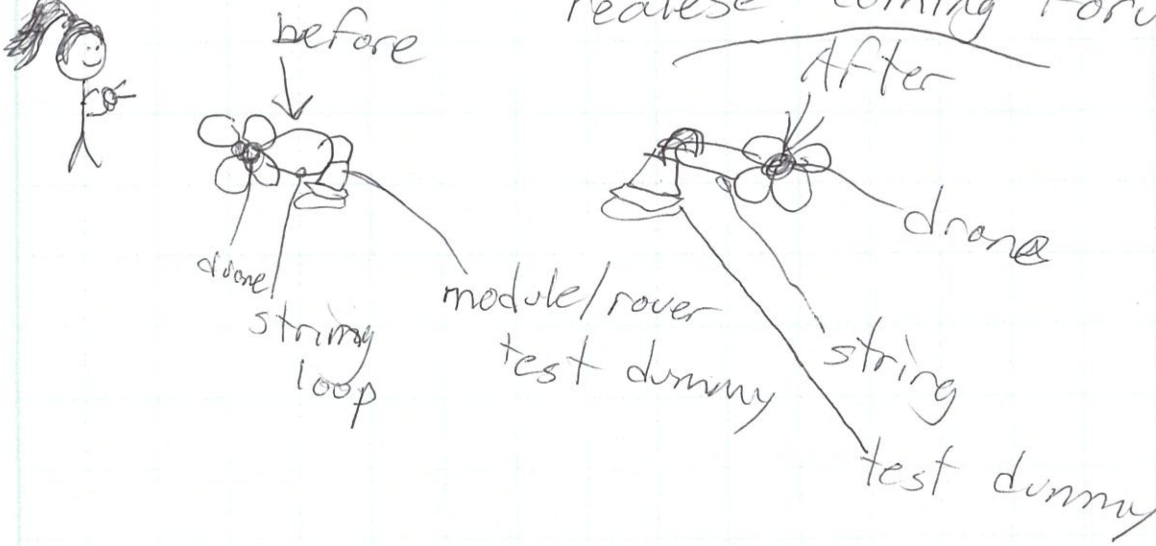
(4) <u>Create</u>: Our design:



- Our test design for the hook was succesful, ~~but we~~

- We didn't only change hook, we changed direction of string to drone:

We changed it so we can realese coming forward



February 7, 2020

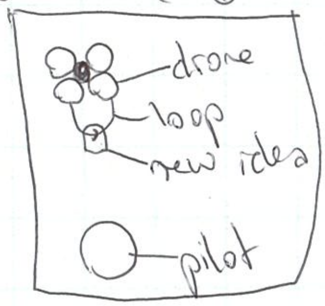
Sophia + PJ
Misley

SESSION :

Sky Hook (page 4)

⑤ Try it out:

- Sophie launched with our new idea 6 times
- it was easier to drop
- when we launched it it didn't fall off
- it never twisted and ~~fell~~ came off when we needed it to



⑥ Make it better:

- have the hook push up when it hits the ground

string won't detach if trapped by hook

camera maybe on hook

PJ

SESSION: 2/5/20

Today Sophie, Pahlychai and I worked on a way to pick up our Rover

- we tried using a cup as our makeshift Rover
- we filled the cup with sand to add weight
- Pahlychai practiced flying with our "Rover"

PJ

SESSION : 2/5/20

Rover Weight test

What weight is coming from	Weight	Performance
1. Only hook	5 grams	5 out of 5, easy to manuver
2. hook and cup	17 grams	5 out of 5, easy to manuver
3. hook, cup and 18g weight	35 grams	4 out of 5, struggled to get up at start but did good otherwise
4. hook, cup, 18g weight and 13g weight	48 grams	2.5 out of 5, was difficult to manuver
5. hook, cup, 18g weight, 13g weight and another 13 g weight	61 grams	1 out of 5, it got off the ground but was <u>very</u> difficult to manuver

PJ

SESSION: 2/5/20

~~M~~ Mars Rover Weight test

- ~~Cup: 12g~~ Only Hook: 5g

  Performance: 5 out of 5

- Hook with cup: 17g

  Performance: 5 out of 5

- Hook w/ cup + weight (18g): 35g

  Performance: 4 out of 5 because at begining it struggled (a little) to get high

- Hook w/ cup + two weights ~~(13g)~~: 48g

  Performance: 2.5 out of 5 because it was difficult to manuver

- Hook, cup, three weights: 61g

  Performance: 1 out of 5 it got off the ground but was <u>very</u> difficult to manuver

January 29, 2020 Sophia Misley

SESSION :

Rover (landing System)

Identify the problem: We need to make a mars rover that is light weight so the drone can carry it, and also represents our community.

Explore: Others ideas =

- Some made of paper
- lego complete is too heavy

This is most like our design we are trying for

Materials we have

- lego
- styrofoam
- scewers
- cardboard box

Design:
- using cardboard box
- lego wheels

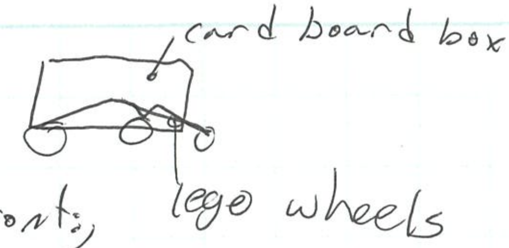
Create:

peices needed:

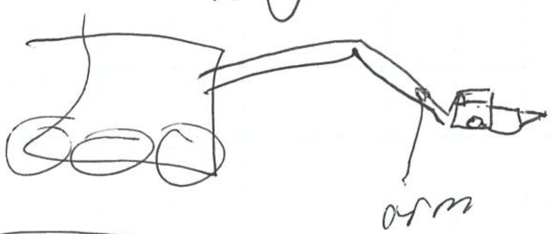
part number 4

SESSION :

our design so far :



· next building arm on front:



weighs: 47 grams

Decor ideas:
- related to OK, maybe trees?
- sequins again
- usa flag
- ~~Lunar ladies~~ Lunar ladies sign

To be continued!

Rover
Page 2
1/29/20

Communication Dish

July 22nd, 2020

SESSION: Overview of M02 Communication Dish

When we were making our communication dish, we went through many prototypes. We first locked at other people's com. dishes and then decided that we would build our com. dish out of lego. We saw that other people had made theirs of straws and paper towels, and we choose lego instead because lego is very stady and easy to put together. Lego is also very stable and something built of lego can easily stand up alone.

Because we choose to use lego to build our com. dish, it was very easy to seperate it into 10 pieces and quickly reassemble it. Our dish meets all 4 requirements: 10 or more components, one round piece that fits into a square piece, able to stand alone when built, and no larger than 12"x12"x12".

We used real pictures of communication dishes as a reference to build our com. dish. With a curved dish, lego technic for supports, and a 2x2 block for the TNB, our com. dish looks very realistic. We also have several items of importance significance on our com. dish. There are 5 colors all over our com. dish: pink, purple, blue, orange, and turqviose, which each represent each of our own individual colors. We have a waterfall which represents the Willamette Falls because we live in Oregon City. There is a douglas fir tree that represent's Oregon's state tree and also represents two of our teamates' grandpa who owns a Christmas tree farm. Nancy G. Roman is on our com. dish because she is a famous female scientist who represents woman in Science. Marvin the Martian is also on our com. dish because he has been on previous NASA mission patches and because our costumes are based off of him. We also have the Saturn V rocket which represents the 50th aniversary of Apollo 13, and the American flag because we all live in America and are Americans.

Scrapbook: Communication Dish

Scrapbook: Communication Dish

Communication Dish:`

-Saturn V Rocket for Apollo 13

-Xmas Tree for a family Tree farm

-Willamette Falls for Oregon city

-American Flag for our country

-Marvin the Martian for our team of “martians”

-Nancy G. Roman for Women of NASA

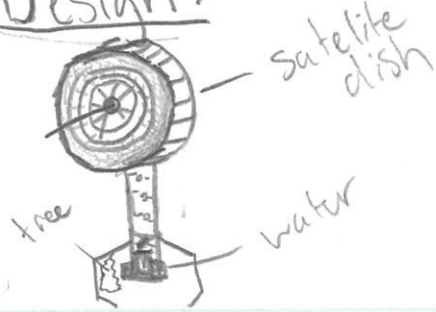
Ariana Nackos

SESSION: Designing + Creating Satelite Dish
1-29-20

Problem: we need to design and create a satelite dish that has 10 pieces and ties in with our community. Needs 1 circular piece that fits into a square. Max: 12 in diameter

Explore:
- we liked the idea of the open satelite dish so we used a tire with an open middle to create that effect
- to represent Oregon City we liked the idea of using the colors green and blue to represent how wet and green Oregon City is

Design:



Ariana Naukos

SESSION: Designing + Creating Satelite Dish (continued) 1-29-20

Create:

- we had to figure out how to make the satelite dish be facing at an angle and we eventually figured it out →

- we are trying to find a swivel piece so that the satelite can turn. We found it because another teamate found one for us
- we still have to figure out how we are going to get a circle inside a square

To be continued...

PJ

SESSION: Communication Dish

Engineering Design Process

Our Satellite Dish had only two problems

1. We wanted it to spin
2. It looked too much like a tire

Our second problem was easy to solve, we just looked through our lego and found legos that were good shapes for a satellite.

For our first problem we had to do research

A way we found to make it spin was a plan for a merry-go-round. It had a handle and when you spun the handle the satellite should spin

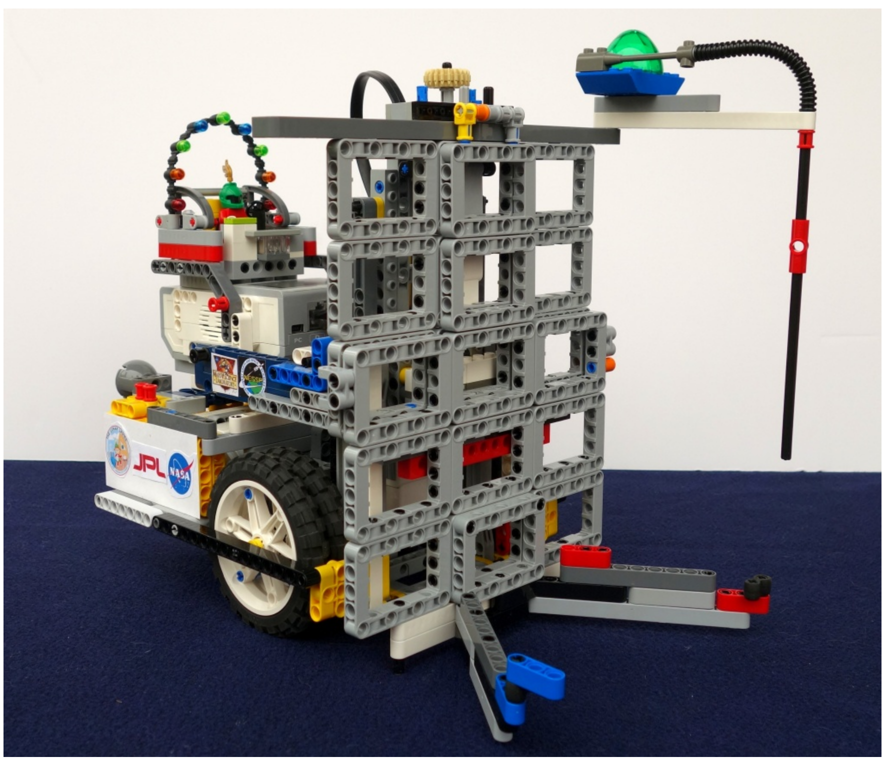
PJ

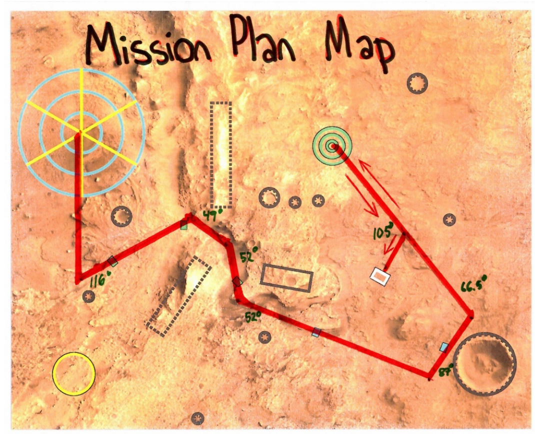
SESSION: Communication Dish

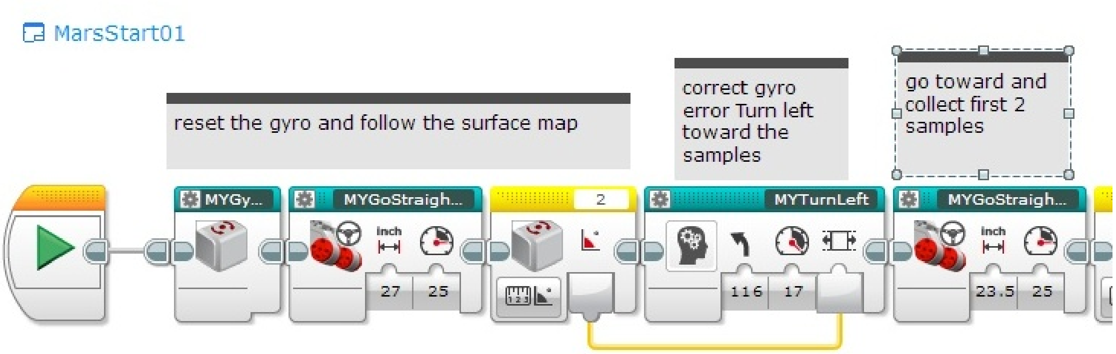
Engineering Design Process

- when we first put it inside of one of the buildings the dish wouldn't spin
  - this was because the axel sticking out of it was too short
- to solve our problem we put a longer axel in so it could reach the stack of bricks that held the Satellite and spin

Rover Design







Sophia Misley

SESSION :

Overview of Rover Design + Testing

1. Mechanical Design

A lot of work went into making sure our robot was strong, sturdy, and fit for the competition challenges. There were several aspects that stood out:

A. Our Dual Rack Mechanism
B. Our Soil Sample Scooper
C. Tire Selection
D. Axel Support
E. Balancing the Rover

A. Dual Rack

After our initial brainstorming, we decided it would be extremely helpful to make a dual rack attachment so we can easily line up attachments on the dual rack up, down, left, and right. A dual rack is something you can build with lego to attach to your robot. It uses gears and gear grip rack pieces on top and in the back to make the whole attachment move in all directions. The

Sophia Misle

SESSION :

Overview of Rover Design + Testing

Front of the attachment is designed to be flat so anything can attach to it, (like our scoop attachment). We had to find special lego parts to let the attachment move horizontally and vertically at the same time. We studied YouTube videos to get clues on pieces we need. The rack was a perfect addition to our rover.

B. Soil Sample Scooper

We made a soil sample collector attachment to put on our dual rack. It is in a V shape so even if the samples hit the very outside it will channel them back in to the center. This gives us a larger error margin. We also can line up the scoop attachment with the cache zone by using our dual rack attachment to move left or right once we reach that part in the program. Some samples were hooking onto our scoop so when we push the samples into the cache circle we can lower the dual rack and drop off our whole scoop attachment and drive to the

Sophia
Misley

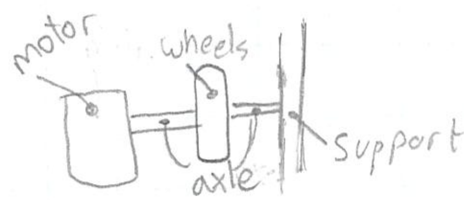
SESSION :

Overview of Design and Testing.

regolith sample without it. This is similar to an strategy NASA has considered using where samples will be placed in containers and left for future missions. This scoop attachment gets us all the points we need from the samples!

C. Tires

We needed to focus on several things like the tire size, stiffness, and stability. The small tires we originally started using were too slow, so we switched to taller ones that turned out to be too wobbly. Then we switched to the medium size which was just right. For more accuracy, we stuffed the tires with lego tube pieces so the wheels were harder. And finally, we put two wheels on each side to double the friction.



D. Axel Support

To help prevent the wheels from wobbling, we put a support bar connecting to the axel going through the wheel.

Sophie Misley

SESSION :

Overview of Rover Design + Testing

E. Balancing

Because of our dual rack, scoop, and probe, our robot is a little front heavy! To balance the front and back of our robot, we added castor wheels hanging off the back of our robot for even weight. We also moved the EV3 brick back on the robot.

2. Challenge Strategy

Sophie Misley

SESSION :

Overview of Rover Design + Testing

The first thing we did was a test to see if the samples could slide accross the mat. once we confirmed they could, we knew we wouldn't have to pick the samples up. Another thing we focused on with our challenge strategy is having the least amount of turns possible. While going strait, its hard to mess up. Turns are more accident prone, the robot or program is most likely to make a mistake. We start off the challenge by collecting the closest samples first, so we can go the shortest distance possible. We will then weave through the craters and mountains collecting samples and ending up at the cache drop. Using the dual rack attachment we line it up with the cache drop center, move forward, and drop off the samples and the scoop attachment. Finally, we go in reverse, turn, line up the probe with the regolith sample, and put it in.

Sophie Misle

SESSION :

Overview of Rover Design + Testing

3. Programming and Navigation

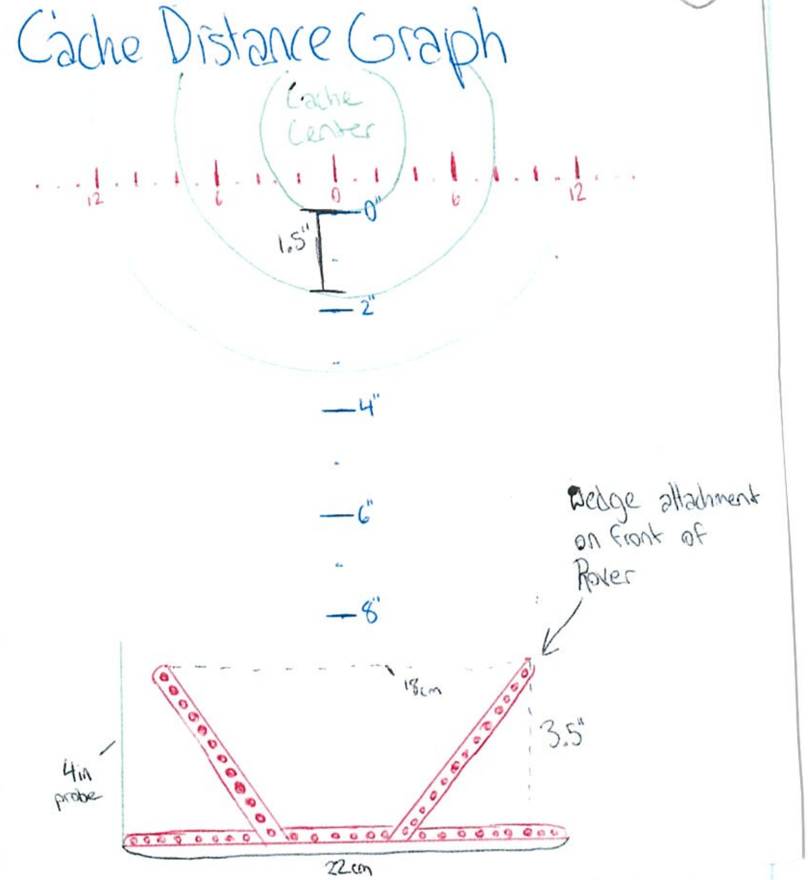
One thing we worked on a lot with programing is going straight and turning correctly. We have four error correction methods. While driving, if we drift, we record it and program it to drift the other way, correcting its mistake. This method is called proportiona error correction Another type, called turn correction, records the angle it is at at the end of each go straight. If it is off, it adds or subtracts that from your next turn. We measure angles with our gyro sensor. The third form of error correction is how we can stop the program in the middle and send commands to our robot to avoid craters/mountains or to line things up. We also slowed down the start and stop on the robots go straights, and we slowed down all our turns. The last form of error correction includes a graph we have, to line up the robot with the cache drop and sensor box so we can move our dual rack attachment. *See next Page*

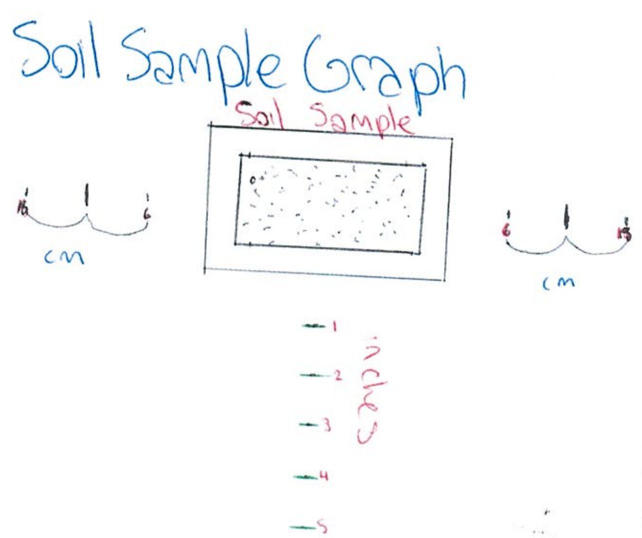
Sophia Misle

SESSION :

Overview of Rover Design + Testing

This is the graph we use to line up our soil samples with the cache drop center. →





← This graph is what we use to center the probe to the regolith sample center.

Sophia Misley

SESSION :

Overview of Rover Design + Testing

4. Innovative Features/Creativity

We worked together and thought of as many creative, helpful, ideas to use for this Roads On Mars challenge. These are a few of our innovative features:

A. Dual Rack
B. Scoop
C. Proportional Error Correction
D. Slow Starts + Stops

A. Dual Rack

We got the idea to build a dual rack mechanism from a "SAP Rocket" video. This attachment allows us to move up and down, and left an right during our run. We use our left and right feature when centering the samples and the Probe, and we use up and down to drop of the samples + scoop and put the probe in the regolith sample.

Sophia Misley

SESSION :

Overview of Rover Design + Testing

B. Scoop

On the front of our robot, you will find a "V" shaped attachment used for collecting samples. Even if they are off center, the slanted sides will channel the sample back to the center. We also put lego rubber axle connectors on the edge to make sure the samples stay within the attachment edges on turns.

C. Proportional Error Correction

We came up with the idea for our proportional error correction using tutorials from "Builder Dude 35" on Youtube. This form of error correction, (as previously mentioned) happens while going straight and helps the robot stay in a perfect line by fixing any drifting motions detected by our gyro.

Sophia Misley

SESSION :

Overview of Rover Design + Process

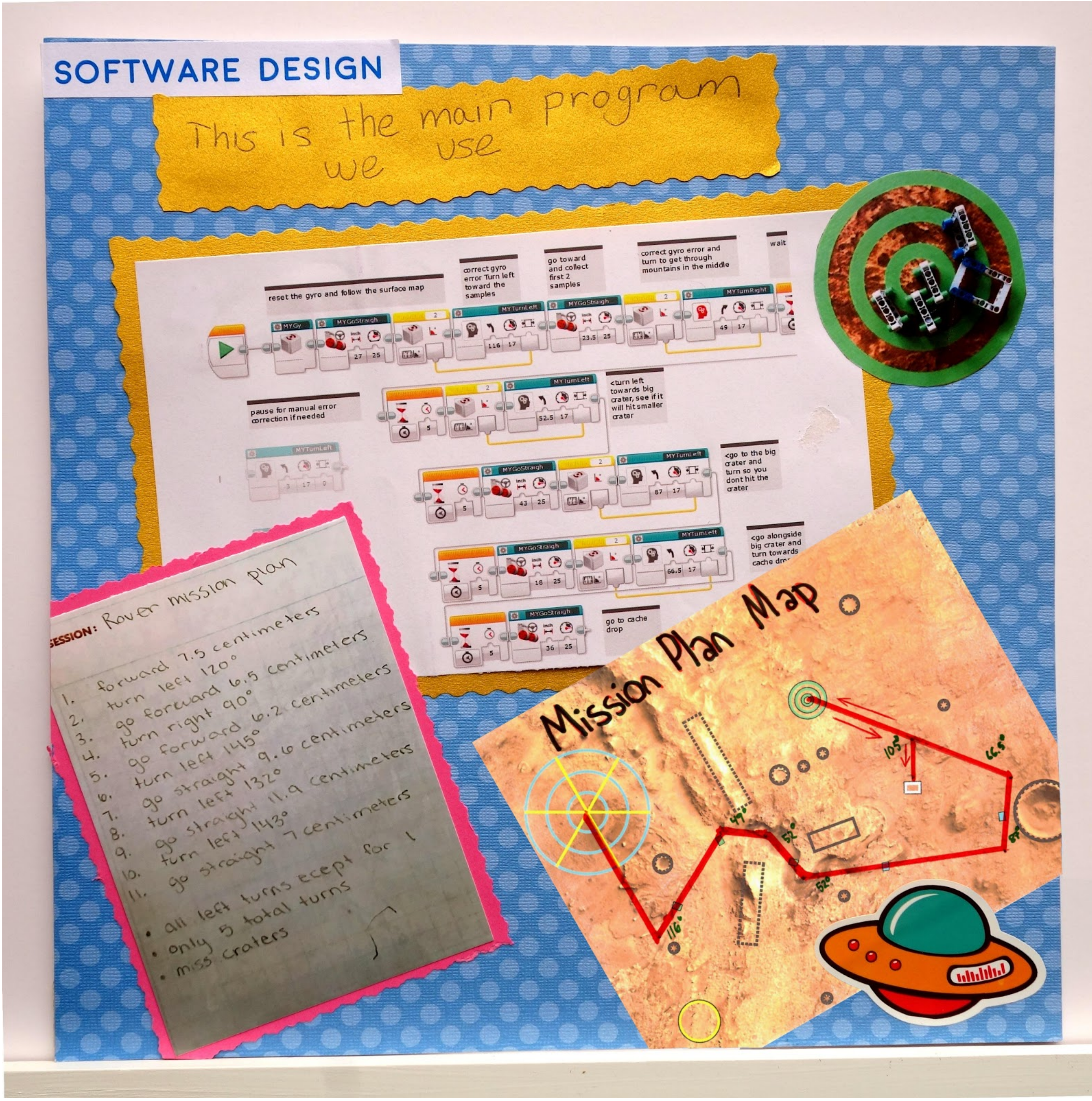
D. Slow Start and Stops.

With an idea from "Nate Simpkins" on youtube, we figured out that if you slow down the start and end of a go straight, it will be more accurate. We also slowed down the turns. Our rover was significantly more accurate after we implimented this idea.

Scrapbook: Rover Design

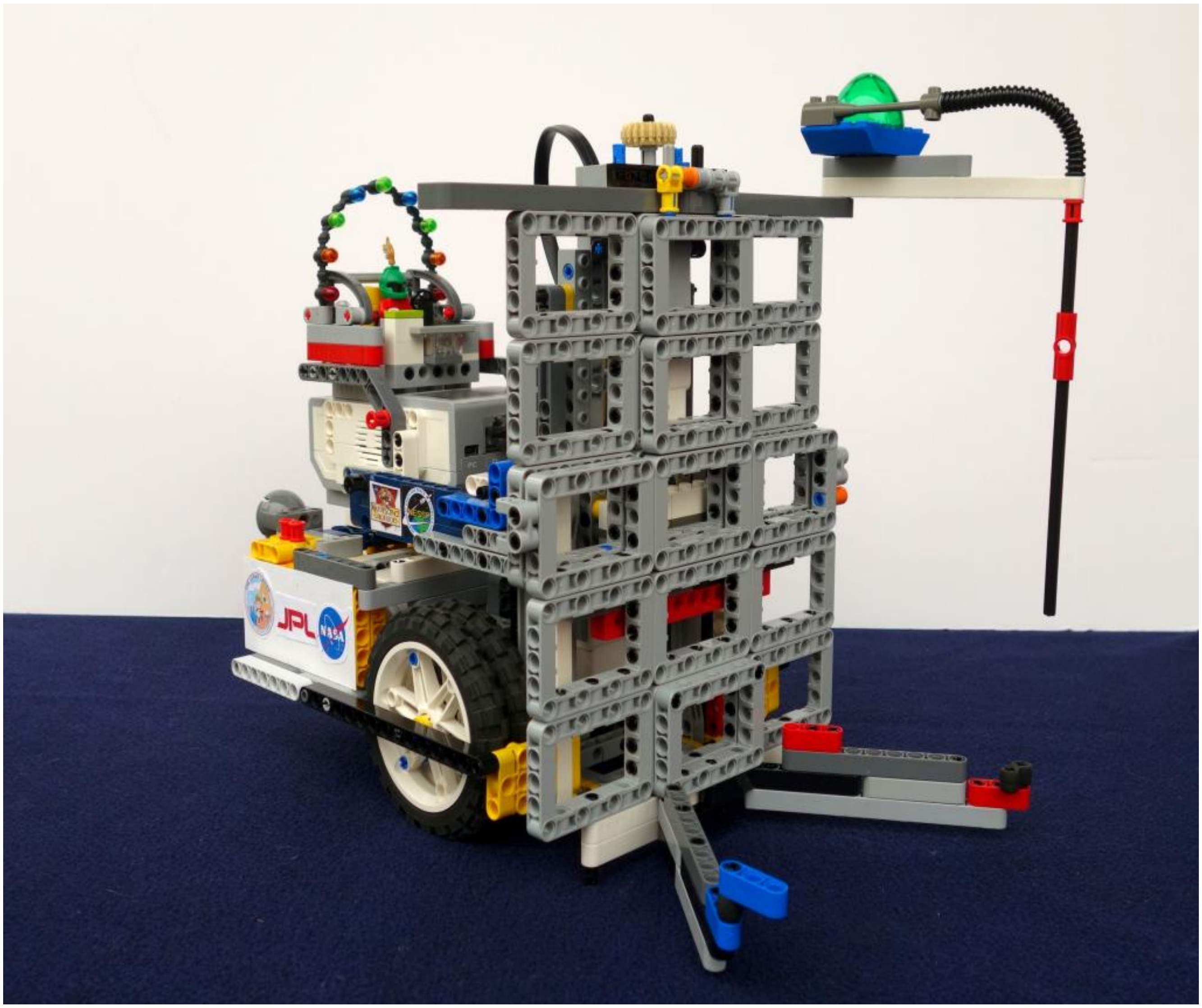
Scrapbook: Rover Design

Scrapbook: Software



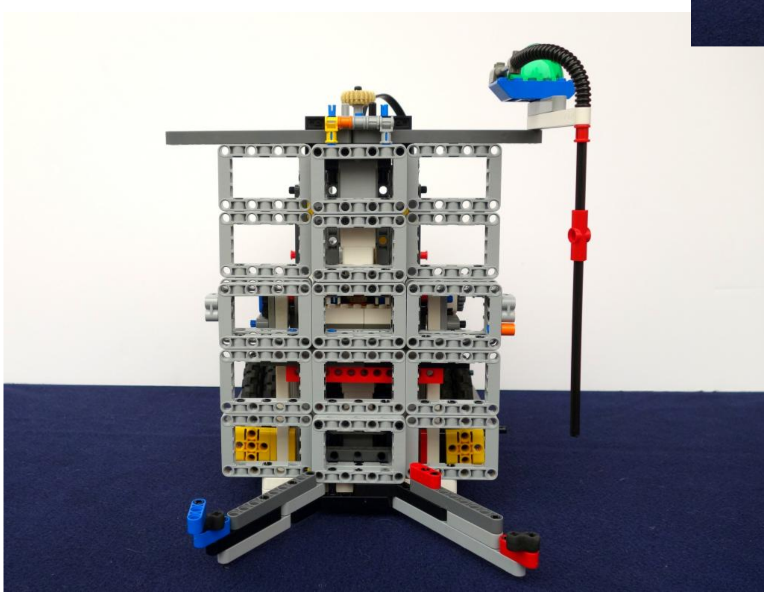
Scrapbook: Software

Our Robot: “Wall-E”

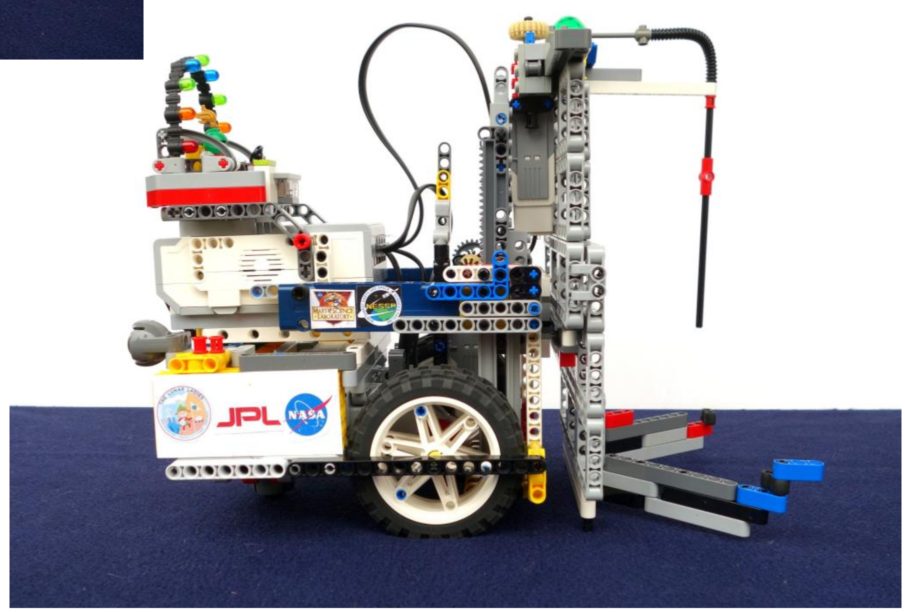


This is our robot “Wall-E”, driven by Marvin The Martian. We have different features such as our dual rack attachment, our scoop attachment for the soil samples, our dual tires, and our simulated sensor probe.

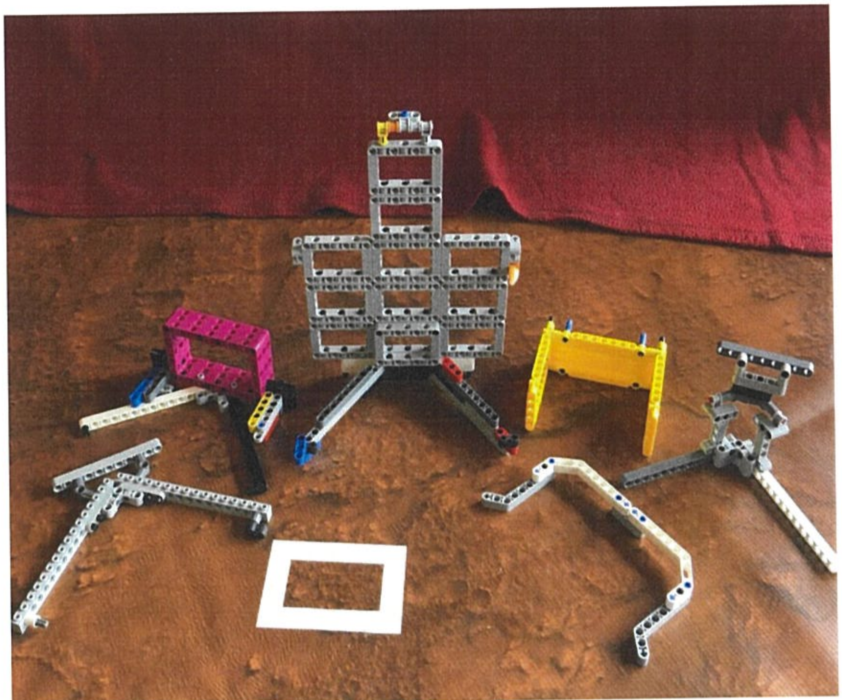
Different Views of “Wall-E”

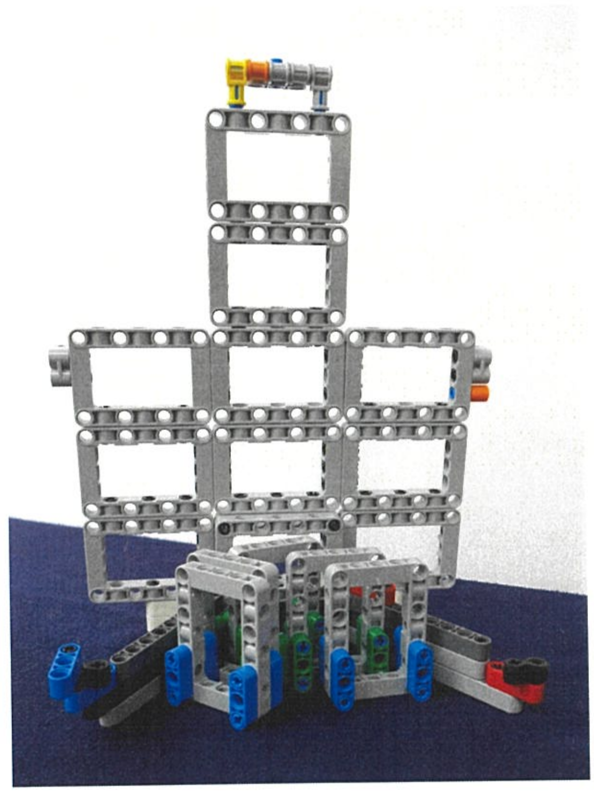


Our rover is decked out with team colors and logos from NASA, JPL, Mars Science Laboratory, NESSP, and the Lunar Ladies

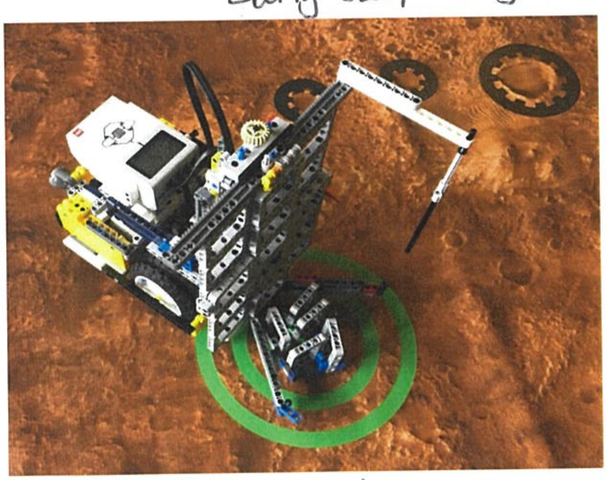


Our Scoop Attachment

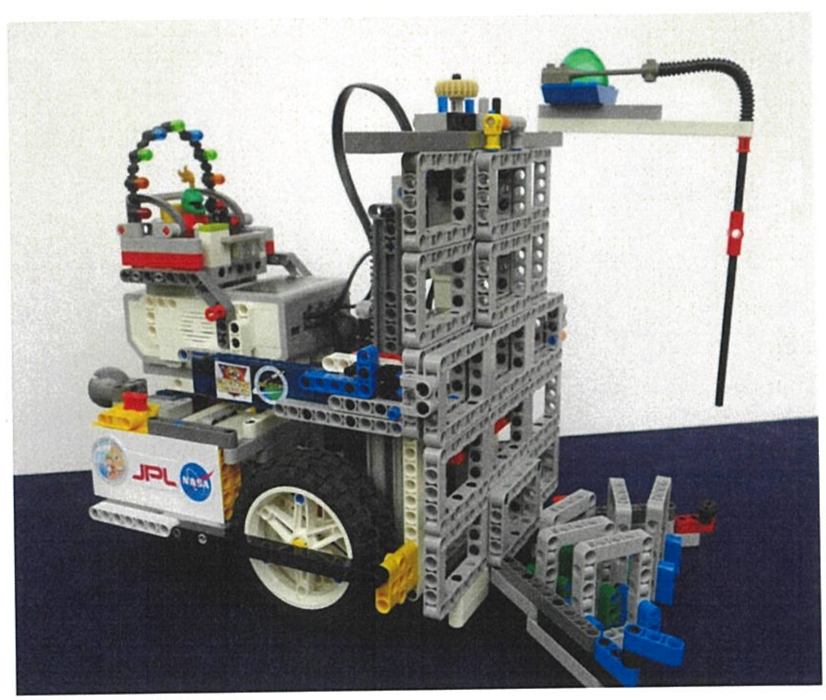




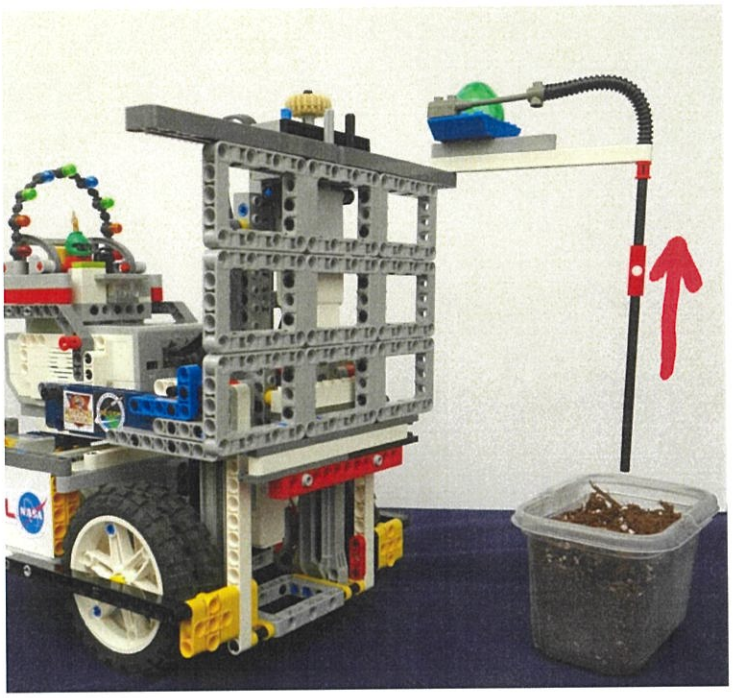
Early Scoop Designs



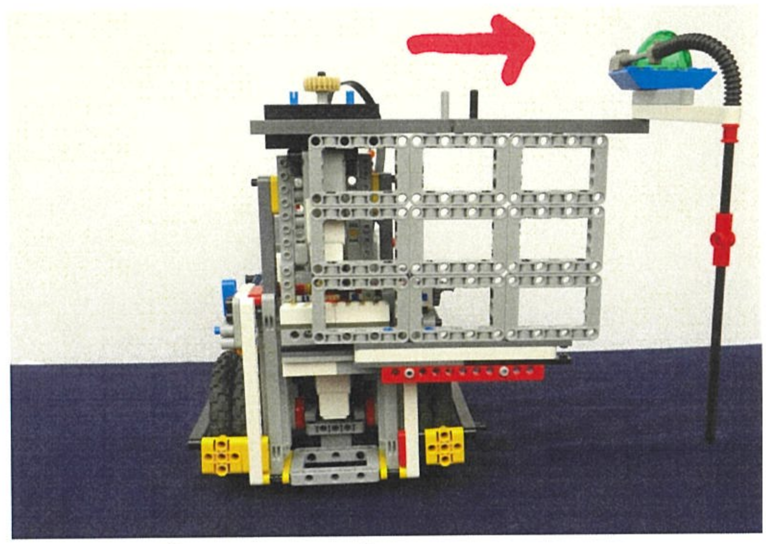
Bullseye!



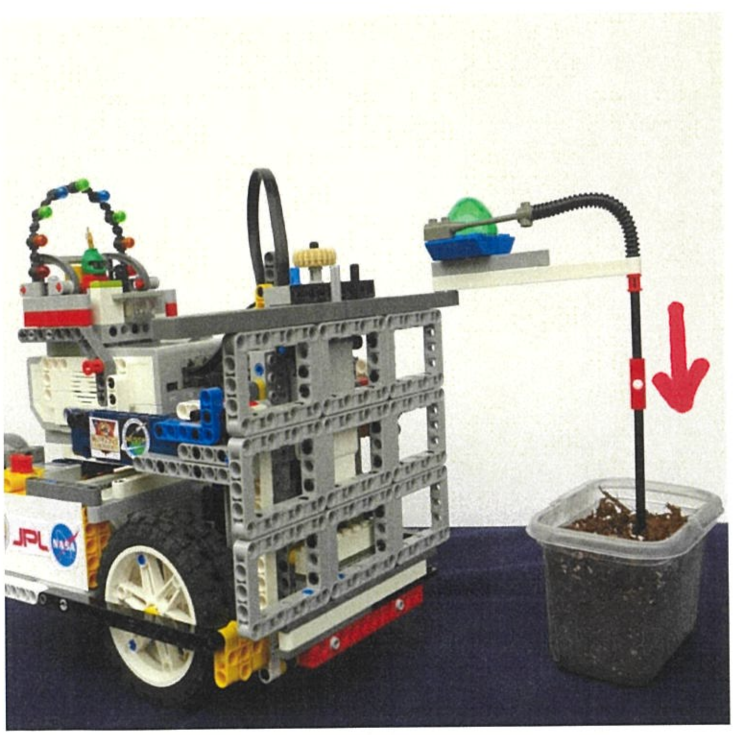
Our Simulated Moisture Probe



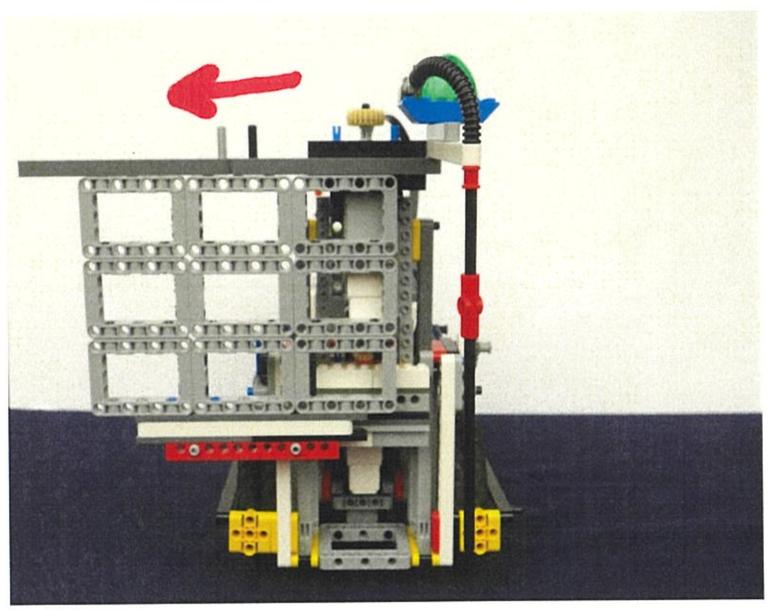
Probe Up ↑



Probe Right →

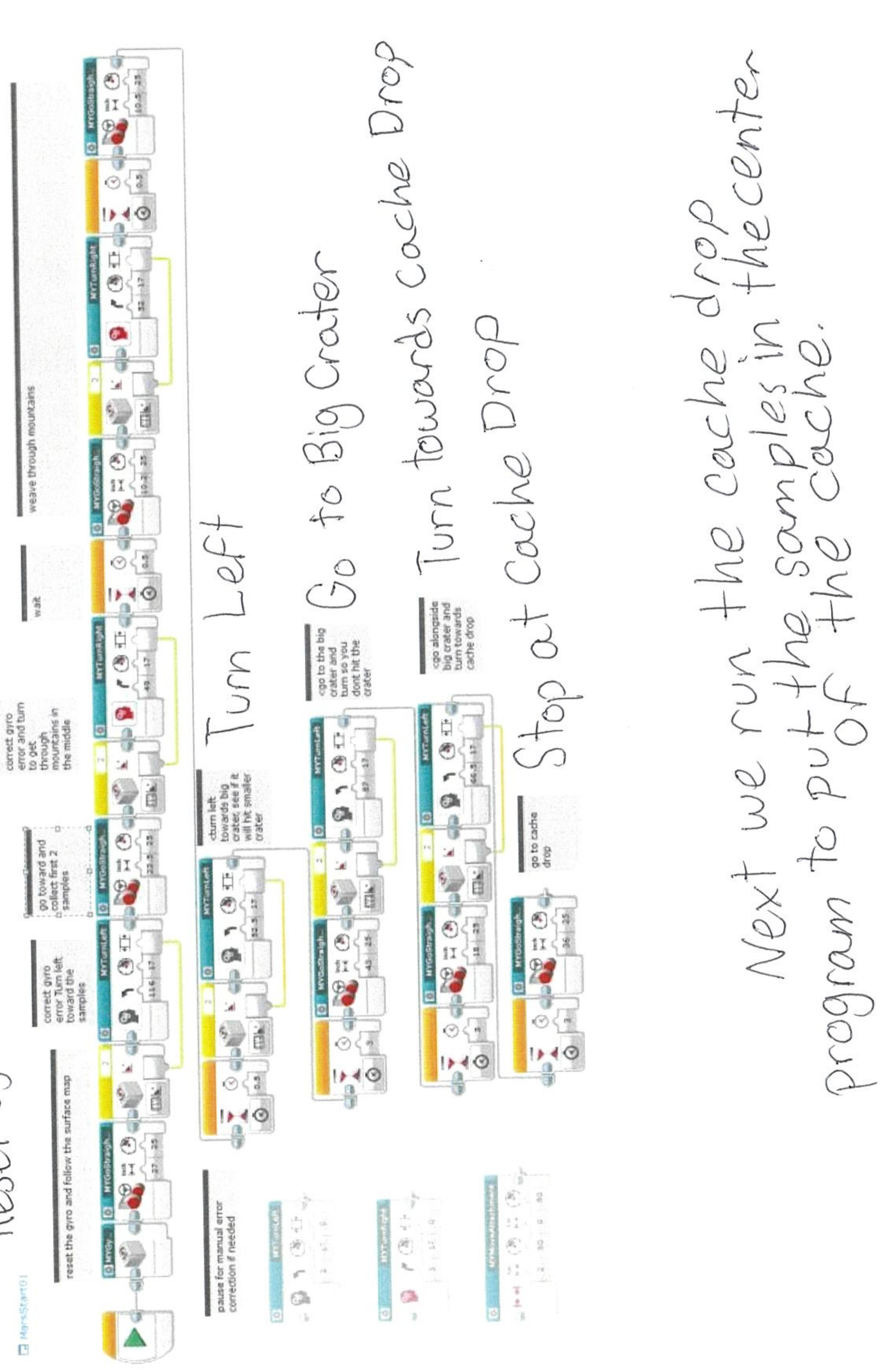


Probe Down ↓



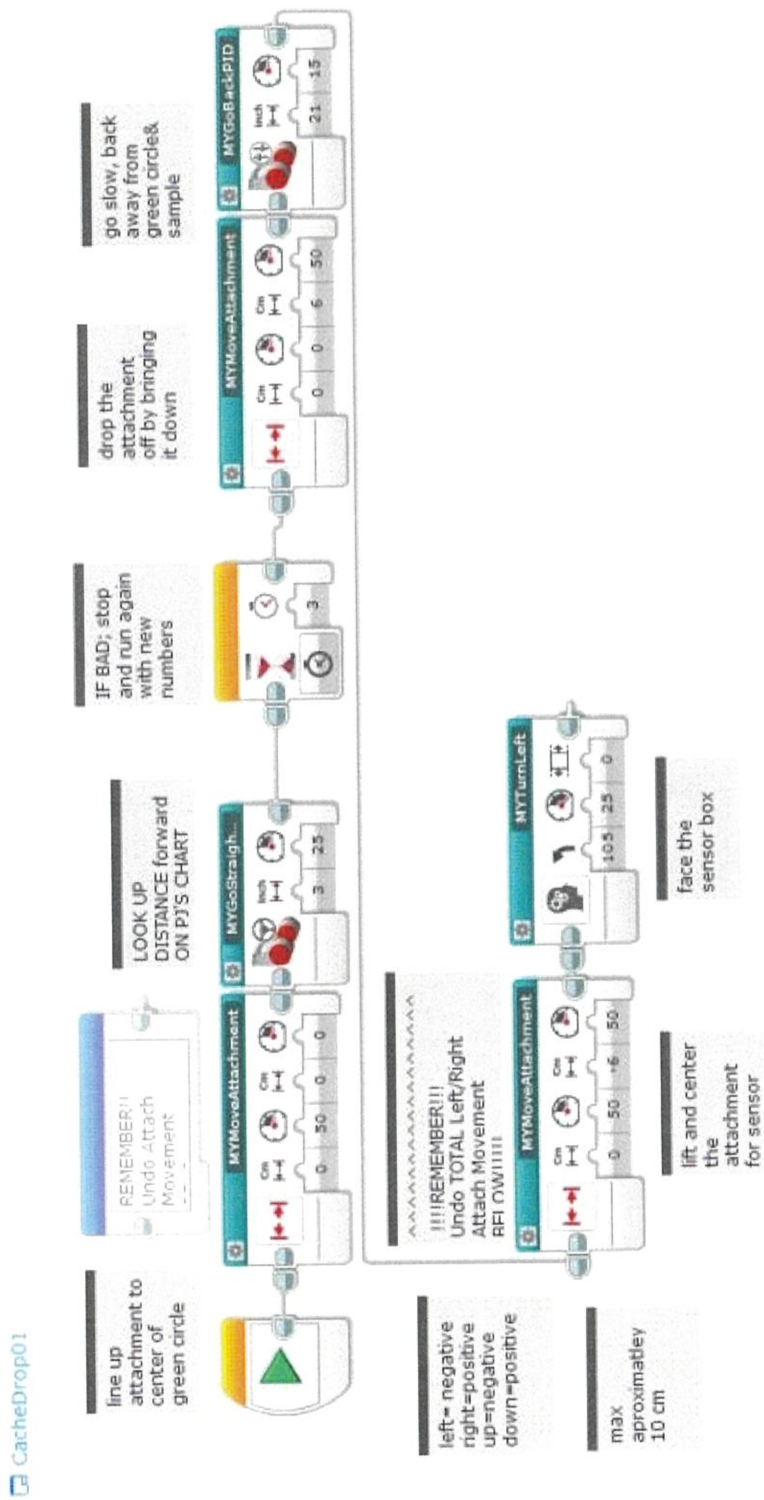
Probe Left ←

Coding Mars Start 01 Main Program



Coding for the Cache Drop

This program centers the samples in the cache zone

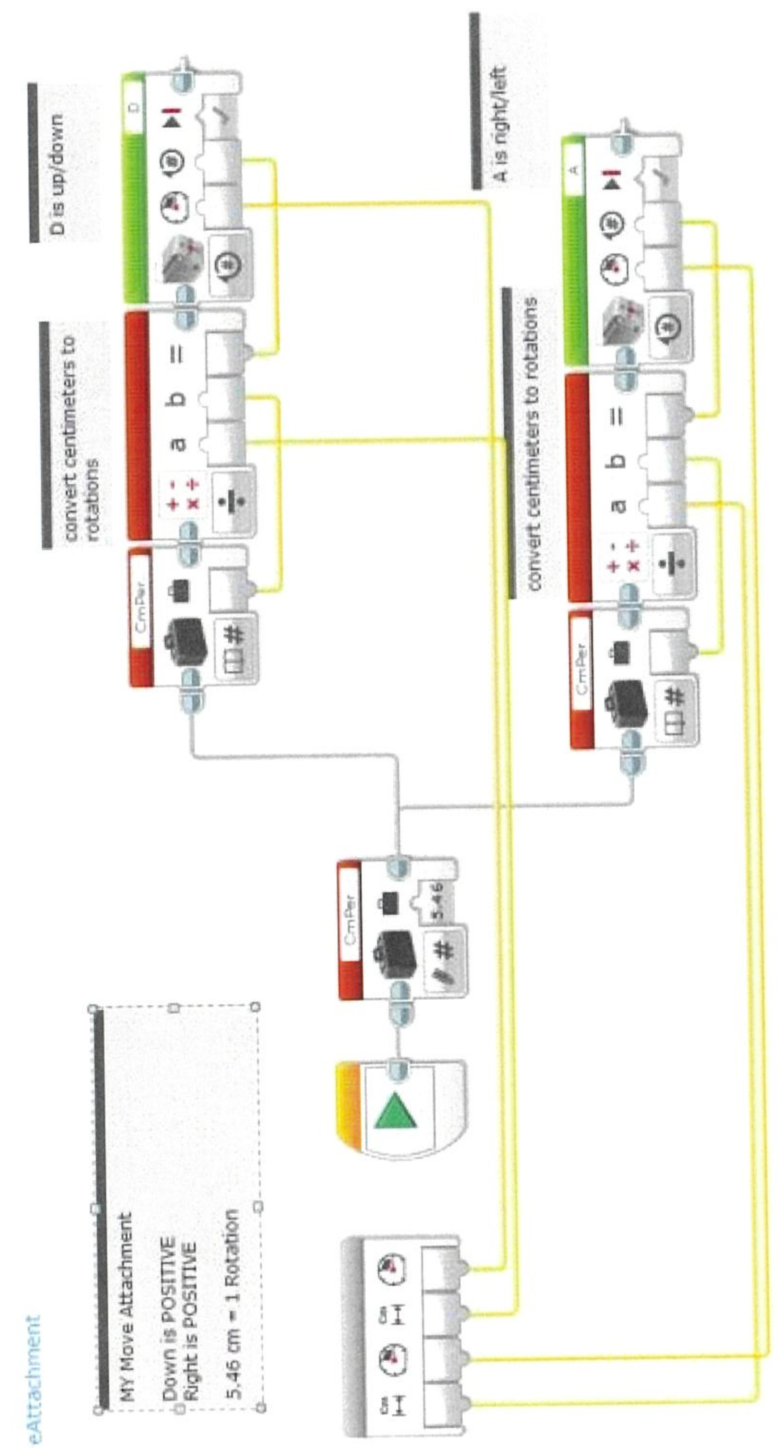


Code for the Sensor Box

This Program centers the probe in the regolith sample.

Coding My-Block for My Move Attachment

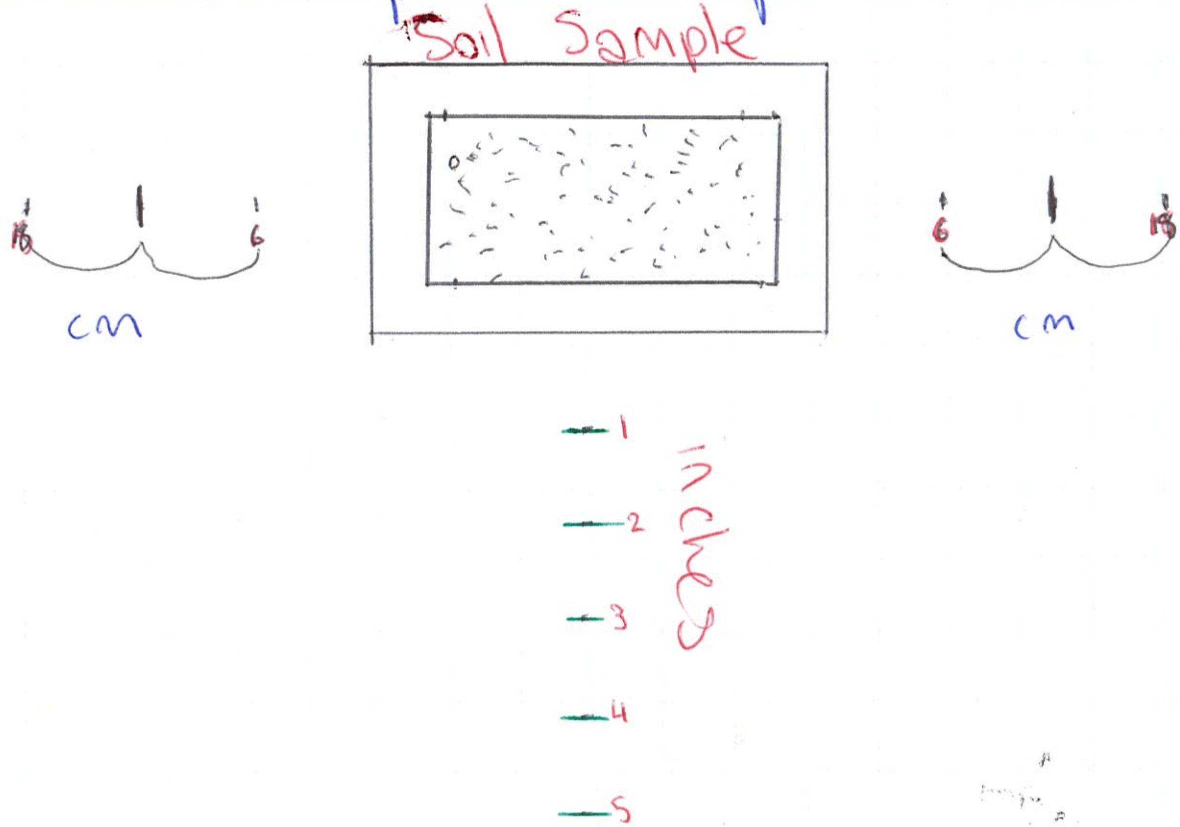
This Program moves our attachments up, down, left, and right.



PJ

SESSION : 25 August, 2020

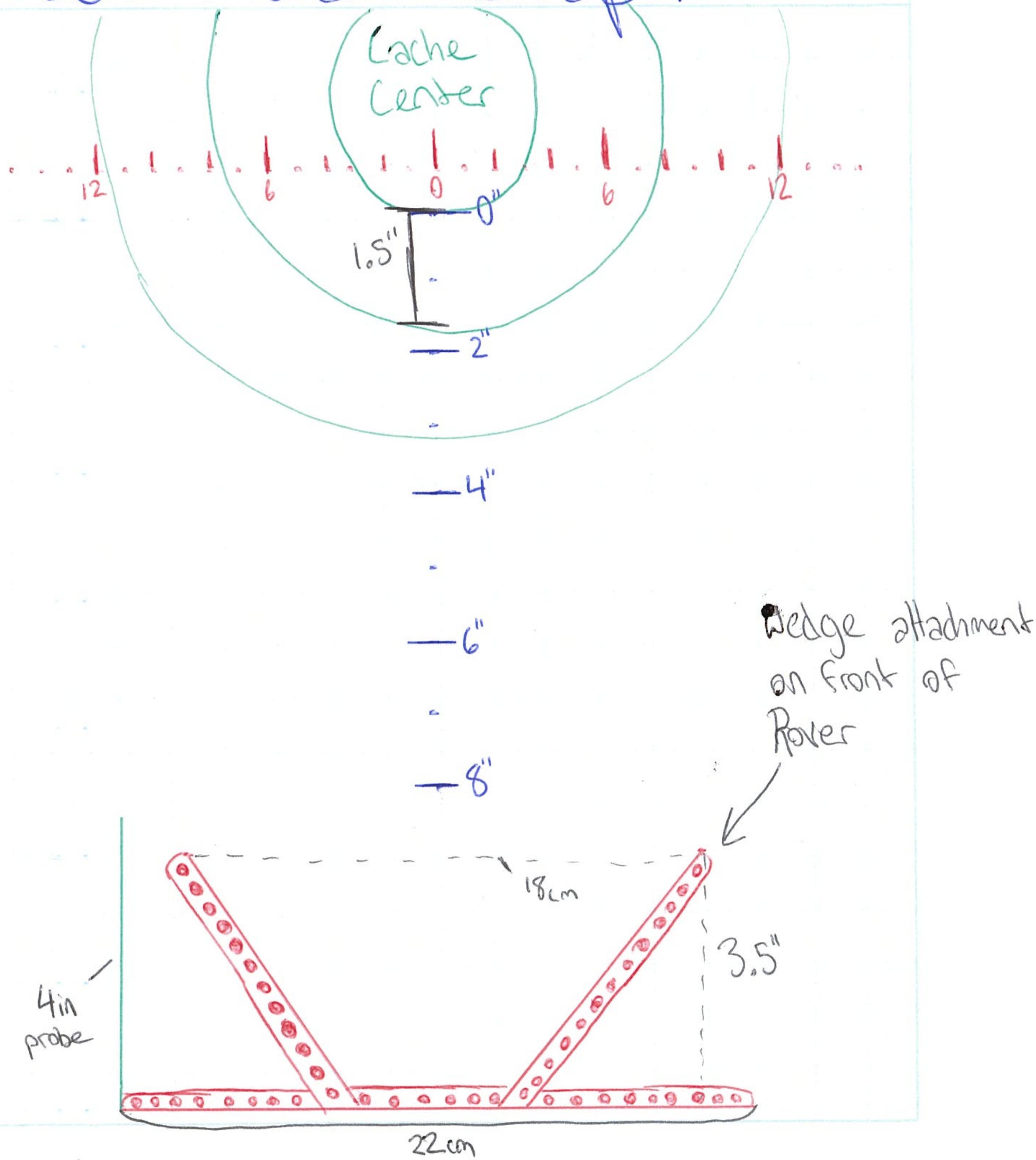
Soil Sample Graph



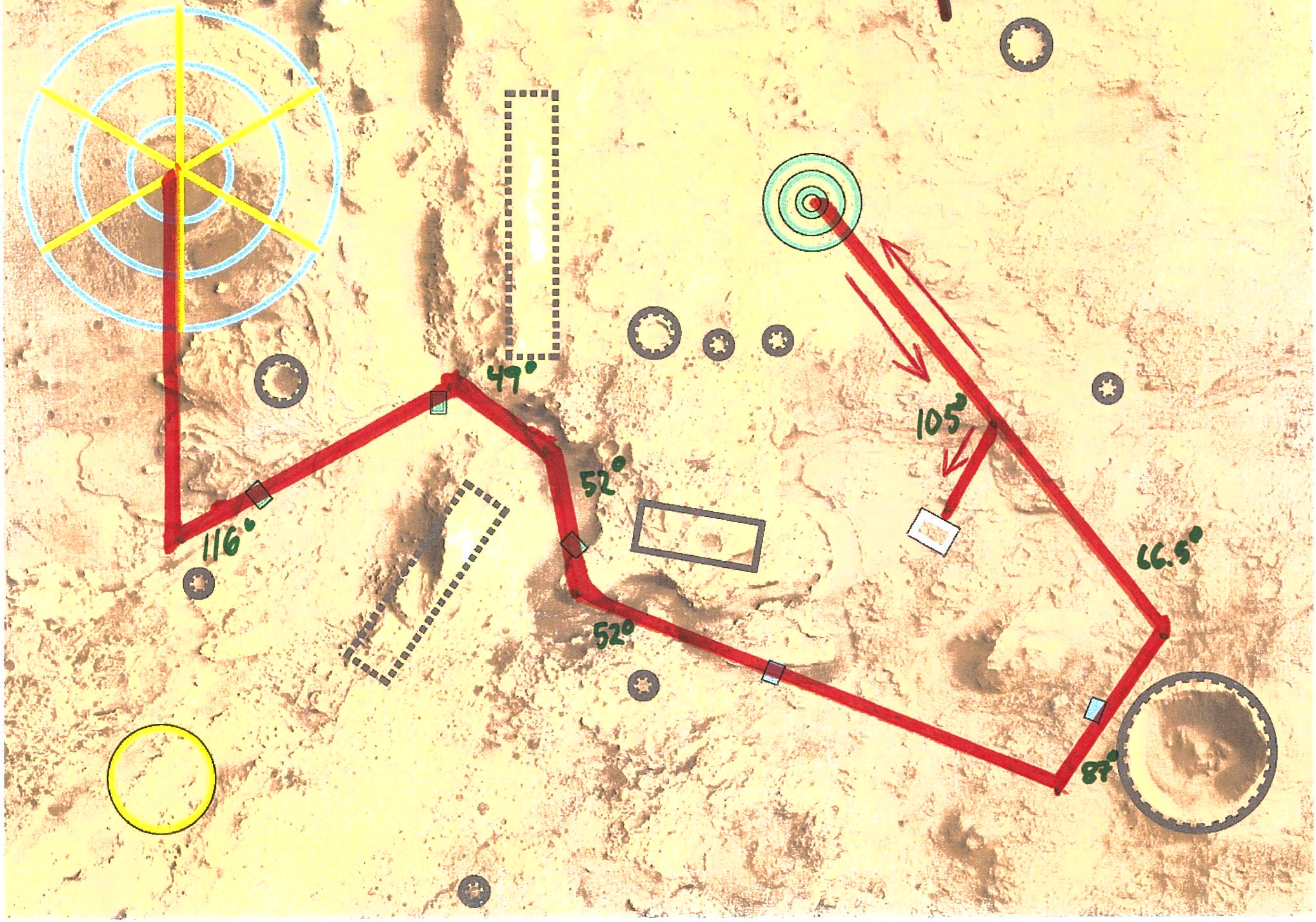
PJ

SESSION : 23 August, 2020

Cache Distance Graph



Mission Plan Map

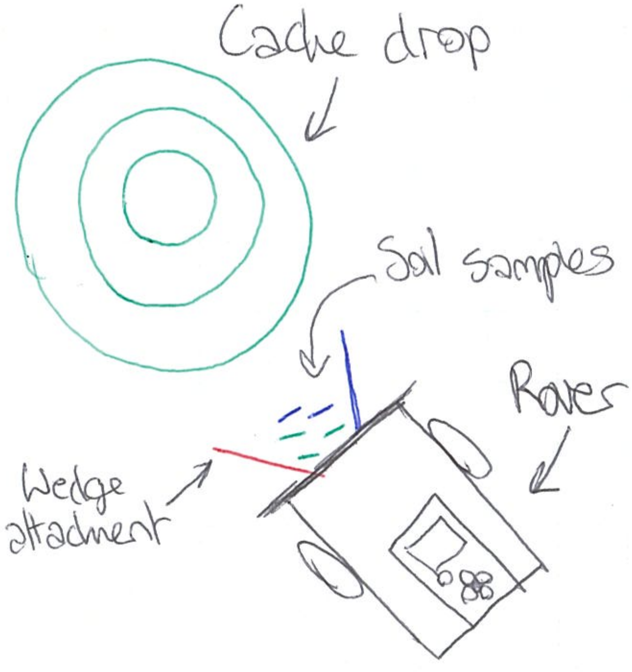


PJ

SESSION : 25 August, 2020

Cache Distance Graph

To line up our dual rack attachment for maximum points I created a graph which allowed us to estmate errors forward, backward, left and right and fix them. I drew a diagram and put measurments to see how the attachment could line up with the samples in the center of the cache.

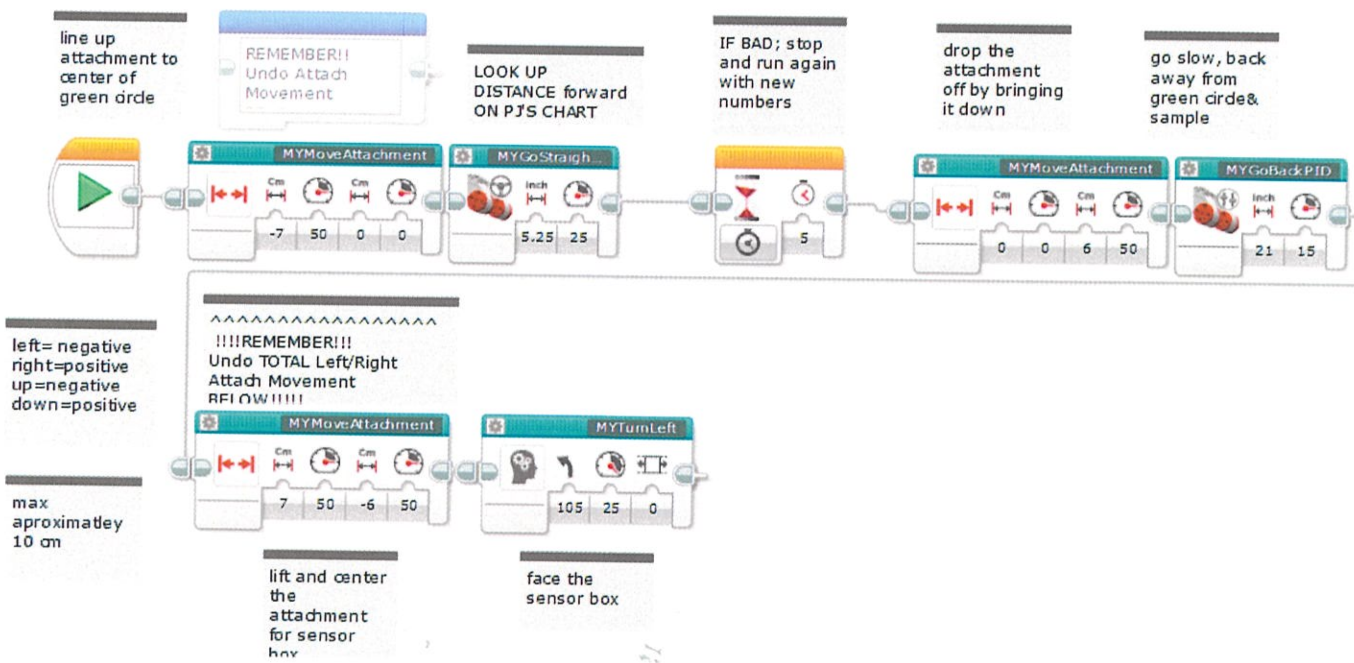


Sophi
Misle
8/25/

SESSION :

Example EV3 Program: Cache Drop

This is the code for our Cachedrop Program. This program is for lining up Wall-E with the green circles at the cache drop, dropping off the samples, and going to the soil samples.

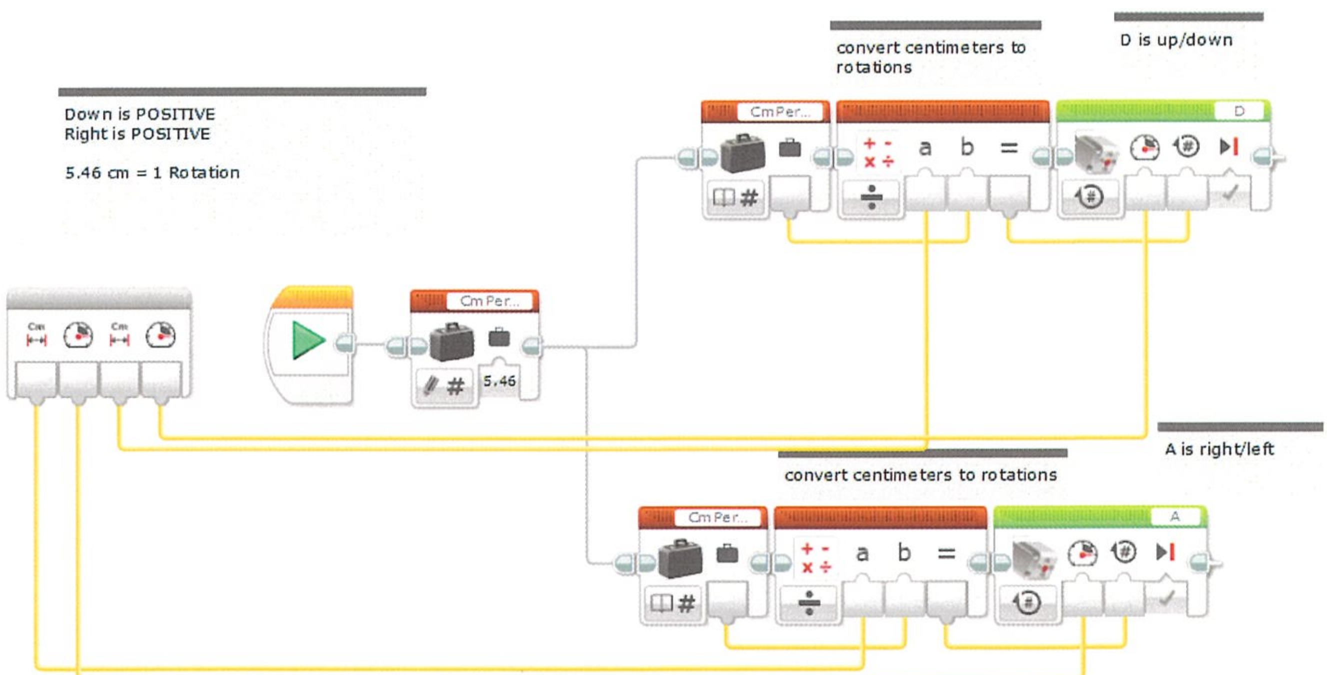


Sophia Misley 8/25/20

SESSION :

Example EV3 Program: MyMoveAttachment

This is the code for our MyMoveAttachment program. This program is a my-block for moving our front attachment, WallE, up, down, left, and right. We measure it in centimeters.

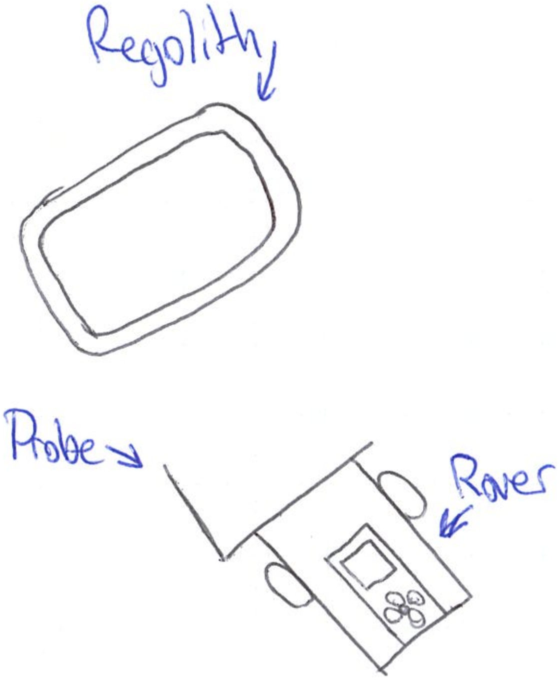


PJ

SESSION: 25 August, 2020

Soil Sample Graph

To line up our probe, imitated moisture detector, we use our dual rack system as well as a graph. With the graph I made we can get the probe into the center of the soil sample.



SESSION: 22 Februrary, 2020 PJ

- Today we ran the code that we had so far

- we put up blockers where the mountains are and realized that our attachment hit them

- we also need to fix our code when getting the farthest blue because ~~we hit~~ the attachment hits the big crater

- on turns the samples escape from our attachment so we need to make the pins on the end longer

- we also have to remember to reset the gyro after every 5 runs because it was really off sometimes or spin in circles randomly

February 23, 2020

- we tried making new prototype attach to the front of our rover and we made one that works better than the first one

h

February 23, 2020 Sophia Misley

SESSION :

Cache Drop + Sensor Box

- The things we need to do to drop off samples:

① slide front attachment to the right / left

② go forward

③ bring front attachment down to drop it off

- To put 'sensor' in ~~t~~ sensor box:

① Go backwards

② lift and center

3 ~~②~~ Do left turn to face box

4 ~~③~~ Go forward to sensor box

5 ~~④~~ move attachment left ~~to~~ or right to ~~center~~ line up sensor to sensor box

⑥ lower sensor into box

SESSION : 28, Febcurary 2020

Cache Distance Calculator

- when our robot drops the samples sometimes it can get off
    - we need a quick, easy, accurate way to get the samples close to the center

- first, we ran experiments

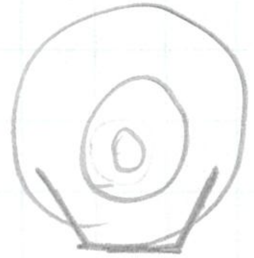
Circle diameters:

Big: 9 inches - 33cm
Middle: 6 inches - 15cm
Small: 3 inches - 7.5cm

Test 1:

if it is here it needs to go 4.5 more inches

Test 2:



if it is here it needs to go 2.5 more inches

SESSION: 28, Februrary 2020

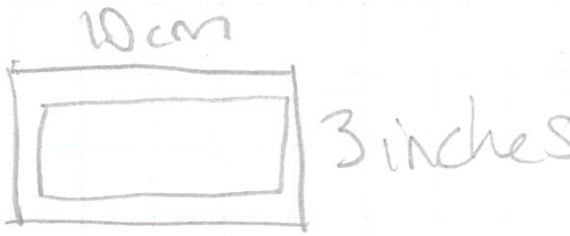
Cache Distance Calulator

Test 3:

if here go 10 cm to the left (max)

• then I drew a graph to easily see what I need to move with certain outcomes

Cache box:



-ily K
2/12/19

SESSION: Soil Scooper Attachment Test

1. Identify the problem - we need an attachment that can collect the soil to drop off at the cash.
2. Explore - we brainstormed about different ideas including scoops, ramps and a pushing device.
3. Design - we all had different ideas we wanted to try so each of us got some legos and started to biuld an example of the ideas we thought of and seeing what they turned out like.
4. Create - started biulding and putting our ideas together using all different types of legos.
5. Try it Out - we set samples on the ground and moved our samples like a robot to see how they worked.
6. Make it Better - we looked at all the models seeing which worked the best and started modifying it.

Peyton Nov 6, 2019

SESSION :

What we did today

- watched how to make the robot go straight.

- Set up map

- Talked about how to make it Start at the same place.

- Peyton & Sophia making a atatment to complet the bat & drone misson.

- Pahlychai & PJ found out that when the bot goes down it shudders but when it goes up it's really smooth. They figuered out it was being pulled so they put a spacer between the track that goes up & down (Robot) now it runs alot smoother.

Go to next side →

Sophia Misley

SESSION: 11/5/19

• First today we started to program but couldn't transport a myblock to a different file.

• We started figuring out attachments to do the traffic jam, swing, and the bat and drone.

• We also figured out kind of what we want to do to get the crane to move the right distance

• Pahlychai and Peyton studied distances we needed to go and other, (see attached sheet!)

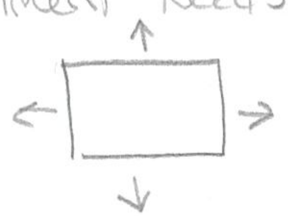
PJ

SESSION : October 1, 2019

- Today as a warmup, we worked with gears
  - how to line up gears and get the two on the end spinning oppisit (or the same) directions

- We also worked on simple machines
  - seeing if we knew them all
  - memorizing them if we didn't

- As an idea for our front attachment we worked with racks and gears
  - our attachment needs to go:



- we watched a super cool video about a building that was 3D printed with cement

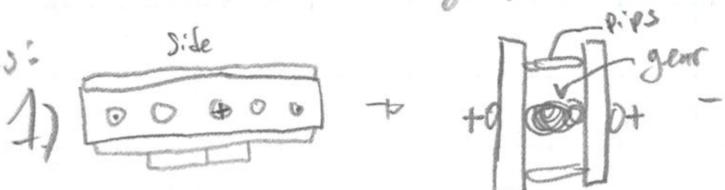
- we also watched a video about modular construction where they make a ton of these little houses at an affordable price for small families

SESSION: Thursday 3rd october 2019

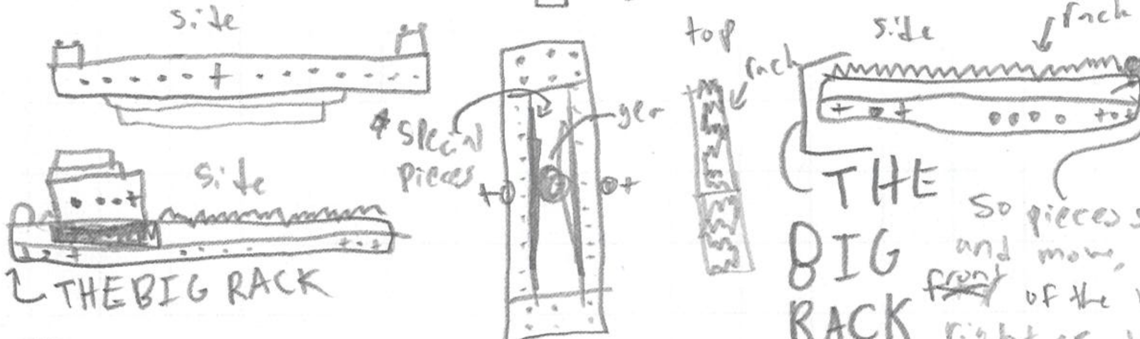
Contour lines are Good

Today we started off making up a short story and telling stories about what superpowers that we could have and what'd we do with them. One of the super powers was really werid like being able to see the molecular structure of plants. :)
Then we rewatched a very cool lego video and started building prototypes of their ideas. We were brainstorming ideas on how to use a rack and gears on the rack.

Protypes:

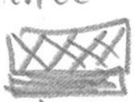
1) 

So these pieces slide onto this piece:

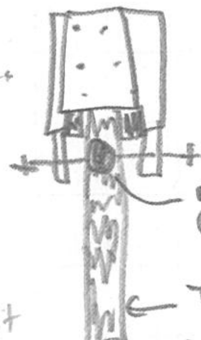


So pieces slid in here and move, lifting the front of the robot left and right or up and down.

So for 3, there is an very important piece, the fence



The fence has holes in it so lego pieces can fit in it. This special side allows it to slide in the groves of THE BIGRACK. It's connected by legos stuck through the holes, keeping it together.



PJ & Peyton designed 1.
Sophia designed 2
And I designed 3 :)

The box robot we're trying to replicate can be found on 590 points in one week FLL video. It's really cool. You should watch it.

Sid 

* special pieces  These pieces slide into THE BIG RACK and slide back and forth moving up and down/left and right

Sophia M

SESSION : 10/17/19 Testing our Robot

-Today we ran our Robot for 10 rotations and it was 105 inches, so we divided by ten and we got 10.5 inches every 1 rotation

-We also tested our front attachment and for side to side: 1 cm = .27 rotations vertical = 1 cm = .27 rotations

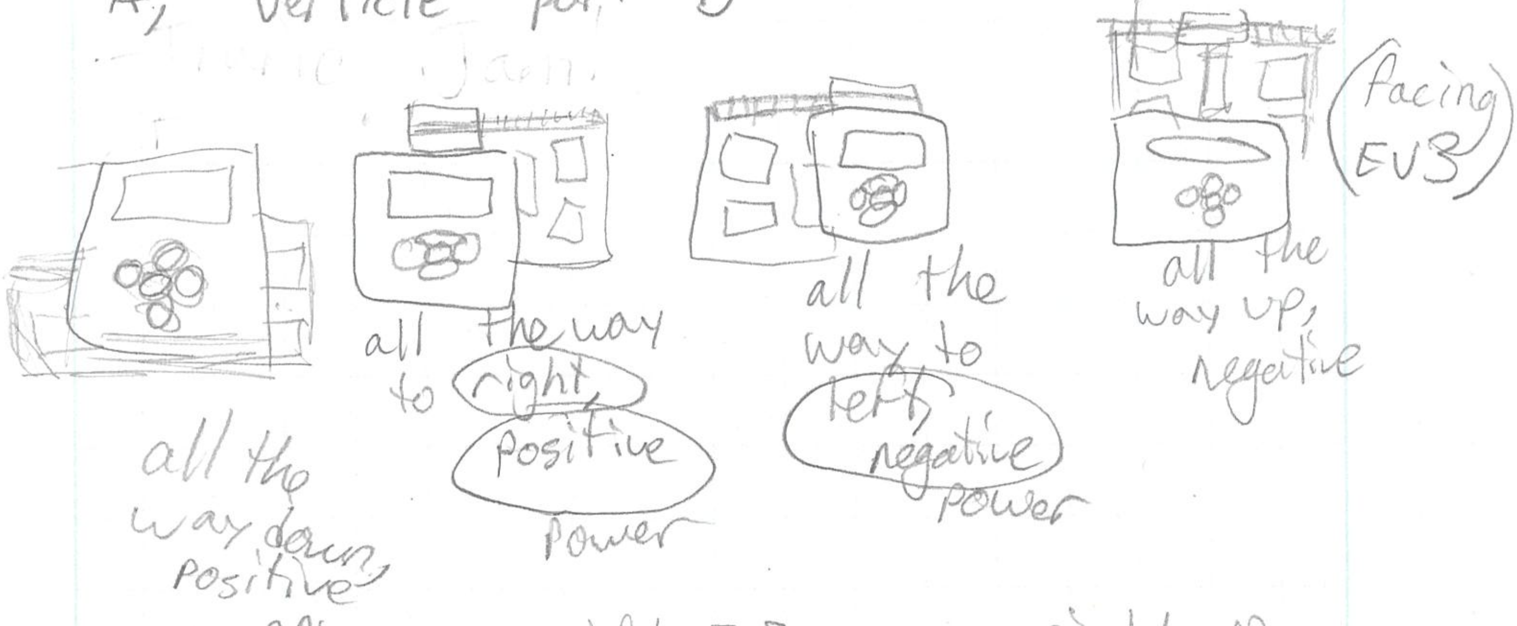
-We attached the front attachment

-we secured the gyro sensor with rubber connectors

Sophia Misley

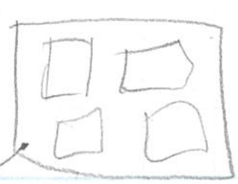
SESSION : 10/18/19

- Today we tried two missions: 1st problem: we forgot ratios we calculated yesterday
- On robot attachment: 0.27 rotations = 1cm, verticle & horizontal
- Robot - 10.5 in = 1 rotation, horizontal: port A, verticle port D



- Traffic Jam: Lift 5.5 cm, go right 10cm

attachment:



start front attachment:

(Facing EV3 up-side dow

to left (right when facing EV3 upside do

October 22nd, 2019 See attached Notes for extra info →

Pahlochai Thao

SESSION: Highlights: • Setting up mat
• Figuring out building scoring
• Research for project

Today we got out our FLL mat and placed all of the buildings on it. We manovered our bot around and tried to figure out how we'd complete all the missons. We're thinking that the Steel construction might be the hardest, pulling it up and manovering our big bot there might be hard.

We had Building points discussion, And we looked at the rules and devised ways to get the most points out of our building stacks. Briding stacks are good for the outsite, but not in circles because you got less points.

Our project is going to be about the moon. We want to have living on the moon. Building homes on the moon is our goal, 3-D printed ones. We watched some videos about 3-D printed houses on Mars/Moon and it's pretty cool. (look at notes for further refrence). We need to research this more and study the core rules (again). !

PJ Mrozek

SESSION : October 29, 2019

Problem:

-robot would shimmy back and Fourth and wasn't going very straight

Problem solving:

1.) unplug and replug in the Gyro and calibrate
- still shimmied, didn't solve problem

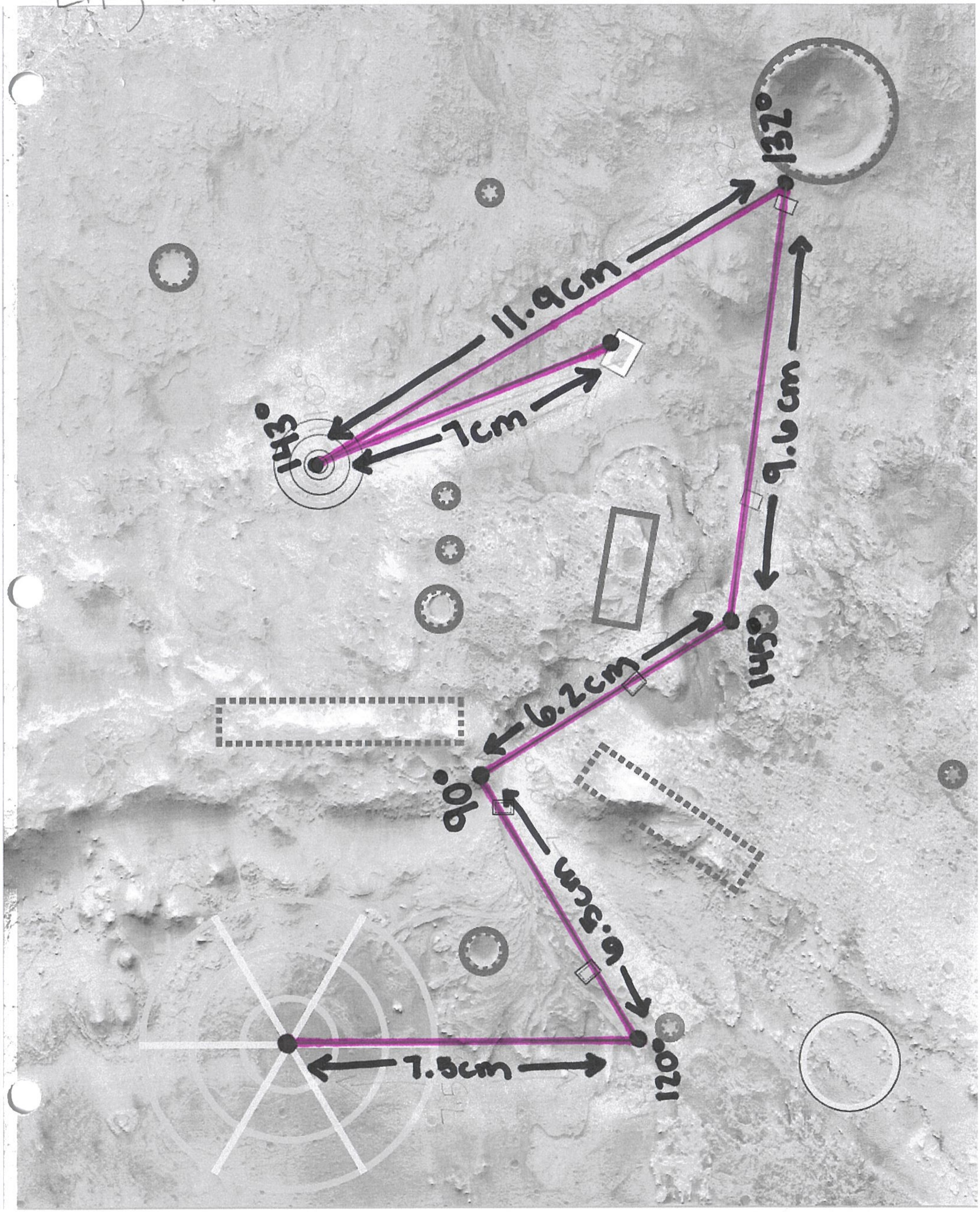
2.) trade the caster wheel because it was really ruff
- still shimmied but not as much, still didn't completely solve the problem

3.) trade wheels with another robot to see if that was the problem
- only slightly shimmied, problem was pretty much solved

At First:

After problem solving:

Lily K 1-22-19



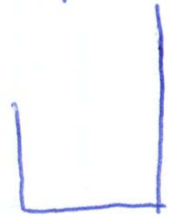
PJ

SESSION : Februrary 19, 2020

Attatchment tests

Ariana's attachment looked like this:

- it didn't have a big enough error margin



- the ledge was helpful for left turns

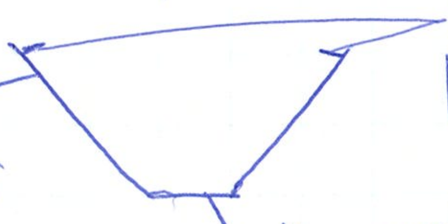
Pahlycha's attachment:

- on turns the samples would fly out

- big error margin

We worked off of Pahlycha's attatchment and then it looked like this:

still has a wide/big error margin



the little ledge keeps the samples in on turns

the samples can now rest on the back of the attachment

Feb 19th
2020

SESSION :

from bot left wheel axle on right of yellow line

- possible design

Problems

Arianna's attachment

Problems

2 narrow

Measure of mat plan:

1. go forward 27 inches
2.) ~~pivot~~ turn left 120°
3.) Go foward 23 ½ inchs
4.) 60° turn pivot right
5.) Go foward 13 inch
6.) 5 Pivot turn right

Pahlgchi's attachment

- 3- design allows soils to be hooked & lets 'em fly out.

February 19, 2020 Sophia Misley

SESSION :

Moisture Sensor Prototypes

- We need a "moisture sensor" model to go on our robot for the missions
- My idea:

PJ

SESSION : January 22, 2020

Rover mission Plan

1. drive straight 7.7 cm
2. turn left 120° degrees
3. drive straight 5.9 cm
4. turn right 72° degrees
5. drive straight 8.9 cm
6. turn left 35 degrees
7. drive straight 6.3 cm
8. turn left 123 degrees
9. drive straight 12 cm
10. drive backwards 6.2 cm
11. turn left 120 degrees
12. drive straight 0.8 cm
13. test soil for moisture
14. turn right 90 degrees
15. drive straight 2.4 cm
16. turn left 20 degrees
17. drive straight 8.5 cm
18. turn right 40 degrees
19. drive straight 6.3 cm

Lily K 1-22-19

SESSION: Rover mission plan

1. forward 7.5 centimeters
2. turn left 120°
3. go forkward 6.5 centimeters
4. turn right 90°
5. go forward 6.2 centimeters
6. turn left 145°
7. go straight 9.6 centimeters
8. turn left 132°
9. go straight 11.9 centimeters
10. turn left 143°
11. go straight 7 centimeters

- all left turns ecept for 1
- only 5 total turns
- miss craters

PJ

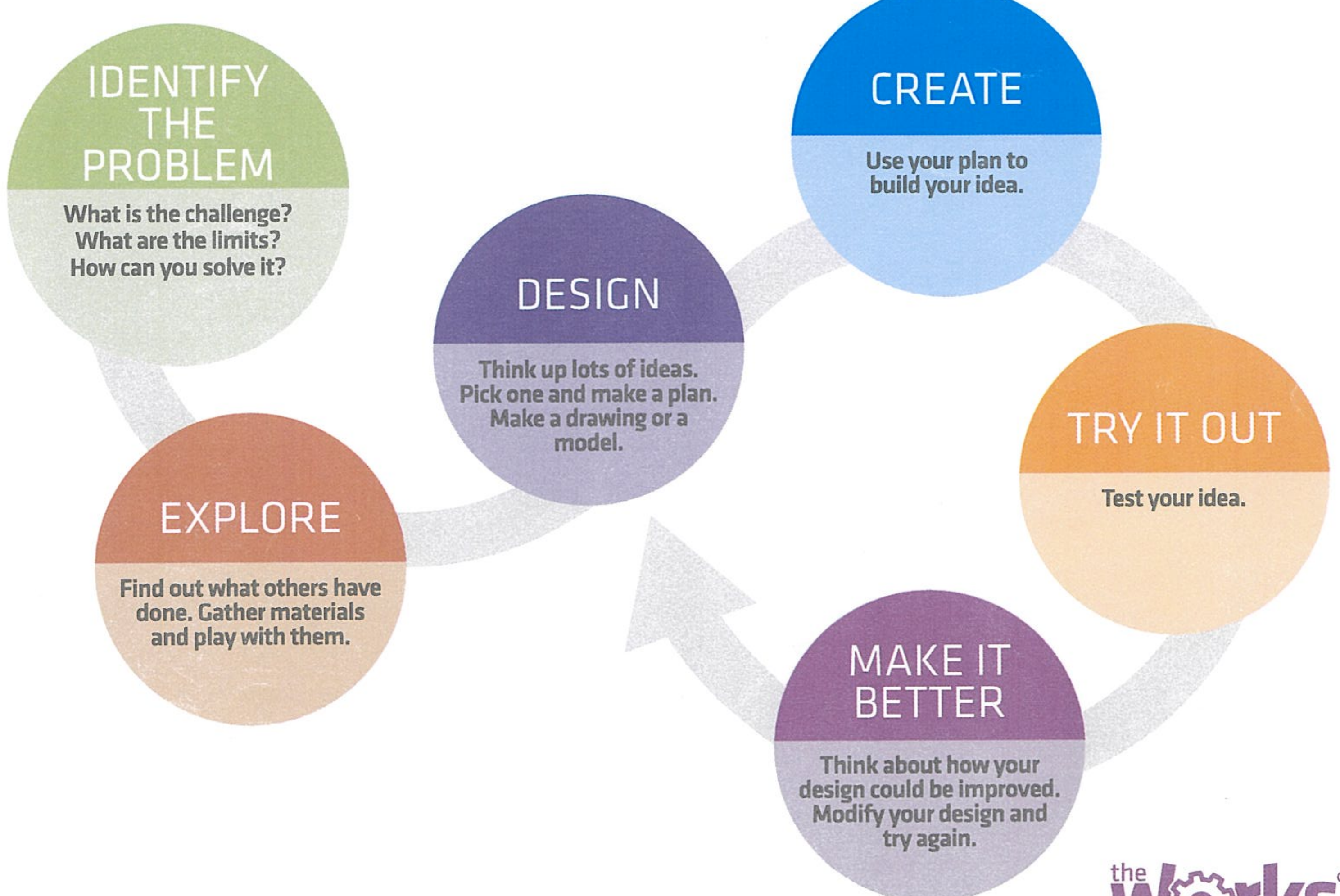
SESSION : 1/31/20

Today we found the measurements on the board. We already mapped out our idea of how to navigate our way across the board.

We figured out that one centimeter on our paper diagram equals 4.65 inches on the real mat.

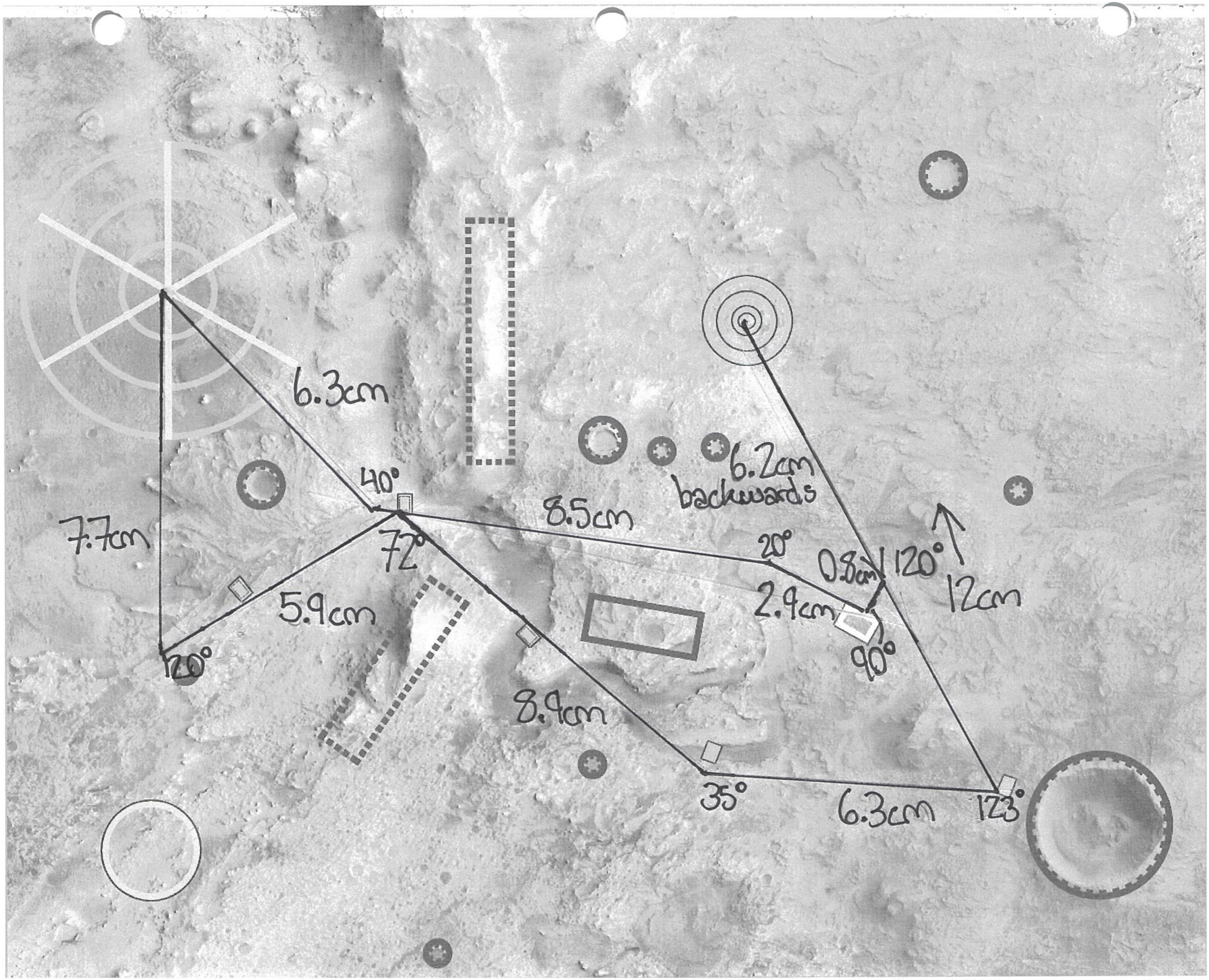
We played a mission based on our calculations and it took around 40 seconds in all three of our runs.

ENGINEERING DESIGN PROCESS



Engineers use the Design Process to create something new or make something better.

the Works® museum
Engineering Fun


6.3cm
40°
7.7cm
72°
5.9cm
120°
8.5cm
20°
6.2cm
backwards
0.8cm
120°
12cm
2.9cm
90°
8.9cm
35°
6.3cm
123°

PJ

SESSION: January 22, 2020

Summary of Activities

- Today we all mapped out a different path ~~around~~ around the board
- We wrote down how to do a mission with our idea with turns but only centimeters instead of inches or feet
- Lily finished one of our iMovies for our social Media post
- We all graphed our data from our experiments
  - crater information
  - water in soil

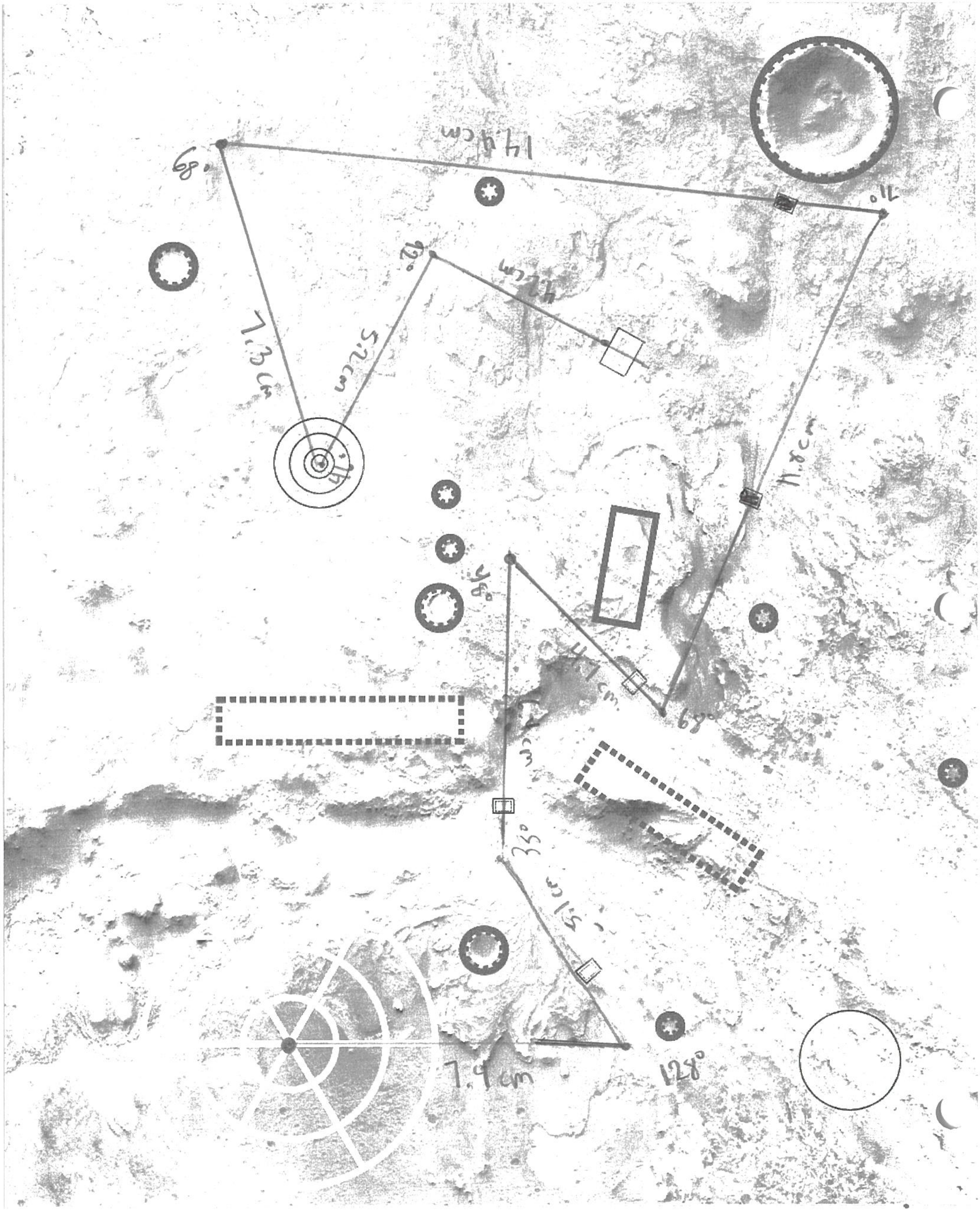
Pahlychai Thao
22nd January 2020

SESSION: Rover Misson Plan

1.) Go straight 7.4 cm
2.) Turn 128° left
3.) Go straight 5.1 cm
4.) Turn 35° right
5.) Go straight 6.4 cm
6.) Turn 48° right
7.) Go straight for 4.7 cm
8.) Turn 68° left
9.) Go straight 11.8 cm
10.) Turn 71° left
11.) Go straight 14.4 cm
12.) Turn left 68°
13.) Go straight 7.3 cm
14.) Turn 46° left
15.) Go straight 5.2 cm
16.) Turn right 92°
17.) Go straight 4.2 cm
18.) End. Stop.

I don't think the angles are right. They are estimated

I did not take into account that we would have to go backwards after dropping off the samples.



14.4cm
7.3cm
5.2cm
4.2cm
11.8cm
7.9cm
128°

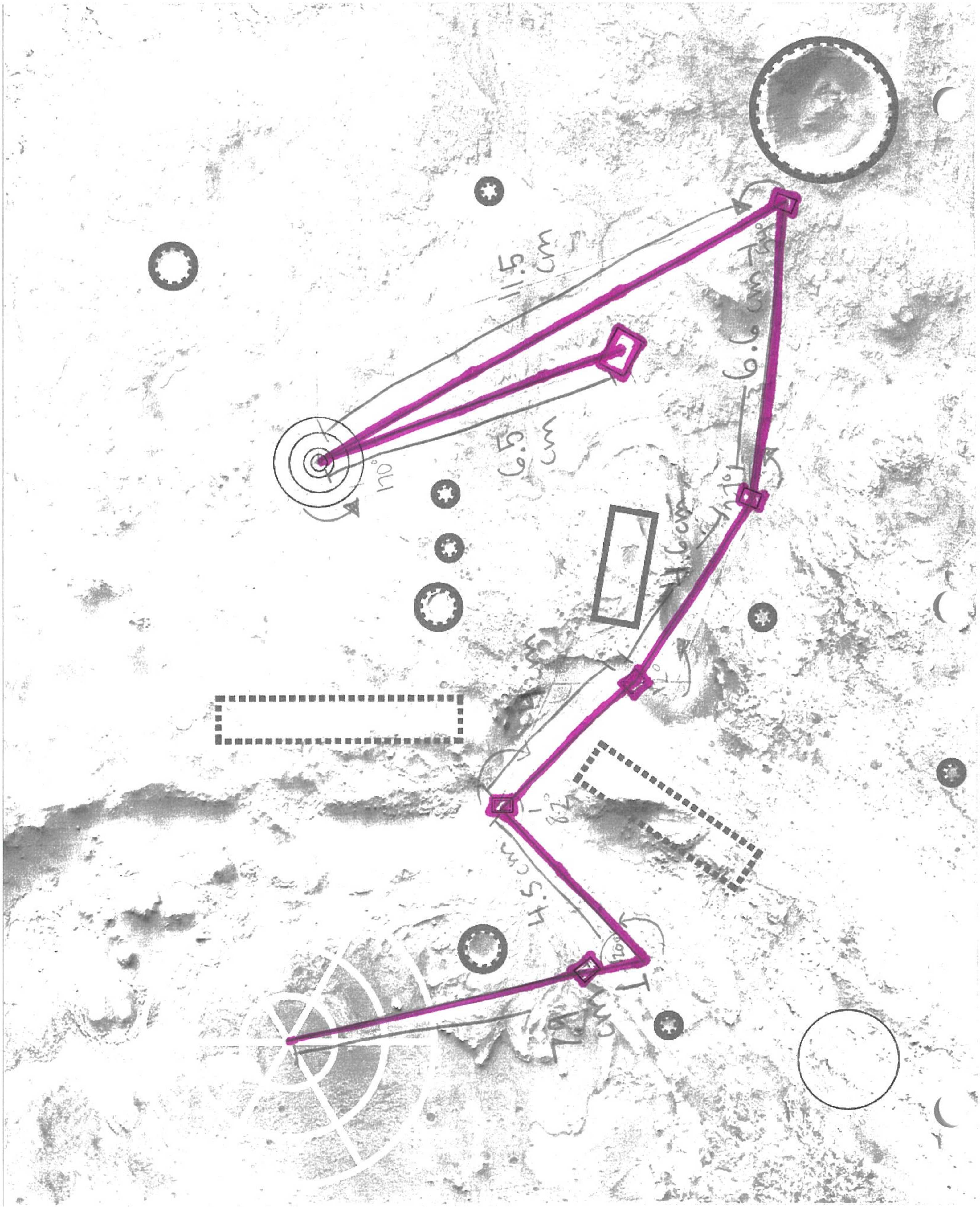
Ariana N. 1-22-20

SESSION: Rover Mission Plan

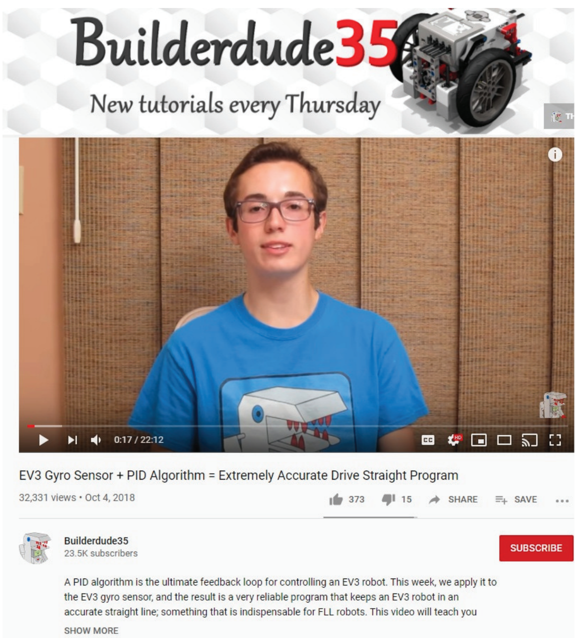
1. forward 7.9 cm
2. turn 120° left
3. forward 4.5 cm
4. turn right 82°
5. forward 4 cm
6. turn left 12°
7. forward 4.6 cm
8. turn left 27°
9. forward 6.6 cm
10. turn left 54°
11. forward 11.5 cm
12. turn left 170°
13. forward 6.5 cm

I don't think I measured the angles correctly. They were estimated.

- 6 turns
- 2 turns greater than 100°
- all turns are left except for 1 right turn


11.5 cm
6.5 cm
6.6 cm
4.6 cm
4.5 cm
170°
82°

References


Builderdude35
New tutorials every Thursday
0:17 / 22:12
EV3 Gyro Sensor + PID Algorithm = Extremely Accurate Drive Straight Program
32,331 views • Oct 4, 2018
373
15
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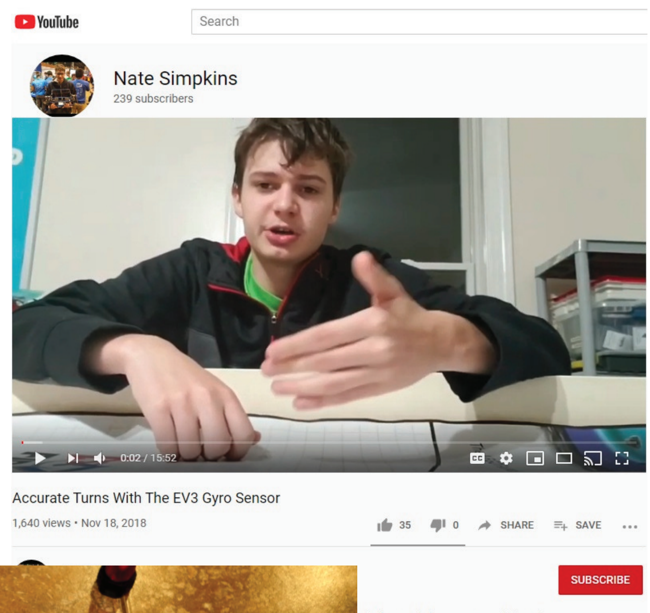
A PID algorithm is the ultimate feedback loop for controlling an EV3 robot. This week, we apply it to the EV3 gyro sensor, and the result is a very reliable program that keeps an EV3 robot in an accurate straight line; something that is indispensable for FLL robots. This video will teach you
SHOW MORE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THE UNOFFICIAL LEGO TECHNIC BUILDER'S GUIDE
Paweł "Sariel" Kmieć
THE LEGO MINDSTORMS EV3 IDEA BOOK
YOSHIHITO ISOGAWA
181 Simple Machines and Clever Contraptions
THE LEGO POWER FUNCTIONS IDEA BOOK
MACHINES AND MECHANISMS

Tools

- Paint Shop Pro
- Google Docs
- iMovie
- LEGO Mindstorms EV3 Software
- iPhone Cameras

Scrapbook: References

Bonus Projects

Rocketry

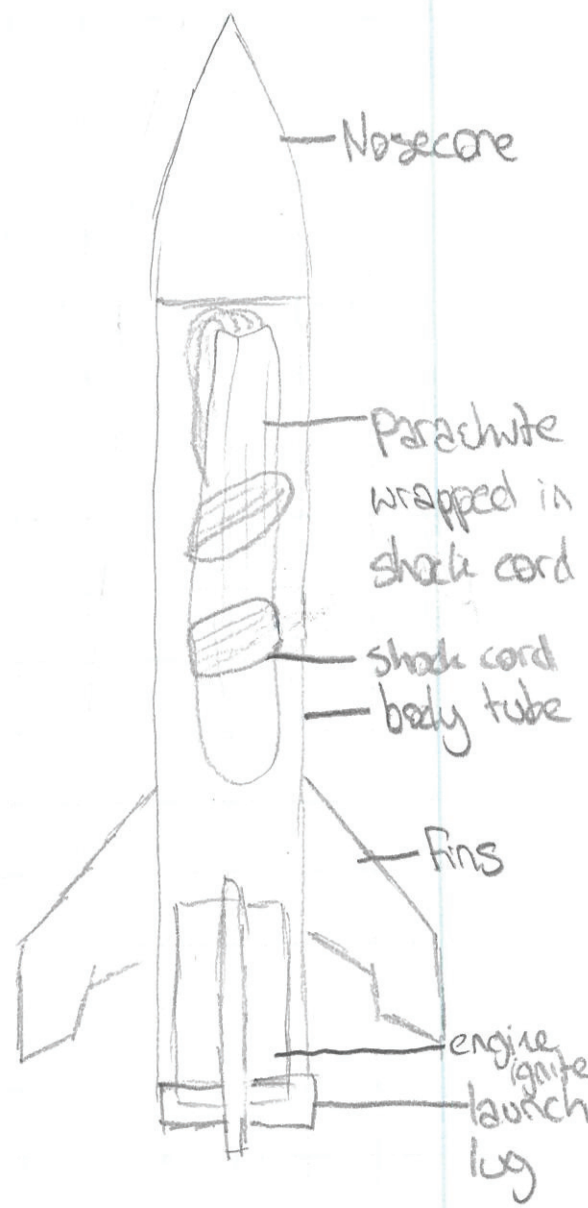
Rocketry

PJ

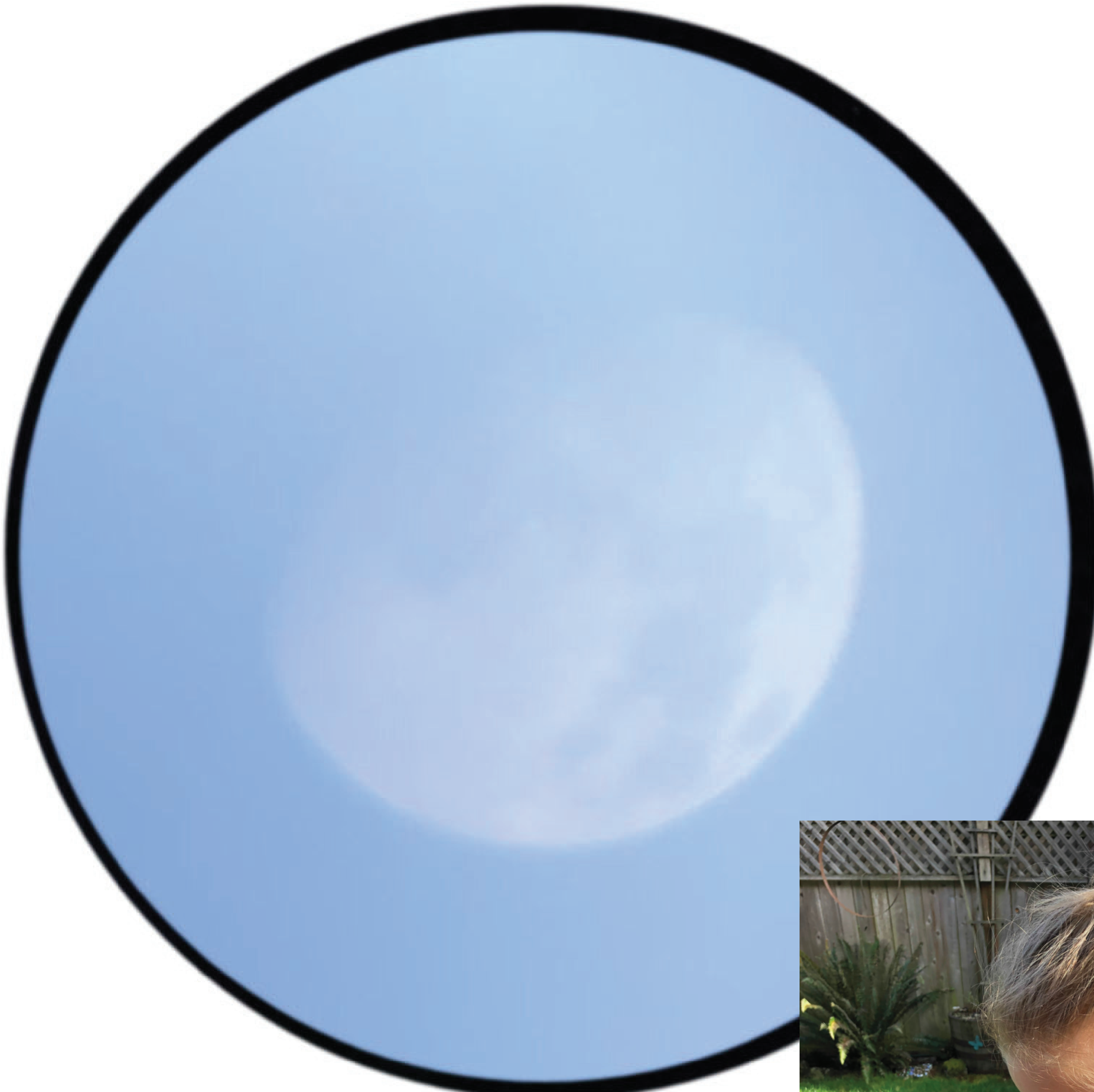
SESSION: 2 September, 2020

Model Rocket

Today we launched a model rocket to better understand how NASA got probes into space. Things we had to be careful of were making sure the batteries had power, making sure the clips didn't touch, we had to wrap the parachute correctly and we had to do it on a day that wasn't windy. Once we set off the rocket it started to accelerate for powered flight, then it would coast until it reached peak altitude and the parachute ejection charge set off. The parachute was deployed and it came down and we retrieved it. We launched it a total of three times.



Telescope



We learned about different size eye pieces, types of telescopes, (dobson telescopes) and lunar craters!

Scrapbooking:

Scrapbook: Teamwork