Sunray Bobcat Ares X-plorers

Sunray Middle School

Mission Development Log

TX037

Sunray, TX 79086

Project: Opportunity

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Sunray Middle School

Sunray, TX

Flight Director- Angaleta Crenshaw

raven_2955@hotmail.com

 **Commander: Kelley Turley** **Age:**12 **Grade:** 7th **Parents:** Troy Turley, Samantha & Brok Diffendaffer **Favorite Subject:** ELAR **Favorite Sport:** Softball **Future Goals:** I want to go to Texas Tech and get a college degree **Hobbies:** Taking pictures **What I like about Robotics:** Having fun and learning. I like working hard. **What I learned about robotics:** Teamwork is the key.	 **UAV Pilot: Sully Kimbrell** **Age:** 13 **Grade:** 7th **Parents:** Heath & Amber Kimbrell **Favorite Subject:** Science **Favorite Sport:** Swimming **Future Goals:** Agricultural and Robotics **Hobbies:** Fishing, Legos **What I like about robotics:** I like designing and building robots. **What I learned about Robotics:** To work as a team.	 **EVA Officer: Justin Bain** **Age:** 12 **Grade:** 7th **Parents:** Kevin & Gina Bain **Favorite Subject:** Math **Favorite Sport:** Cross Country **Future Goals:** I want to go to OSU and become a coach. **Hobbies:** Running and Fishing **What I like about robotics:** Programming **What I learned about robotics:** Listen, pay attention and have fun.
 **Science Officer: Kenneth Hughes** **Age:** 10 **Grade:** 5th **Parents:** Sam & Janae Robinson, BJ Hughes **Favorite Class:** Science **Favorite Sport:** Rodeo **Future Goals:** Go to WTAMU and be a rancher **Hobbies:** Rodeo **What I like about Robotics:** All the science that is put into it. **What I learned about Robotics:** The more we argue the more we mess up, so we actually need to calm down and think about it.	 **CAPCOM: Brody Purswell** **Age:** 11 **Grade:** 6th **Parents:** Tim & Anissa Purswell **Favorite Class:** Science **Favorite Sport:** Baseball **Future Goals:** Go to TAMU/ Electrical Engineering **Hobbies:**Robotics & Playing my cello **What I like about Robotics:** Element of teamwork **What I learned about Robotics:** It is good to learn all the jobs so someone can fill in if someone gets sick**.**	 **Recorder: Aallura Sharp** **Age:** 13 **Grade:** 7th **Parents:** Justin & Jessica Sharp **Favorite Class:** Don't have one **Favorite Sport:** Softball **Future Goals:** Go to OSU/Teacher **Hobbies:** Hang out with my friends/ my job **What I like about Robotics:** It's fun. **What I learned about Robotics:** Programming and taking notes.

SBAX: TEAM GOALS

1/9/2020

As a team we discussed what we felt we needed to accomplish this year with ROADS on Mars/Mars 2020.

1. Teamwork---WORK TOGETHER
2. No Fighting--COMMUNICATE
3. Realize NOT always going to agree:
   AGREE TO DISAGREE
4. Contribute your talent to their talent for the
   GOOD of the team
5. One’s weakness is another’s strength:
   TOGETHER WE ARE STRONGER: NO ‘I’ in TEAM
6. If there is conflict---RESOLVE IT
7. Take “OWNERSHIP” even if you are wrong or make mistakes not just when you are right
8. WIN and DO OUR BEST!!!!

TEAM NAME: SUNRAY BOBCATS ARES X-PLORERS (SBAX)

1/9/2020

Kenneth Hughes

My idea for our name is “Sunray Martians” because our team comes from Sunray and Martians come from space.

My choice: Sunray Ares Mars X-plorers because we are going to Mars.

Brody Purswell

My idea is Martian Space X-plorers because it's awesome and catchy.

My choice: UVSunray because it combines science with our town.

Justin Bain

Martian Cats because on some movies of Mars the aliens are named Martians, and we are the Bobcats.

My choice: Sunray Bobcats Ares X-plorers because it brings all together.

Sully Kimbrell

My idea is Mars Martians because martians live on Mars.

My choice: **S**unray **B**obcats **A**res **X**-plorers or **SBAX** because it was a mix of all of our ideas together. We took something from everybody.

Aallura Sharp

My idea is Martian Cats because it reminds me of Mars and Bobcats.

My choice: Sunray Bobcats Ares X-plorers because it reminds me of our town and Mars and that we are explorers.

Kelley Turley

Martian because we could not come up with something else.

My choice: Sunray Bobcats Ares X-plorers because it’s catchy.

GROUP DISCUSSION:

As a team we discussed the following ideas that we needed to consider for our team name.

Definitely want in our name:
Sunray - Home town
Cats - School Mascot (Bobcats)
Mars - going there
Group Ideas:
Sol-eclipse, Earthlings, Martian Cats, Sunray Martians, Sunray UV Rays, Sunray Mars UV Rays, Tar Grades, Sunray Craters Bobcats, Sunray Ares Cats, Sunray Bobcats Ares X-plorers

FINAL CHOICE:

Sunray Bobcats Ares X-plorers

Social Media Plan

1/9/2020

1. Facebook Page, Twitter Team Account
2. Facebook - Sunray Bobcat Ares X-plorers
    a. Like-people
    b. Comments
3. Twitter account - @SBAX
4. Invite a local newspaper to come to our video challenge.

Delta Dynamics

1/9/2020

Speakers

Our Flight Director, Angaleta Crenshaw and mentor, Heath Kimbrell (Farmer, Inventor, Business Owner).

They both talked to us today about alluvial fans and craters.

What we learned:

Crator was built billions of yers ago. Water wes once on mars then it evapocated the water made a delta and an astroide hit Mars and created a creator

I learned that NASA Scientists can tell that potintial life could inhabit the area.

I also learned that "the waters currents spread and erode." Also, the currents deposite eroded sediment to form Deltas polar ice cap-snow on either end of the planet

He talked about that how the Alluvial fan on mars compars to a delta one Earth.

very { When water cant go any were then it goes around it.

We leared that deltas are made from water and dert. When it makes a delta from a big rock that when there.

a Delta on mars means that there was water or some form of Liquid.

Swamps are at the Mississipi delta

Heath said water use to flow at mars and they can proove that becuase there is canyons on mars which the water eroded the rock

about metiors, it's not how big the rock is that makes the very big hole it's the amount of force that hits the ground by the metior.

Alluvial Fan

1/9/2020

Materials: Plastic Storage Container
Sand
Water
Gravel
Rocks
Twigs

Procedure:

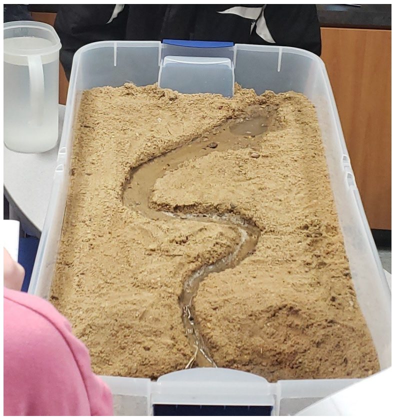
1.) Fill the plastic container with sand, gravel, rocks, and twigs.
2.) Create a meandering river in the sand.
3.) Place twigs and rocks to make obstruction in the sand.
4.) Pour water at one end of the river at variable speeds and quantities. slow and fast.

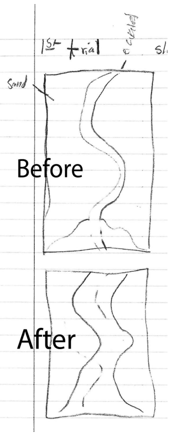
Hypothesis:

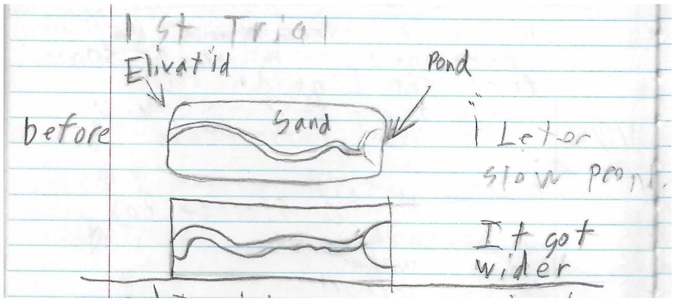
If I do this happens; then this happens.

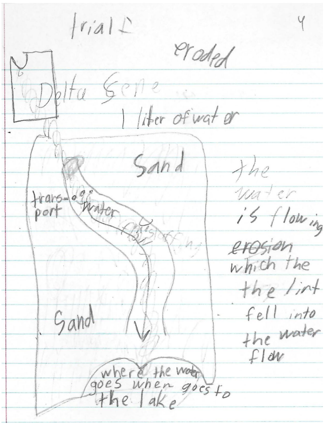
1st Trial- 1 liter of water, Slow

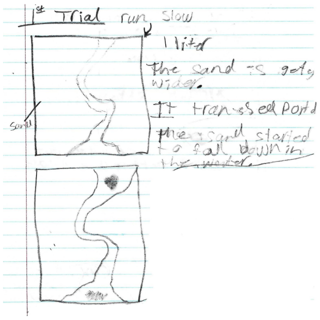
We started out by pouring one liter of water very slowly on the elevated end of the container down our meandering river in the sand and debris.

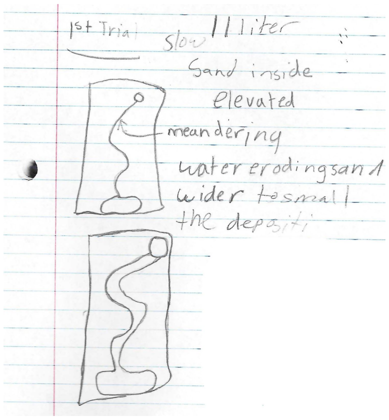


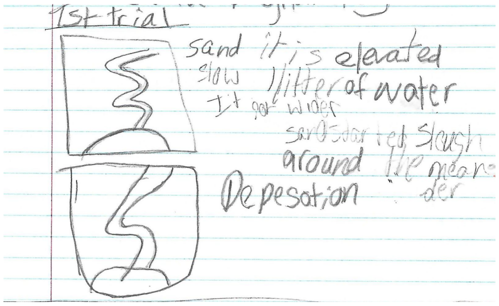








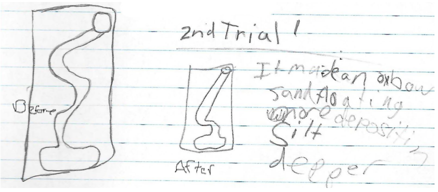


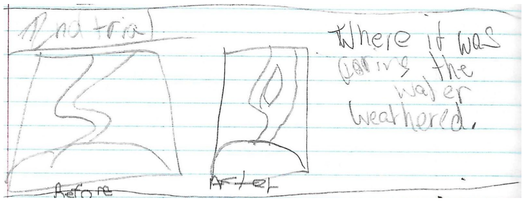


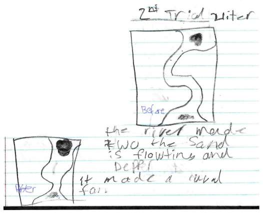
The meandering river got wider after the first trial.

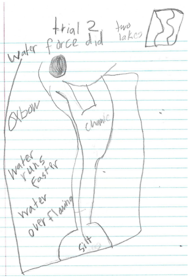
2nd Trial-2 liters of water, Slow

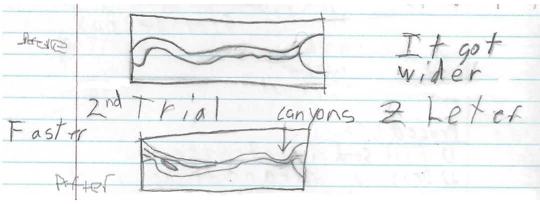
For the second trial we used two liters of water at a slow rate.







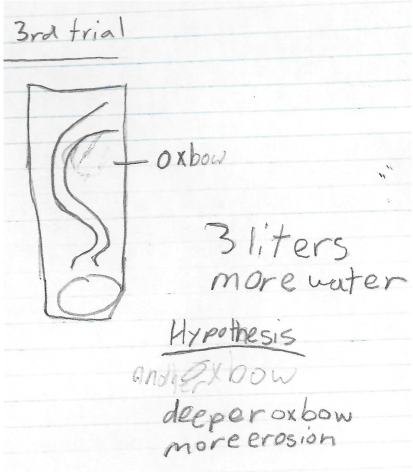




The meandering river got even wider than after the first trial and it also created an oxbow. More sand was floating, more silt was deposited in the alluvial fan.

3rd Trial- 3 liters of water, slow

The third trial we used more water (three liters) and went the same speed as we did on the first two trials.



3rd trial

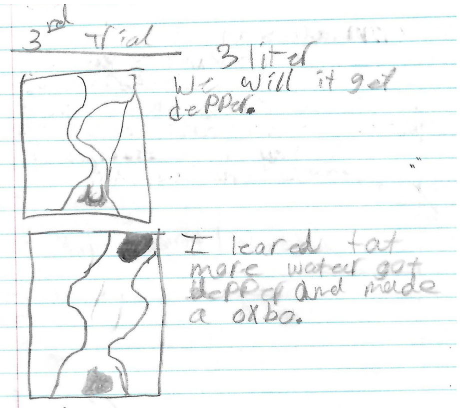
oxbow

3 liters
more water

Hypothesis

andier oxbow

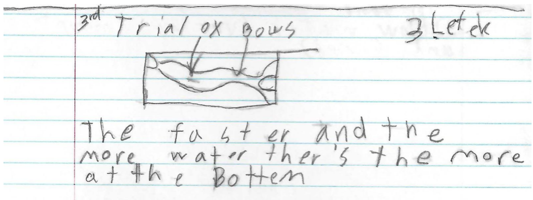
deeper oxbow
more erosion



3rd Trial

3 liter
We will it get
dePPer.

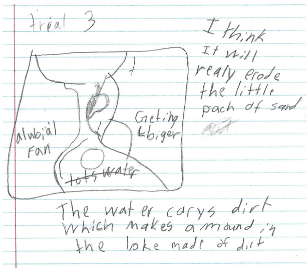
I leared tat
more water got
~~dePPer~~ and made
a oxbo.



3rd Trial ox Bows

3 Letek

The faster and the
more water ther's the more
at the Bottem



trial 3

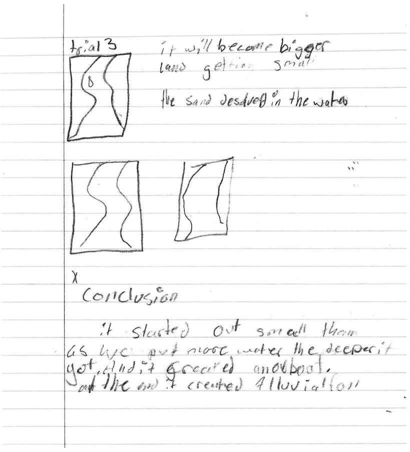
I think
It will
realy erode
the little
pach of sand

alubial Fan

Geting bigger

~~tots water~~

The water carys dirt
which makes a mound in
the lake made of dirt



trial 3

it will become bigger
land getting small

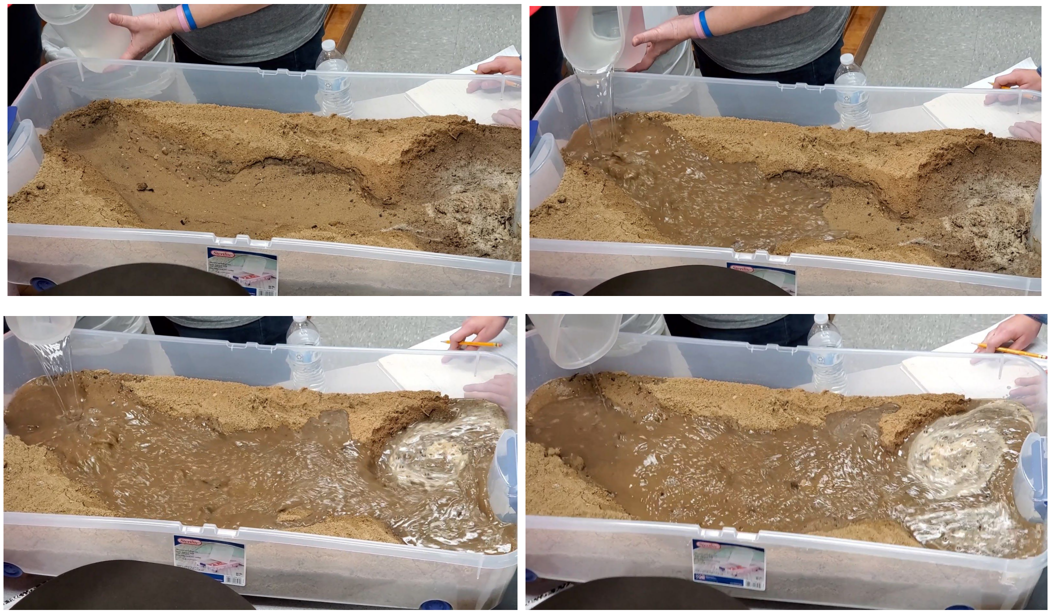
the sand desdved in the water

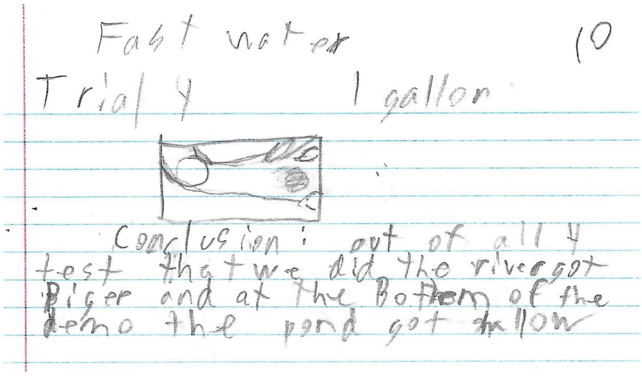
Conclusion

it started out small them
as we put more water the deeper it
got, And it created anoxboat.
at the end it created Alluvialfon

4th Trial-1 gallon of water, Faster

Four our 4th and final trial we used one gallon of water and much faster.

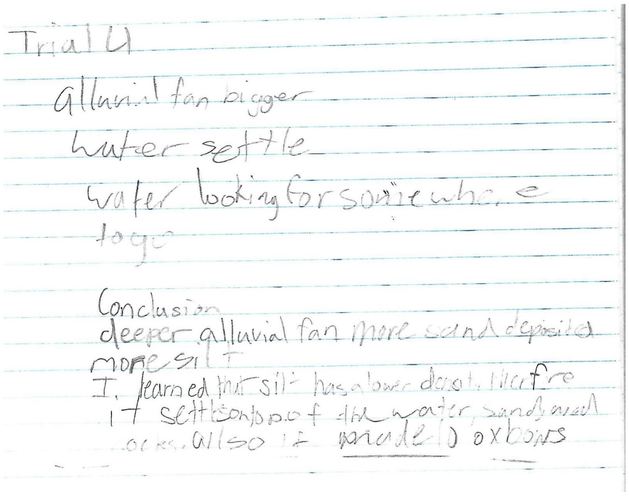




Fast water 10

Trial 4 1 gallon

Conclusion: out of all 4 test that we did the river got Biger and at the Bottom of the demo the pond got shallow



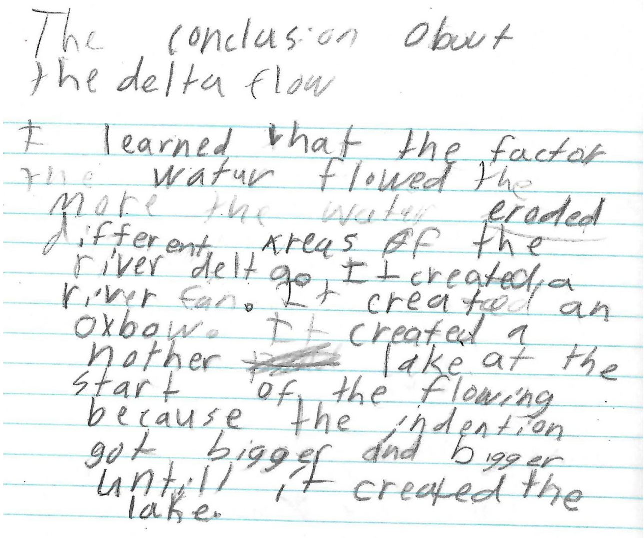
Trial 4

alluvial fan bigger

water settle

water looking for somewhere to go

Conclusion
deeper alluvial fan more sand deposited
more silt
I learned that silt has a lower density therfre it settls on top of the water, sand and rocks. allso it made 10 oxbows



The conclusion obout
the delta flow

I learned that the factor
the watur flowed the
more the water eroded
different areas of the
river delt go, It created a
river fan. It created an
oxbow. It created a
nother lake at the
start of the flowing
because the indention
got bigger and bigger
untill it created the
lake.

The river got even bigger, the alluvial fan got bigger and deeper. You can see the erosion the water caused and there is more silt visible.

Here is the link to our video that we posted on social media.

https://www.youtube.com/watch?v=oH7joM9yDUU

CRATER FORMATION

1/11/2020

How Craters are formed:

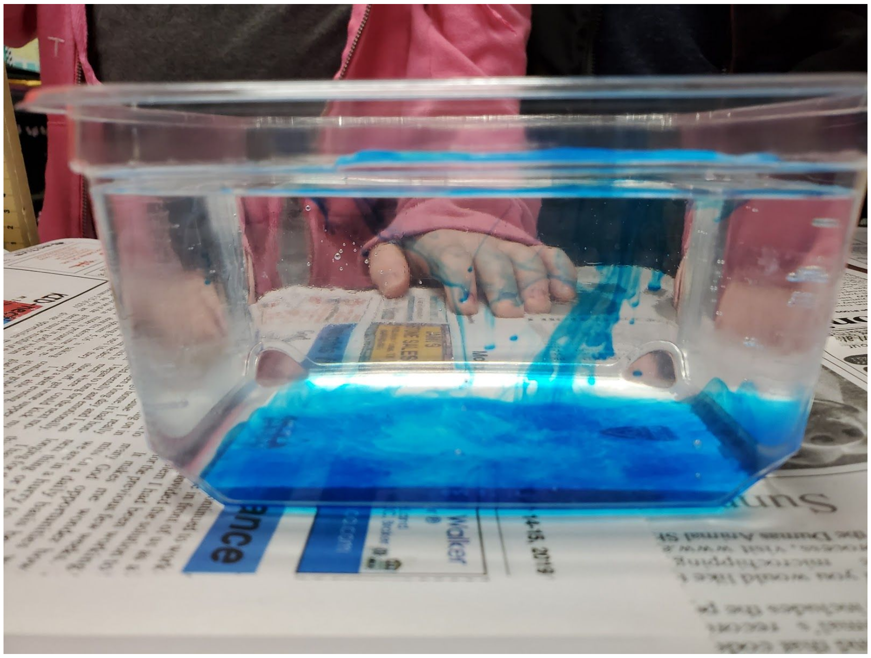
1.) Force-Energy
2.) Gravity
3.) Velocity (speed with direction)
4.) Size of meteorite or object

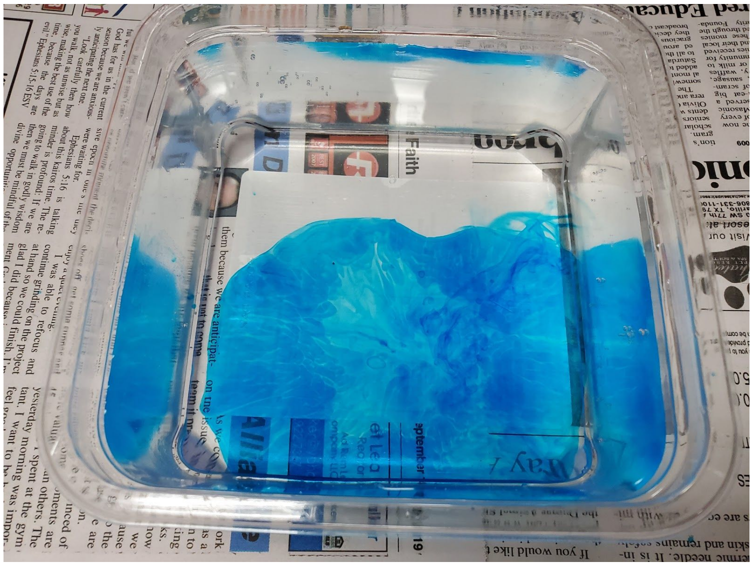
Materials for Crater Formation:

1.) Water- Food coloring
2.) Water- Ball Bearing
3.) Pancake mixture (wet)- Ball Bearing
4.) Flour and cake mix (dry) (packed and unpacked)- Ball Bearing

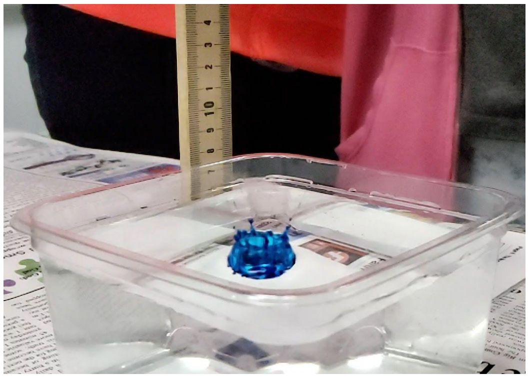
1st Trial - Water:

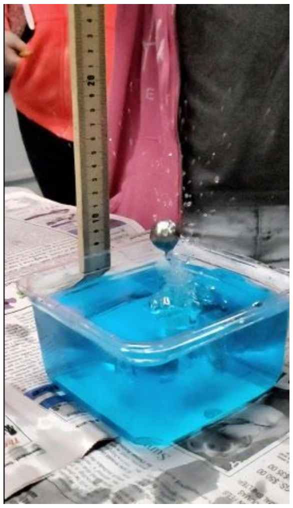
First, we dropped some food coloring into a container full of water. It made really neat designs in the water.

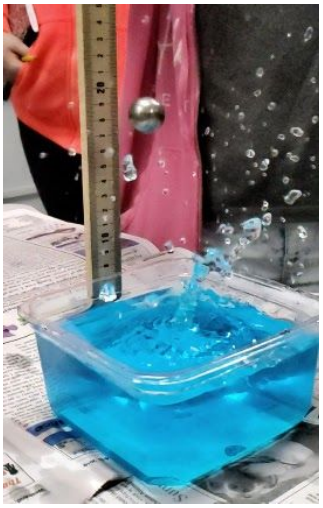




Next, we dropped a ball bearing into the water/food color container. It was awesome. Water splashed out everywhere and the ball bearing bounced back out of the container.

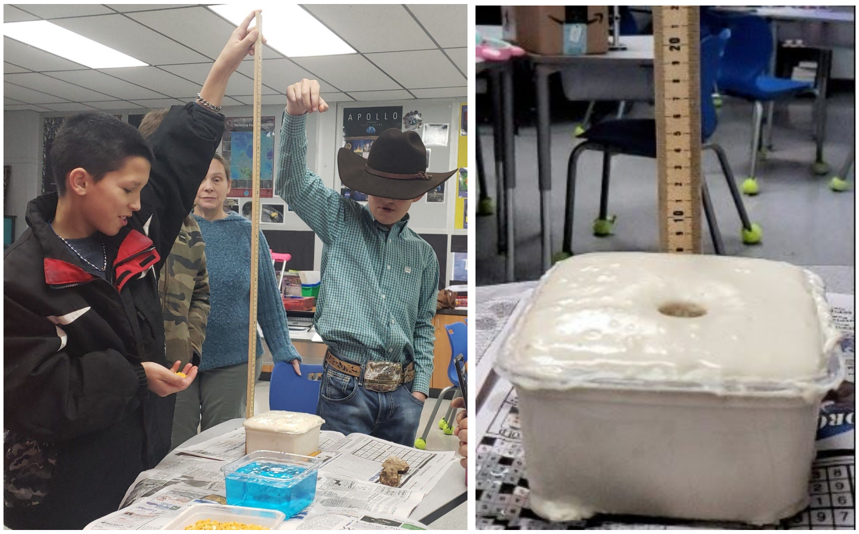






2nd Trial - Pancake Mix:

For the second trial, we dropped a ball bearing into some pancake mix. We were really expecting it to splatter out of the container and go everywhere.

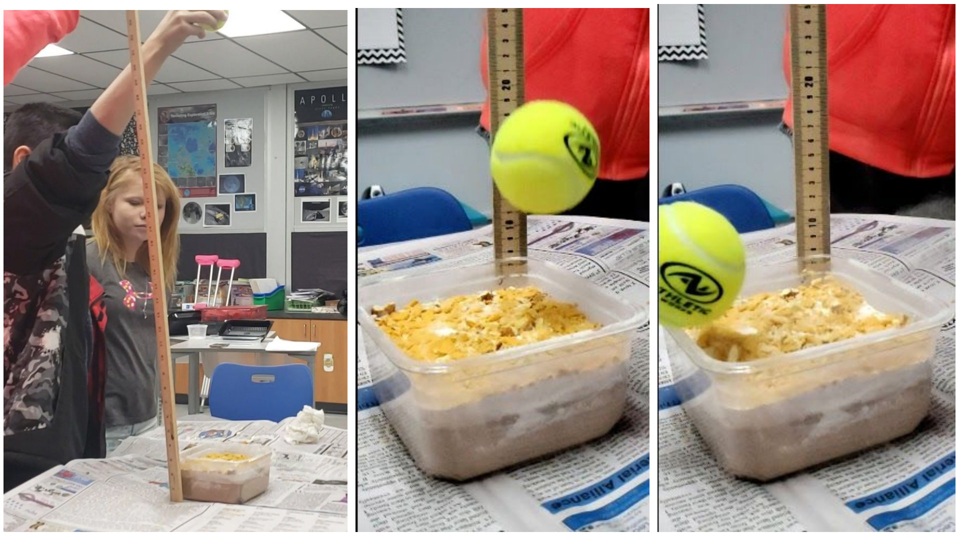


To our surprise, it did not splatter all over us. It did make a small shock wave, which was really neat. It made a small crater in the pancake mix. So we decided to try a bigger ball bearing and see what would happen.

Still no pancake mix everywhere, but the crater was much larger and the shock wave was even bigger.

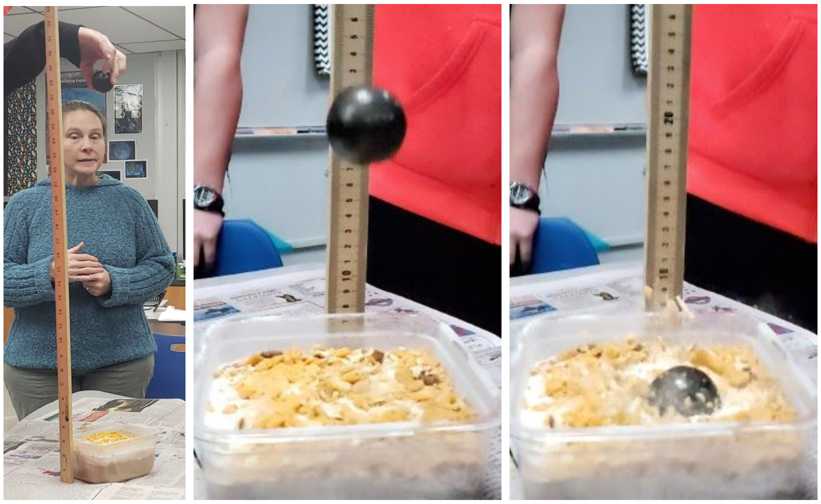
3rd Trial - Dry Flour and Cake Mix:

For Trial 3, we used layers of dry flour and cake mix with some crushed crackers on top to simulate what it might be like on the rough surface of Mars. We tried a tennis ball first to see what would happen with a lighter object.



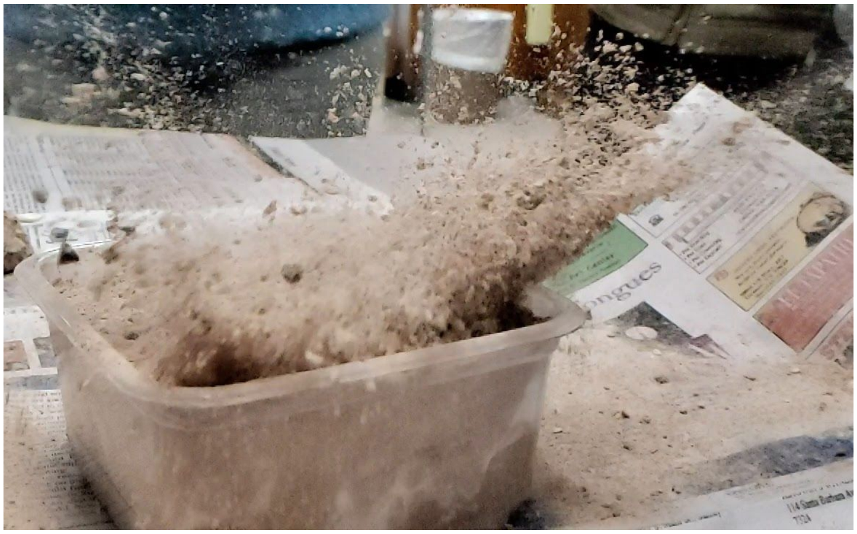
The tennis ball didn't do anything but bounce right off the packed dry flour and dry cake mix. Next up was the small ball bearing. Our hypothesis was that it would have a big explosion of flour and cake mix.

Disappointment again, no explosion. So we tried a bigger ball bearing.



We did have a small explosion, but not as big as we were wanting. In the packed flour and cake mix, you could definitely see the crater after removing the ball bearing.

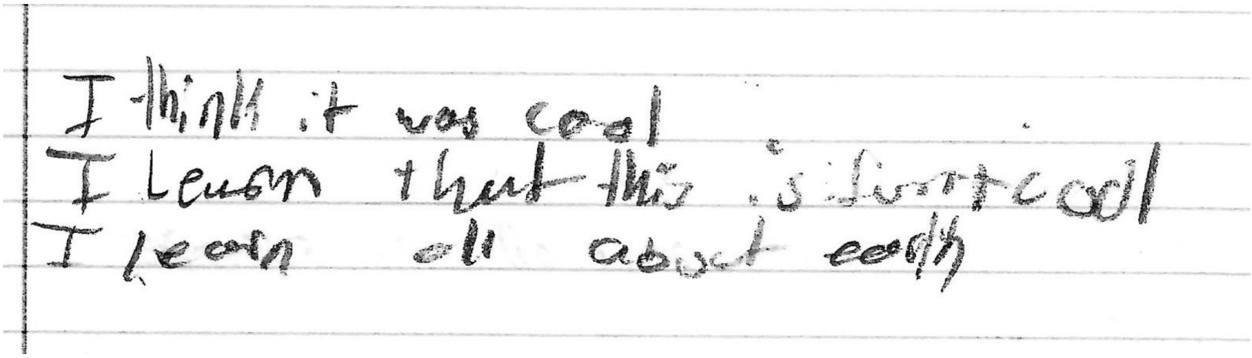
We wanted more explosion, so we stirred up the layers of flour and cake mix and loosened it up so we could try a meteorite (rock) and the big ball bearing to see if we could get the reaction we were wanting. Next, we tried the big ball bearing.



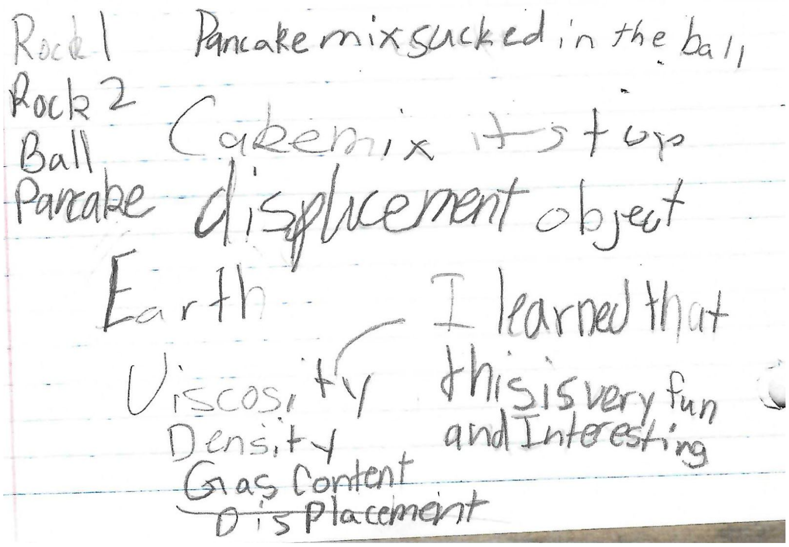
WOW! We finally got the explosion we were looking for. What a mess. That was so much fun. We couldn't wait to see what the meteorite (rock) did.

Another big explosion!

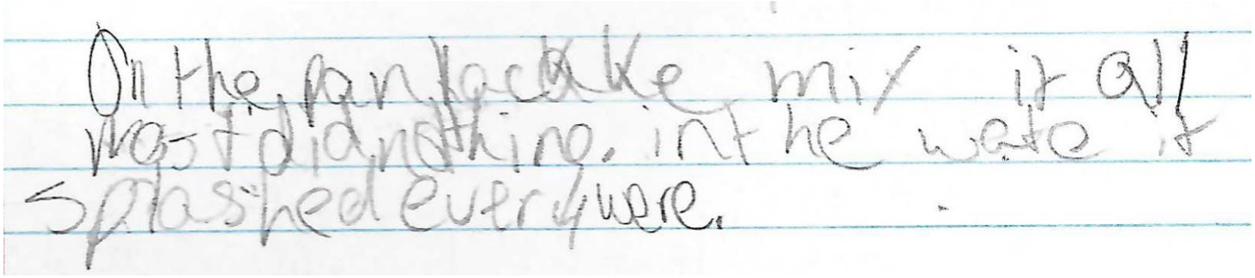
Thoughts on Crater Formation:



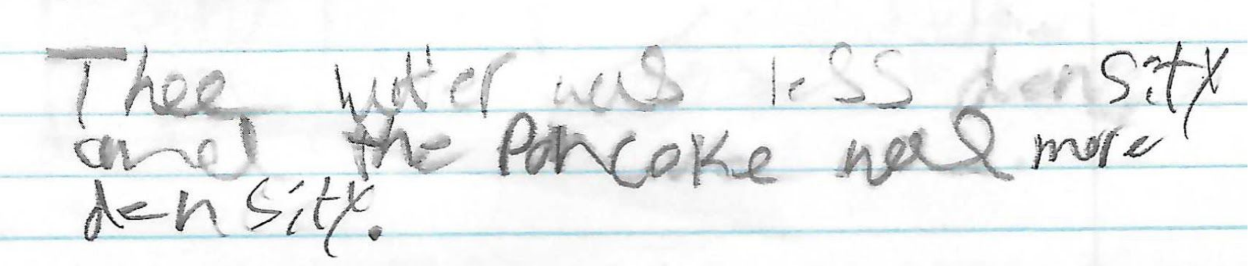
I think it was cool
I Leuan thet this is just cool
I learn all about earth



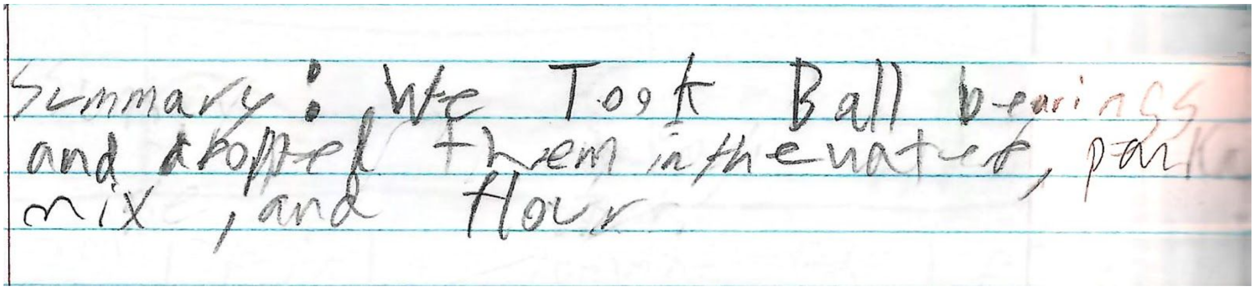
Rock 1 Pancake mix sucked in the ball
Rock 2 Cake mix it stop
Ball
Pancake displacement object
Earth
I learned that this is very fun and Interesting
Viscosity
Density
Gas Content
Displacement



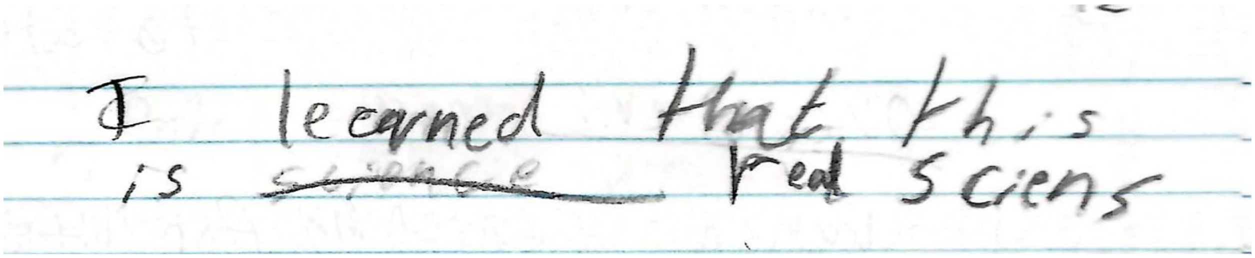
On the panjacake mix it all was t did nathing. in the wate it splashed everywere.



Thee water was leSS density and the Pancake was more density.



Summary: We Took Ball bearings and dropped them in the water, pan mix, and flour



I leearned that this is ~~science~~ real sciens

Here is the link to our video we made on Crater Formations and posted on social media.

https://www.youtube.com/watch?v=mE_sV8IY7o8

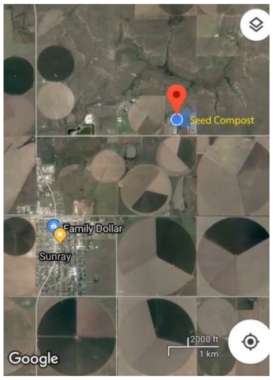
SEARCH FOR LIFE

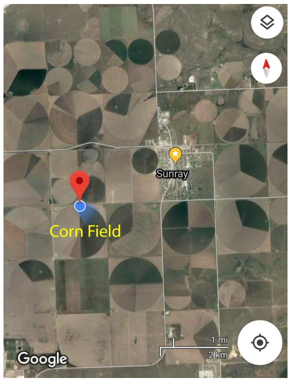
1/15/2020

Overview:

When searching for life, methane is an indicator. Methane is the main component of natural gas.

We went and got some samples of some different kinds of material. Sample 1 came from an area where water flows into a dry lake, and Sample 2 came from a pile of seed compost, and Sample 3 came from harvested corn field.



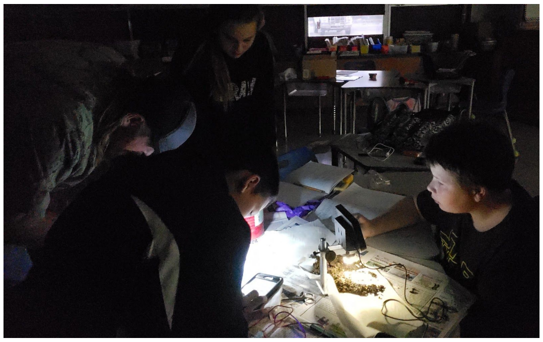


Back in the lab, we learned to calibrate the methane gas detector and took turns testing our own breaths.

Who has the stinkiest breath?

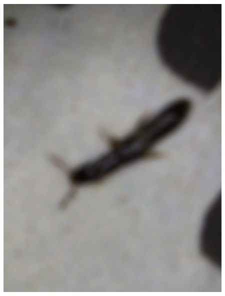
Then we took turns testing the samples from the different locations.

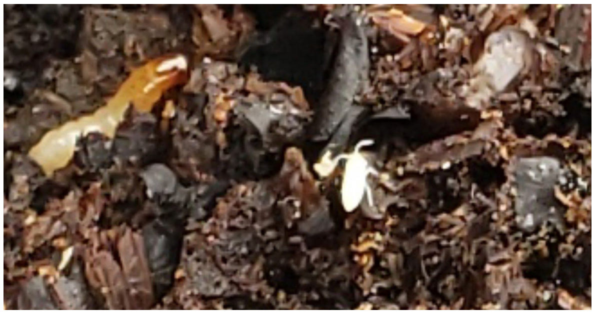
Then we took a sample from each one and looked at them under the microscope.



We found earthworms in all three samples. In Sample 1, earthworms were the only life we found. In Sample 2, we found multiple life forms, lots of tiny insects and maggots. In Sample 3, we found two different types of worms.



We made a video of our Search for Life, and posted it on social media. Here is the link:
https://www.youtube.com/watch?v=gtaGabUrpEY&t=40s

HIGH SCHOOL GIRLS ROBOTICS VISIT

1/23/2020

One of the Sunray High School Robotics teams shared with SBAX their accomplishments, work ethics, and how they do their MDL.

Makenzie Morton, Vanessa Corbin, Dominic Loya, Andrea De La Vega
Went to State in 2019 and were set to go to State in 2020!

Makenzie explained the importance of being precise in your notes:

"Today I fixed a hub, and put in the configuration".

Example of their MDL Book:

- Table of Contents
- Team Summary: August 2018: Went to state; won rave reward

- Team Budgeting: Bought Microscope, gas sensor--$200

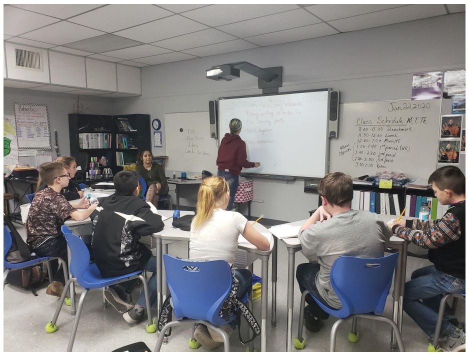
- Team Profile: Picture and description of yourself, what you can do for the team
    - Brody: TX037

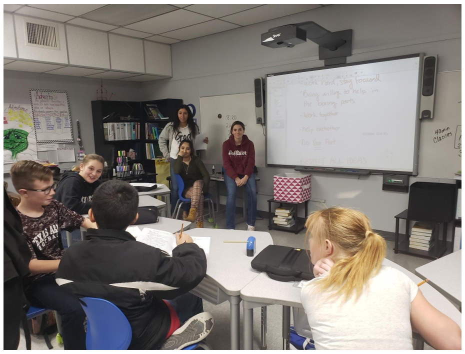
- Programming:
    - Drive (3,3,3,3, 800) .8 hundredths
    - Drive (0,0,0,0, 500)
    - Basic Auto:
        - Drive: 3, -3, 3, -3 800
        - Drive: 0,0,0,0 500
        - Drive: 3,3,3,3 1000

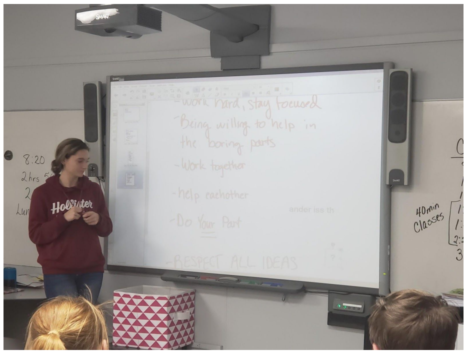
- Drawings: Draw everything; label each part; place measurements
- BEING A TEAM:
    - --Gracious Professionalism--a MUST; STAR importance
        - --willing to work as a team and with any team
    - --WHAT DOES IT MEAN TO BE A TEAM???
        - --work hard, stay focused
        - --be willing to help in the boring parts

--work together
--DO YOUR PART
--RESPECT ALL IDEAS

THANK YOU FOR SHARING YOUR ACCOMPLISHMENTS AND HOW TO MAKE US A BETTER TEAM!!!







SBAX-TX037
MISSION PATCH DESIGN

1/25/2020

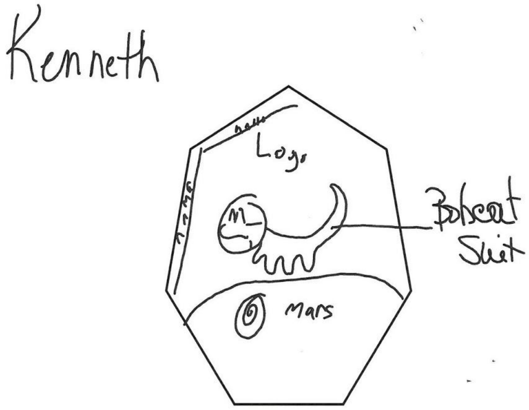
Each member of Team SBAX presented their design for our team patch to the rest of the team. We each had brainstormed our own patch design in our individual log book, and then presented each design idea on the SmartBoard.

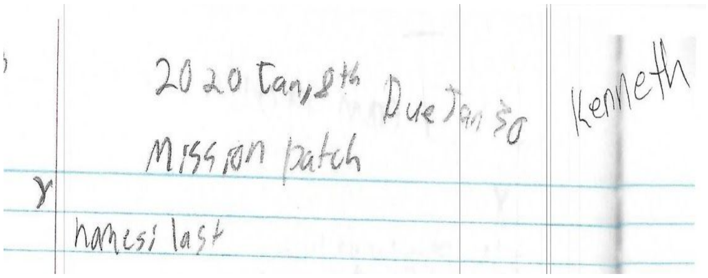
Criteria for patch:

1. Team Name
2. Team Members Names
3. Shape
4. Represent our community of Sunray and school
5. Represent our mission in the ROADS Challenge.

Member’s Design Ideas:

Kenneth Hughes




2020 Jan, 8th Due Jan 30

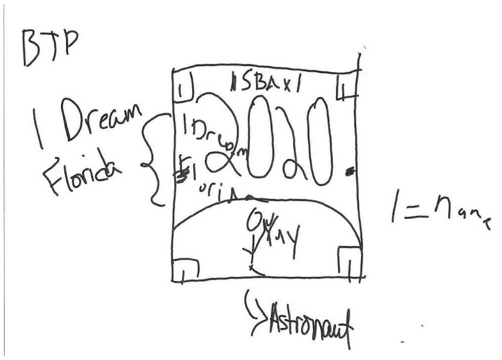
Kenneth

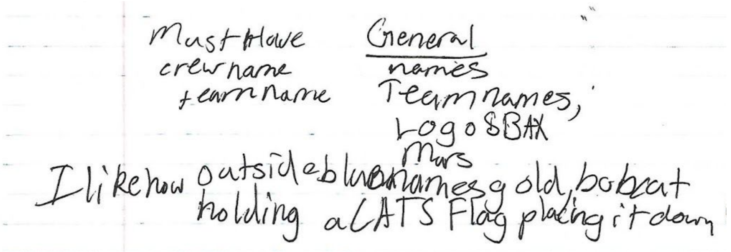
Mission patch

Y

names: last

Brody Purswell

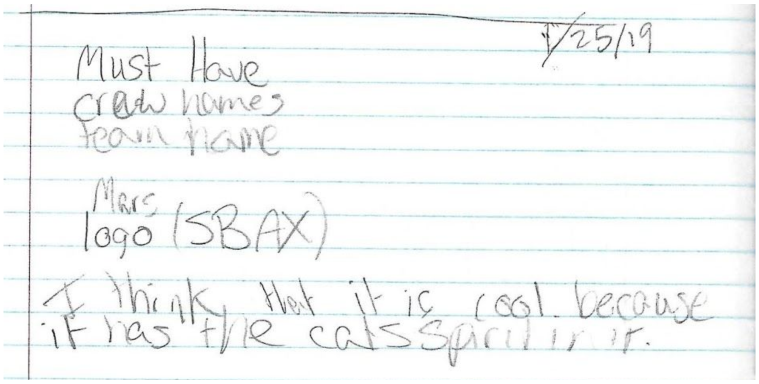



Must Have
crew name
team name

General names
Team names,
Logo SBAX
Mars

I like how outside blue names gold, bobcat holding a CATS Flag placing it down

Justin Bain



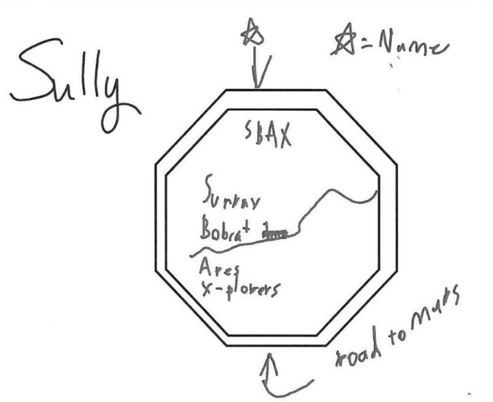
1/25/19

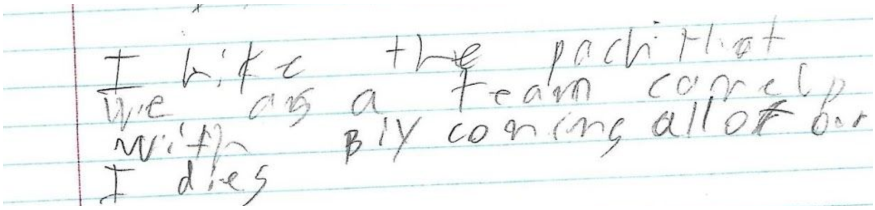
Must Have
craw names
team name

Mars
logo (SBAX)

I think that it is cool because it has the cats spiril in it.

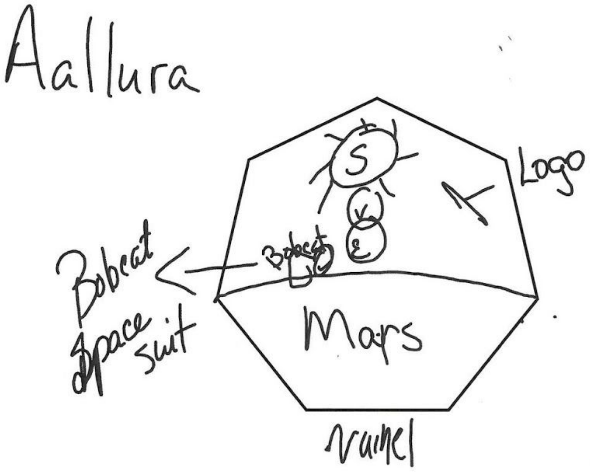
Sully Kimbrell

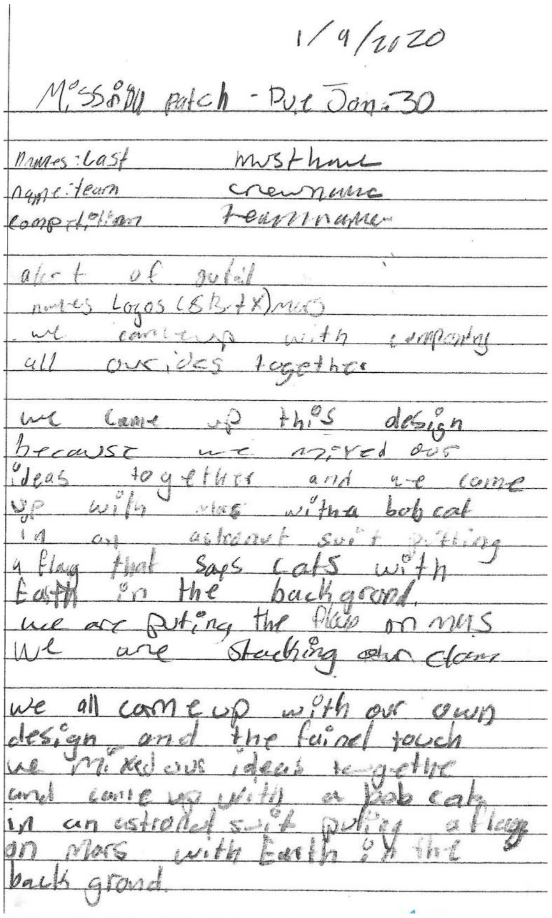




I like the pach that we as a team camelp with by coming all of our Idies

Aallura Sharp




1/9/2020

Mission patch - Due Jan. 30

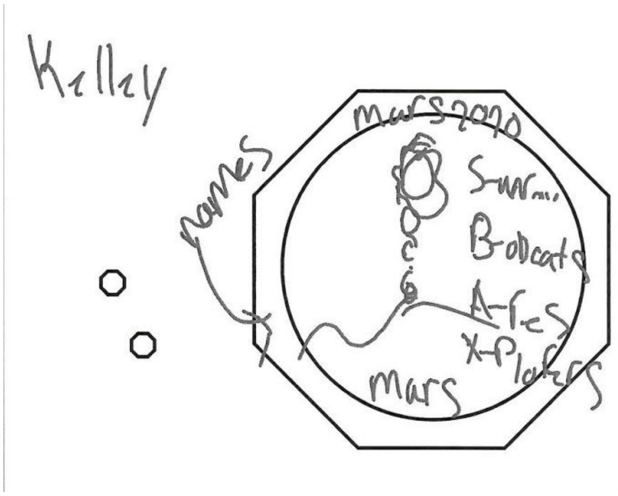
Names: Last must have
name: team crewname
competition teamname

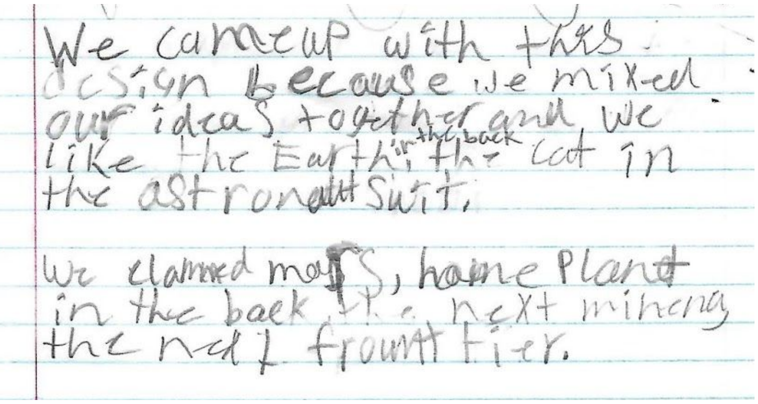
alot of detail
names Logos (SB+X) mars
we cameup with comparing
all our ides together

we came up this design
because we mixed our
ideas together and we come
up with mars witha bob cat
in an astronaut suit putting
a flag that says cats with
Earth in the backgrond.
we are puting the flag on mars
We are stacking our claim

we all came up with our own
design and the fainel touch
we mixed our ideas togethe
and came up with a bob cat
in an astroned suit puting a flagg
on Mars with Earth in the
back grond.

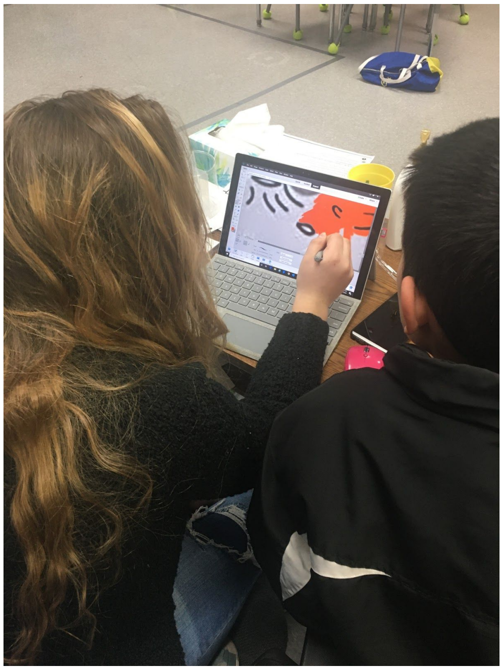
Kelley Turley

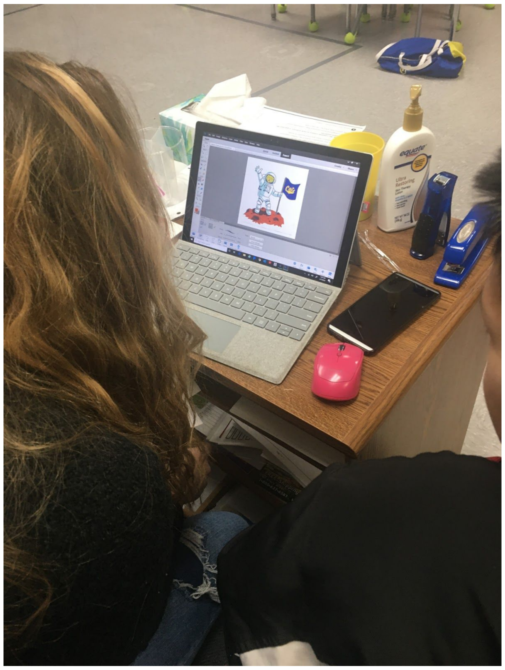



We cameup with this
design because we mixed
our ideas together and we
like the Earth in the back, the cat in
the astronaut suit.

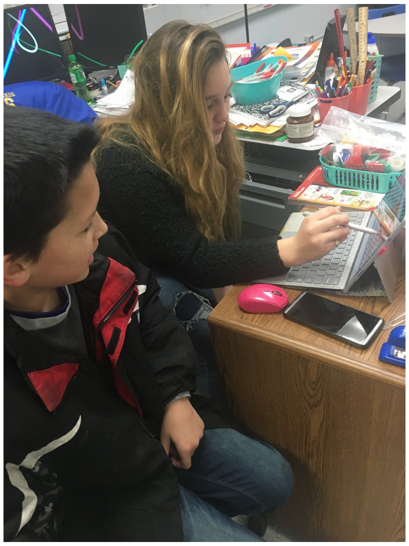
We clamned mars, hame Plant
in the back the next mihcng
the ned frount fier.

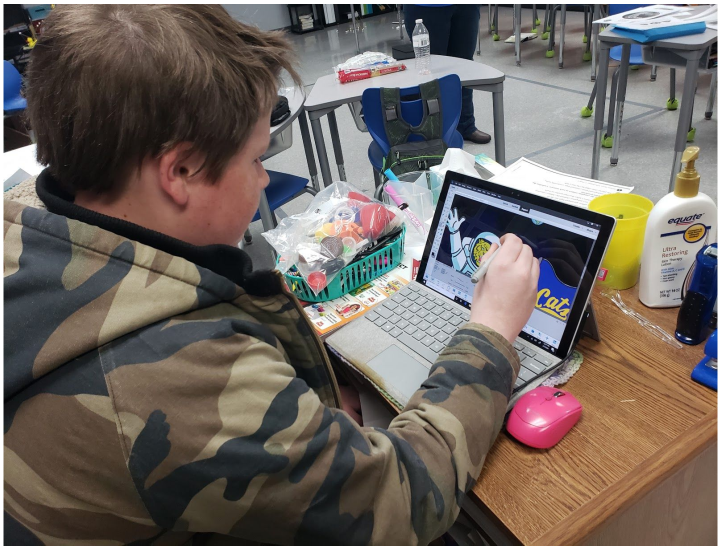
To get our final design, we talked about which features from each one of our ideas we liked the best. We all liked the octagon for the shape of our patch. All of us agreed that we wanted to represent our school by using our Bobcat and our school flags. We also decided we wanted our mascot to be in an astronaut suit standing on Mars. We added the Earth in the background and some stars. For our names, we all agreed to have them in yellow and the background to be blue.





equate





equate
Ultra Restoring
Cats

When we completed our patch, this is what we posted on Facebook and Twitter.

SUNRAY BOBCATS ARES X-PLORERS

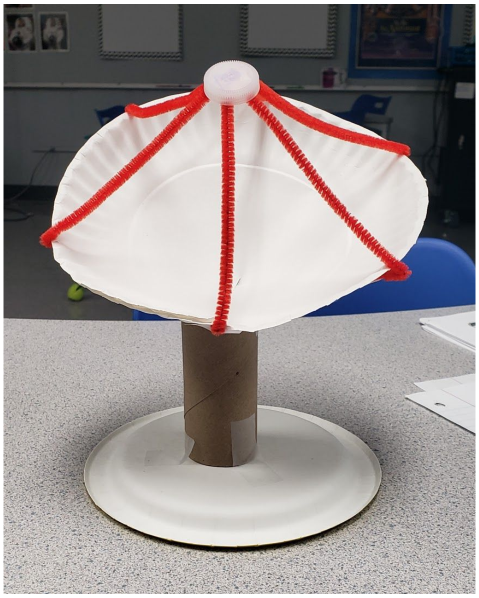
TX037

The Sunray Bobcats Ares X-plorers are busy preparing for their Roads on Mars 2020 Mission. SBAX designed their patch to represent the important factors of our school. Our school colors are royal blue, or as we call it "Bobcat Blue", and gold. We put the outer perimeter of our school colors with our names, logo "SBAX", and mission "ROADS on Mars". The Bobcat astronaut is our school mascot. The "Cats" flag is flown on game days in Sunray, TX, so proudly will fly on Mars for our victory of being there. We wanted everyone to know that we are explorers, and our flag is planted on Mars' surface to show we are here!!! The Earth is in the background which is where our journey began and our home to return.

COMMUNICATION DEVICE

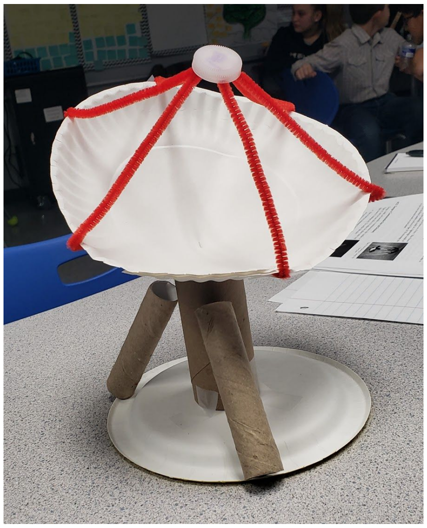
1/25/2020

For the start of our satellite design we just started gathering materials we had available in the classroom to get a basic idea of it. We gathered up empty paper rolls, paper plates, pipe cleaners, and the cap off of an empty water bottle.



First communication device idea

After we put the first one together, we decided it needed some braces on the side of the toilet paper roll. So we added some smaller paper rolls.



Another version

1/27/2020

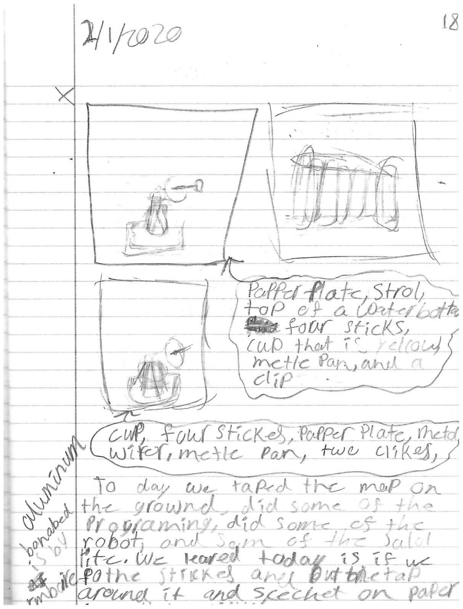
We didn't really all like the first design, so we went back to the Roads on Mars Manual to double-check what the requirements on the communication device are. After reading that we needed a square component, we decided we needed some different supplies and started brainstorming. We gathered up empty water bottles, a small square cake pan, water bottle caps, paper plates, different sizes of plastic cups, different sizes of craft sticks, binder clips, and white stirring straws.

The crew brainstorms communication device designs

Putting the pieces together

2/1/2020

Here is what we came up with today. We also sat it in the circle on the mat to see if it fit.We found that the square cake pan is too big for a base, it does not fit in the circle. So now on to find something that is square and smaller that will fit.



2/1/2020

18

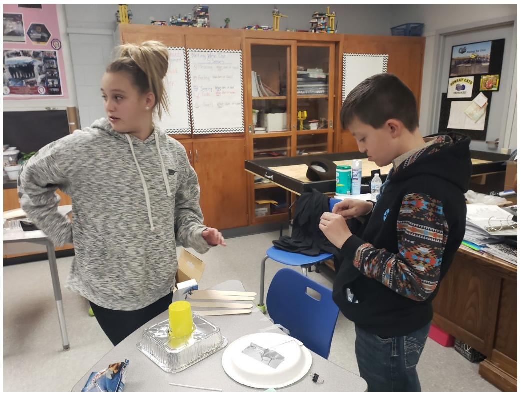
Papper Plate, Strol, top of a Waterbotte ~~[illegible]~~ four sticks, cup that is yellow, metle Pan, and a clip

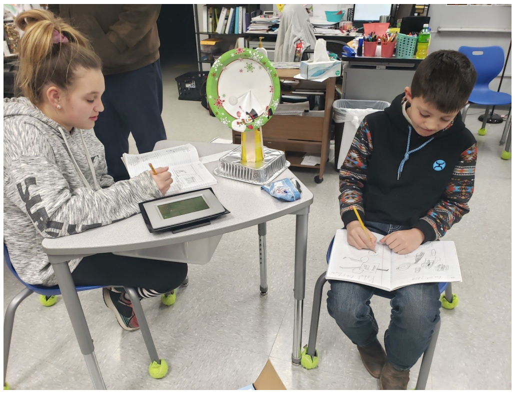
cup, four Stickes, Papper Plate, metal wifer, metle Pan, two clikes,

aluminum

To day we taped the map on the grownd, did some of the Programing, did some of the robot, and Som of the Salol lite. We leared today is if we Po the strikes and Put the tap around it and scechet on paper

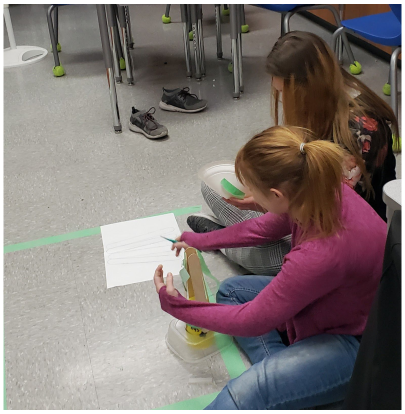
bonabed is by ~~ak~~ mobile



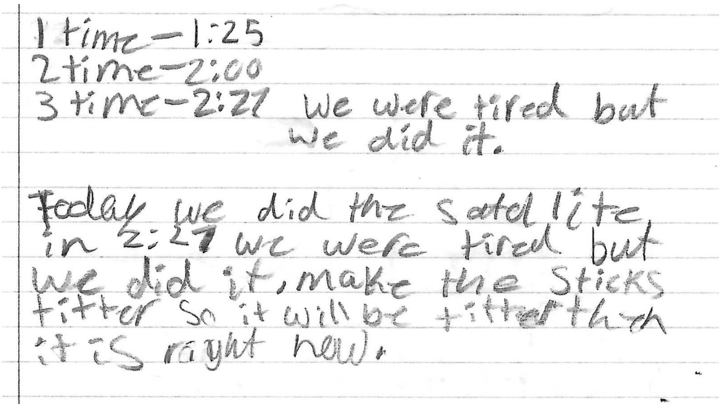


2/5/2020

We practiced and practiced assembling the satellite.



After we got a system down we decided to time ourselves to see how long it was taking us to put it together.

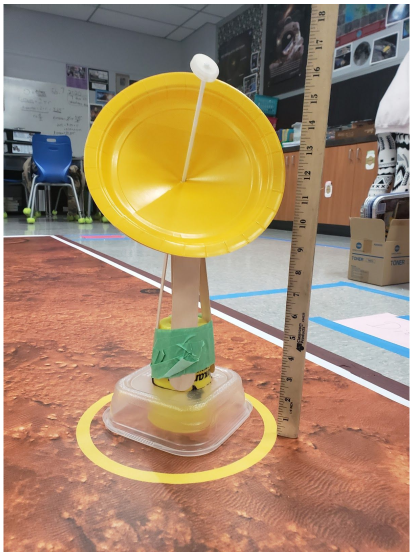


1 time—1:25
2 time—2:00
3 time—2:27 we were tired but we did it.

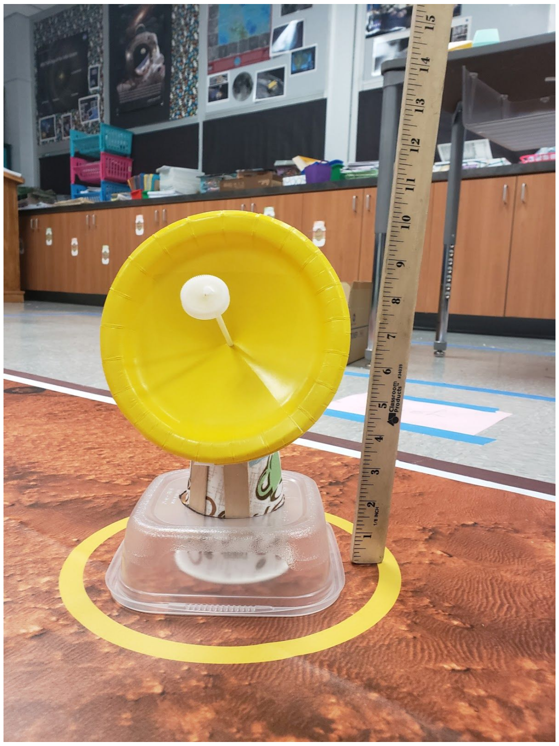
Today we did the satellite in 2:27 we were tired but we did it, make the sticks titter so it will be titter than it is raght new.

2/8/2020

We decided since our base was to big, that maybe we should have our flight director find out what the requirements are on how high it should be and if the plate could be outside the circle or not. Our flight director found out that our satellite was to tall and the plate we used made it to big to fit inside the circle.

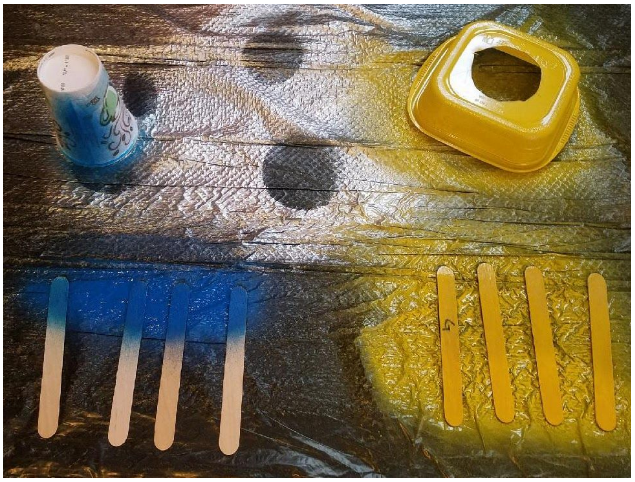


So we went back to our box of supplies and found a smaller plate, shorter craft sticks, and a shorter cup. By changing out these items we were able to get it short enough and the smaller plate fit inside the circle just like the square container. We have finally got our satellite that works and meets requirements.



2/11/2020

We have our design down and can assemble it in under the 3 minute time limit, but we still need to do some cosmetic work to the items we used. We have a yellow plate that is one of our school colors but we need to paint the sticks, the cup, and the square plastic container to better represent our school and our community. We are going to paint the cup blue, the plastic container gold and 8 craft sticks, 4 of them blue and 4 of them gold. We are going to only use 2 blue ones and 2 gold ones, but we want to have extra just in case something happens.



To finish it up we put our mission patch on the satellite dish (yellow plate). Here is our final communication device.

ROBOT / MARS ROVER DESIGN OVERVIEW

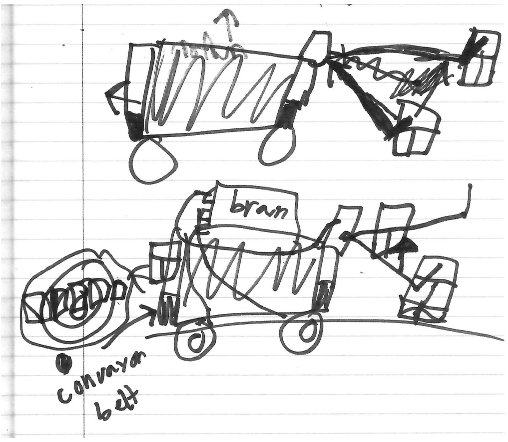
Design Goals

Our goal was to design and build an EV3 robot (a.k.a. Mars Rover) that would complete the Mars Sample Collection Mission and the Soil Probe Mission with the fewest number of commands possible. Our main goal for the Mars Sample Collection Mission was to collect and deliver all samples to the Drop Zone.

Design Ideas

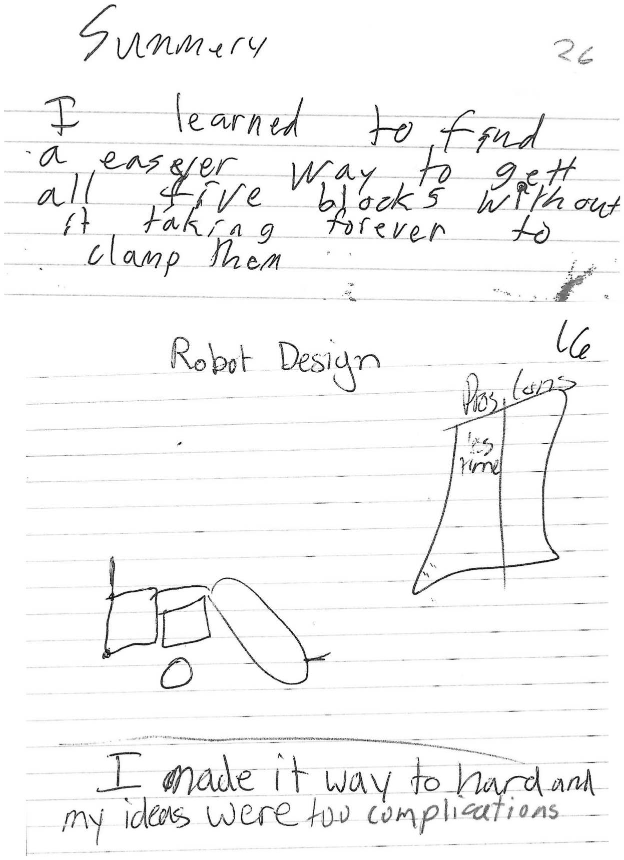
Justin and Sully used their previous EV3 design experience for the basic robot structure//chassis, which features a low profile, with two widely spaced wheels and a “skid” style rear end. The advantage of the skid over a rear tire or a roller ball is that it helped to eliminate inaccuracies caused by inconsistent friction and hangups. The skid design provides consistent friction against the mat.

We had several ideas for the best front attachment design to accomplish the Sample Collection Mission, ranging from simple, non-mechanical designs, to using multiple motors and conveyors to lift and transport the samples. We all agreed that the design should be able to transport all five samples to the Drop Zone in one trip, instead of moving each sample one at a time.



Pros and Cons

We talked about the different pros and cons of each design idea and tried to compare the good things about each one with the negative things about each one to try to decide on the best design.



Summery

26

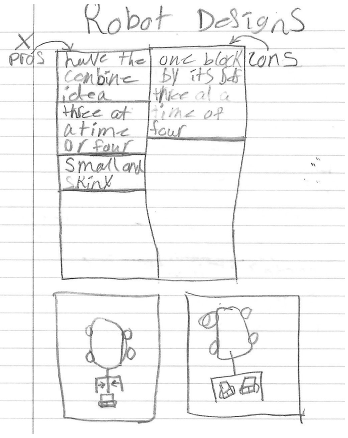
I learned to find a easyer way to gett all five blocks without it taking forever to clamp them

Robot Design

16

I made it way to hard and my ideas were too complications

We learned how to draw a matrix to list the pros and cons of each idea.

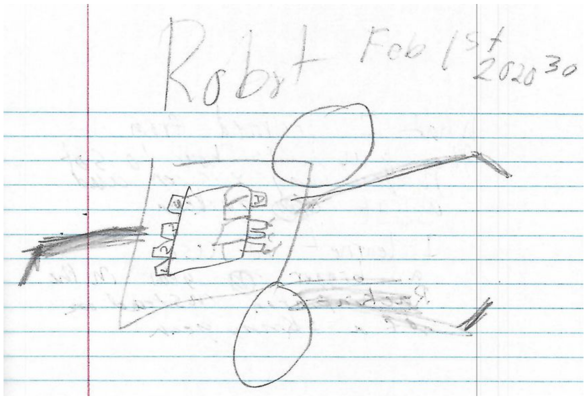


Robot Designs

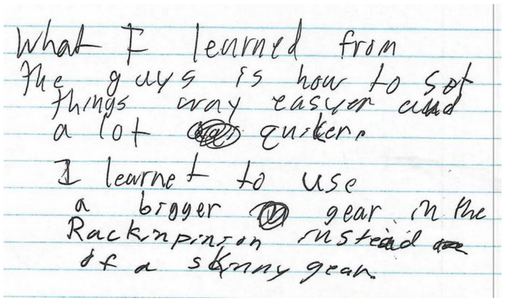
pros	cons
have the combine idea	one block by its Self three at a time of four
three at a time or four	
Small and skinx	

Final Design

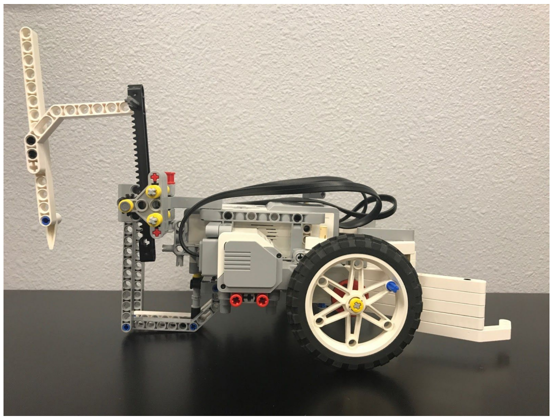
After talking about the pros and cons of each design idea, Kelley suggested the simple “V” shaped sample collection attachment, and we agreed that the simplest design would work the best.



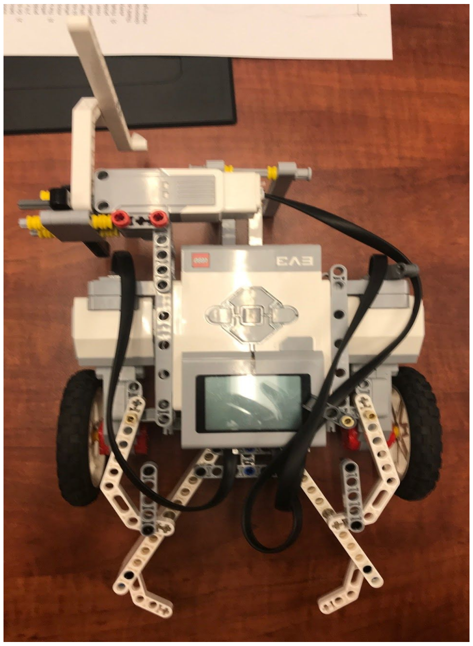
After all our collaborations on different probe designs, we settled on a rack and pinion system. The first probe that we built was not sturdy enough and would come apart when the rack hit its end. After a little research and redesign we built a rack and pinion that was both stronger and lightweight than the initial design. We were all pleased with its operation.



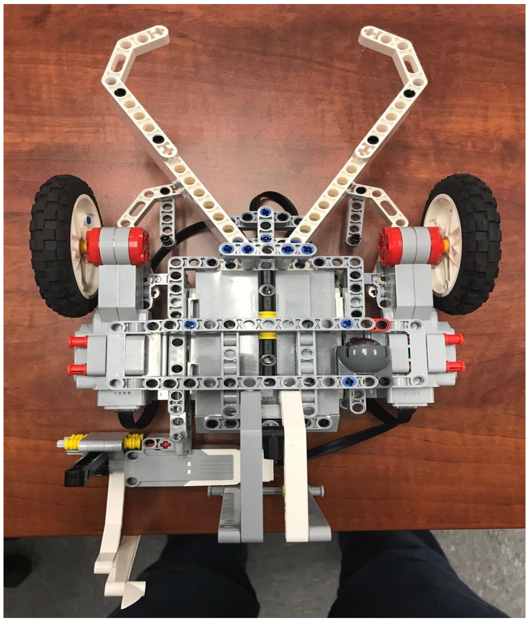
What I learned from
The guys is how to sot
things way easyer and
a lot quiker.
I learnet to use
a bigger gear in the
Racknpinion instead
of a skinny gear.



Rover Side View



Rover Top View



Rover Bottom View

DESIGN TROUBLESHOOTING
and
ENHANCEMENTS

Stability

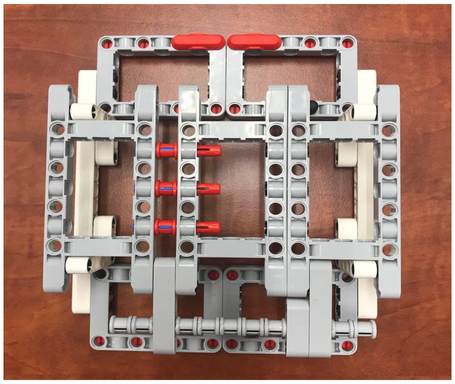
After several mission trials, we noticed a problem with the sample collection attachment. It seemed to be unstable and sometimes didn't collect the samples. Kenneth added two brackets to the top of the attachment to anchor it to the main Rover chassis.

Accuracy

To make it easier to align the Rover in the launch zone, Justin added a folding alignment bracket to the end of the "skid". During alignment, the Pilot lays the alignment bracket on the mat, lined up with the yellow line, so the CapCom can see whether it is lined up straight prior to giving the ready to launch command. This helped to improve our accuracy and make it more consistent each time we line up the Rover for the Sample Collection Mission.

Maintenance

Sully built a stand for the Rover to sit on when we're not running missions. The purpose of the stand is to keep the tires up so they don't get a flat spot from sitting in one place for a long time. If the tires get a flat spot, it can cause the Rover to not drive exactly straight during a mission, which can affect the accuracy of sample collection.



Rover Storage Stand

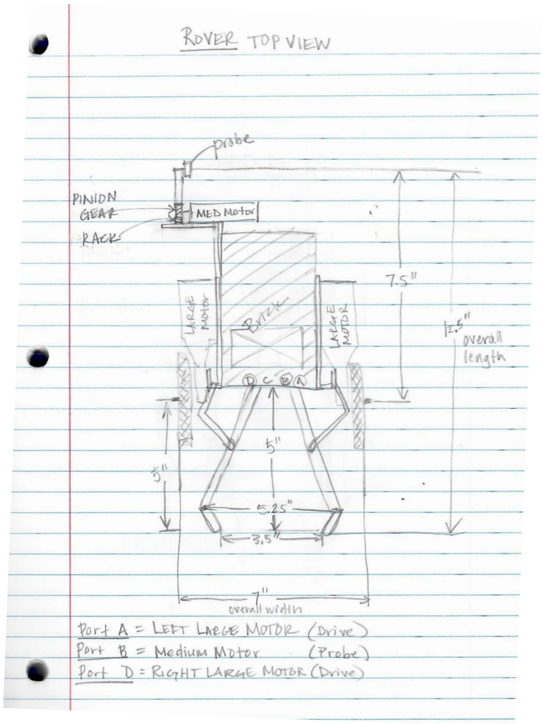
ROBOT / MARS ROVER BUILD

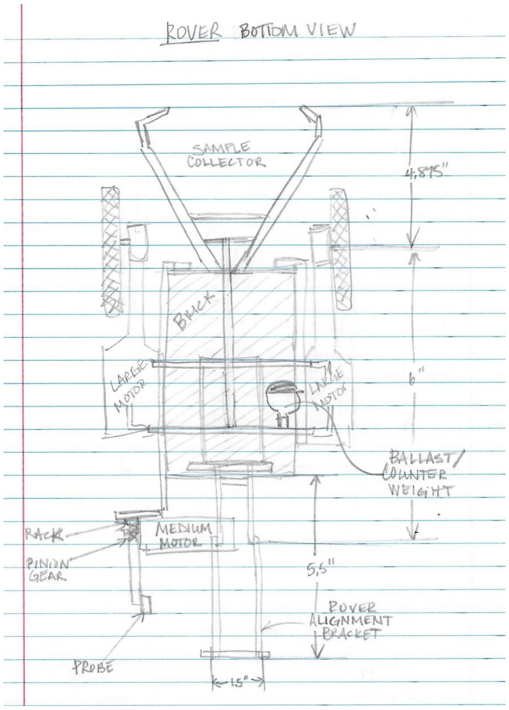
2/1/2020

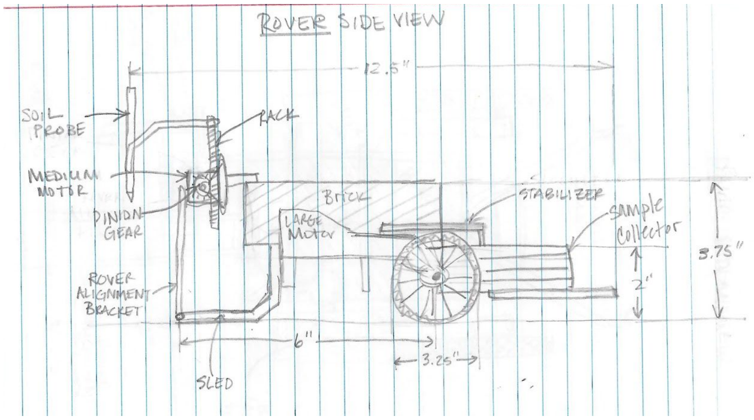
We have our robot design and now we are going to build the robot so we can start programming it.

Mr. Kimbrell advising the team.

Justin and Sully working on the robot/rover build





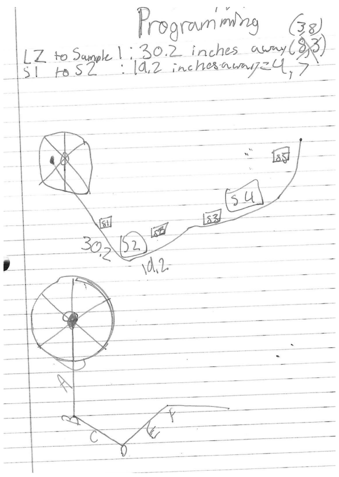


After the robot was built and the probe was added, we used a scale to test the balance of the robot. Previous EV3 experience has taught us that the robot will drive straighter if there is equal weight on each drive tire. We used the roller ball as a counterweight to balance the weight of the medium motor and probe system, and we got the balance to within a few grams.

PROGRAMMING

2/5/2020

The first thing that had to be worked out was the Rover placement inside the landing zone. Some wanted to line it up on an angle so it could drive straight to the first sample and some of us wanted to line it up in the center of the landing zone.

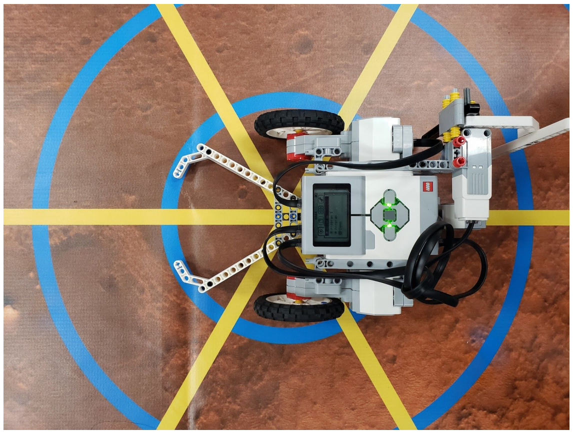


Programming (38)

LZ to Sample 1 : 30.2 inches away ~~(8.3)~~

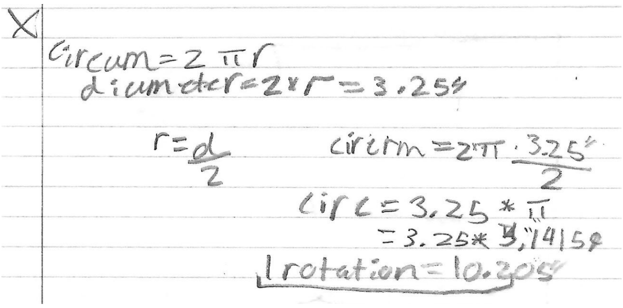
S1 to S2 : 19.2 inches away = 24.7

After discussing the pros and cons of each way, we decided to go with the center alignment because we all agreed that we could get a more accurate placement and that was essential to mission success.



Rover Alignment

We then began the programming process by measuring the diameter of our tires and calculating the distance traveled per revolution.



Circum = $2 \pi r$

diameter = $2 * r = 3.25"$

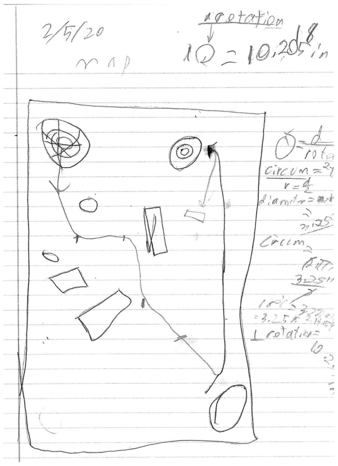
$r = \frac{d}{2}$ circm = $2\pi \cdot \frac{3.25"}{2}$

circ = $3.25 * \pi$

$= 3.25 * 3.14159$

1 rotation = 10.205"

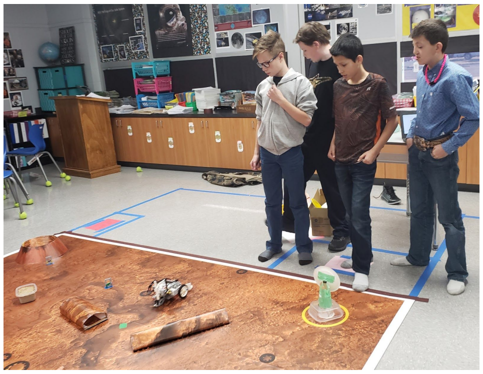
We then discussed the different paths that could be used to collect the samples and dodge the obstacles.



Then we measured the distance from our starting point to our first turn and began entering our programming into the computer. We repeated this process after each turn. For coordinating the turns, we placed a pin in one of the holes on the wheels to determine how much rotation was necessary. After entering the programming we would run the robot and make adjustments to the program. Using this procedure we were able to complete our programming to the collection of the third sample.

2/8/2020

We started programming on getting the robot to the 4th sample. We already decided that we were going to try to go down the channel in between the crater and the mountain. This turned out to be challenging. There was discussion about going around the crater towards the edge of the mat to collect the fourth and fifth sample.



The crew watches a practice run

2/10/2020

The Flight Director decided that we would try going down the channel first and if that didn’t work we would try going around the crater. By this point in the programming, the program had become long and to see the results we had to start over each time. This was time consuming and we barely got past the fourth sample with poor consistency. Robot alignment was a big part of the problem, so we came up with the idea of the rear alignment tool.

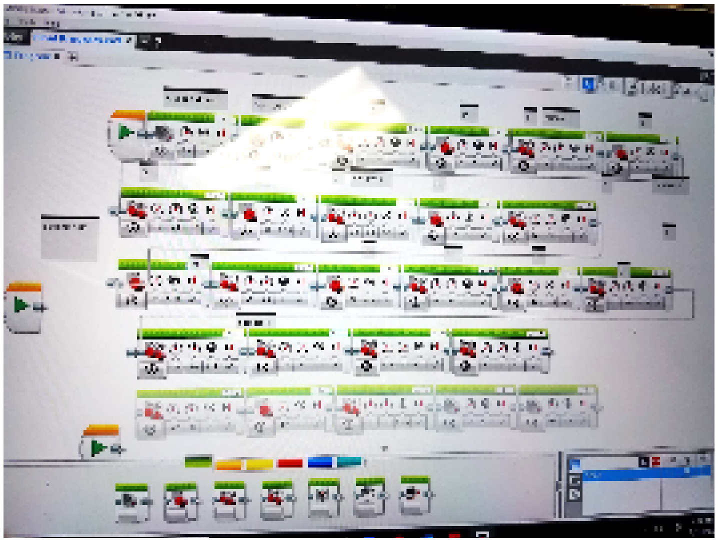
2/11/2020

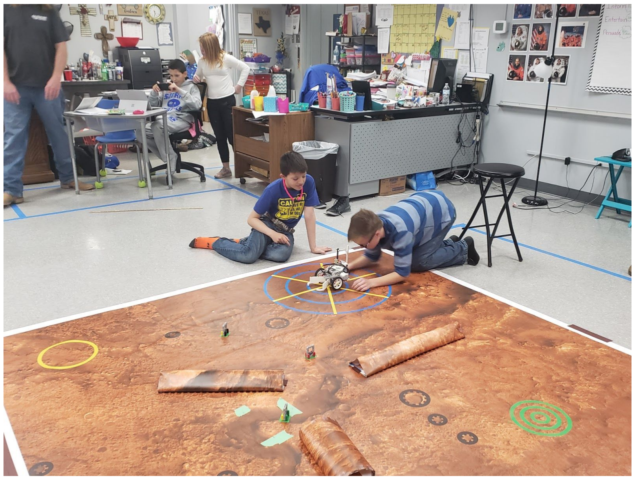
We started out this practice with a new plan. We decided to break the programming up into segments. We were consistently getting to the third sample at this point, so we made that the first stop in the program. We also figured out how to label each element of the program with text boxes on the screen so we could make better notes and be able to match our measurements on the map up with each part of the program.

We used tape to mark the position of the robot on the map so that we could start from there each time after making a change. This sped up the programming process and we made it to the fifth sample and put down some more tape for a stop in the program.

Justin, Brody and Mr. Kimbrell take some measurements

We finished the programming over to the Drop Zone and over to the probe sample. We were then ready to take the stops out of the programming, put it back together and try it from the beginning.





Kenneth and Brody align the Rover for a practice run

The run went really good and we were all excited. We did notice that the sample collector had some movement and needed to be stabilized. At this point the programming was done. Only minor changes to the program were made in future practices.

The Final Program

MARS LANDER

2/8/2020

Design Criteria:

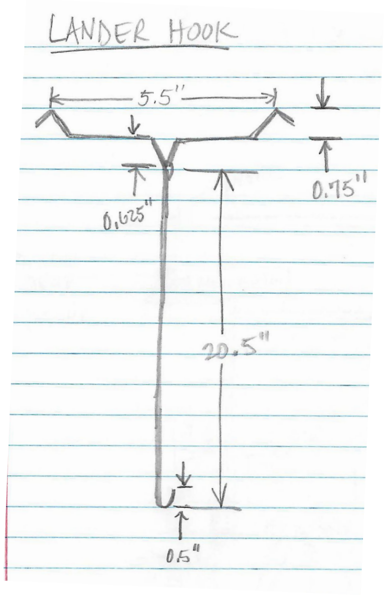
1. Light enough to be carried by the drone
2. Wide base so it won't tip over on landing
3. Represents our team/school

Weight:

We started out our lander design by figuring out how much weight our drone could carry in a controllable manner. First the camera had to be removed from the drone, then we built a simple lander out of LEGO so that we could add and take away weight and test fly the drone to see how well it would fly.

After a few test flights, we figured out that our lander needed to weigh 25 to 35 grams. Any lighter than 25 grams, and the lander could be blown off target by the drone. Any heavier than 35 grams, and the drone became hard to control.

We also had to design a lander hook to attach the lander to the drone. This also needed to be lightweight, but sturdy enough to stay together. At first, we tried to use a wire coat hanger, but this wire was too stiff to bend how we wanted and took up too much of our 25-35 grams weight range. We were able to acquire a donation of aluminum wire from R & B Air. We used this lightweight wire to make both the hook for the drone and the loop for the lander.



Drone Hook

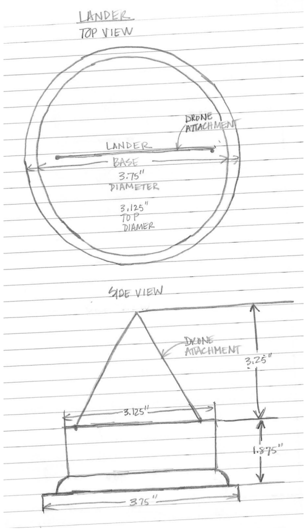
The hooks on each end are designed to hook onto the legs of the drone.

Lander Loop

We wanted the loop to be long enough to give plenty of clearance between the drone and the mat so the Pilot wouldn't lose control of the drone while dropping the Lander off in the Landing Zone. The only problem with the lightweight aluminum wire is it gets bent easily if there's a crash landing.

Lander Design

After watching a few videos of previous mars landings, we decided to design our lander after the capsule that the rover rides in. The idea being that our robot would be carried to Mars inside the capsule. We started with an empty yogurt container that we used for the base of our lander. Then we glued a strip of cardboard to the base. We took a piece of cardboard cut in a circle to make the top of our lander, glued it on, and then put tape around the edges of the top and sides. After that, we fastened the aluminum wire drone attachment loop to the top.



At this point, we did some trials and decided that our lander was too light to stay in place when blown by the props of the drone. Our solution was to add some lead balancing weights and we also put a grippy rubber coating on the base. After these modifications, the lander worked great.

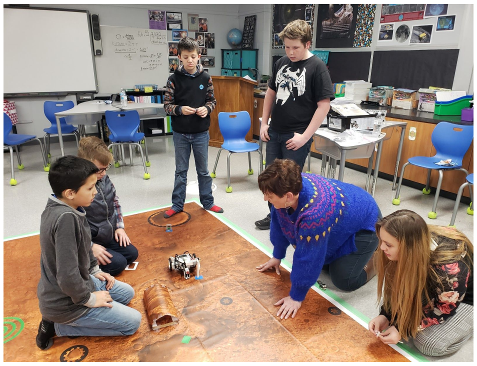
Drone practice flight with the Lander

To get ready for competition, we painted the Lander silver like the capsule on the video we watched, and placed our mission patch on the top to represent our team and our community.

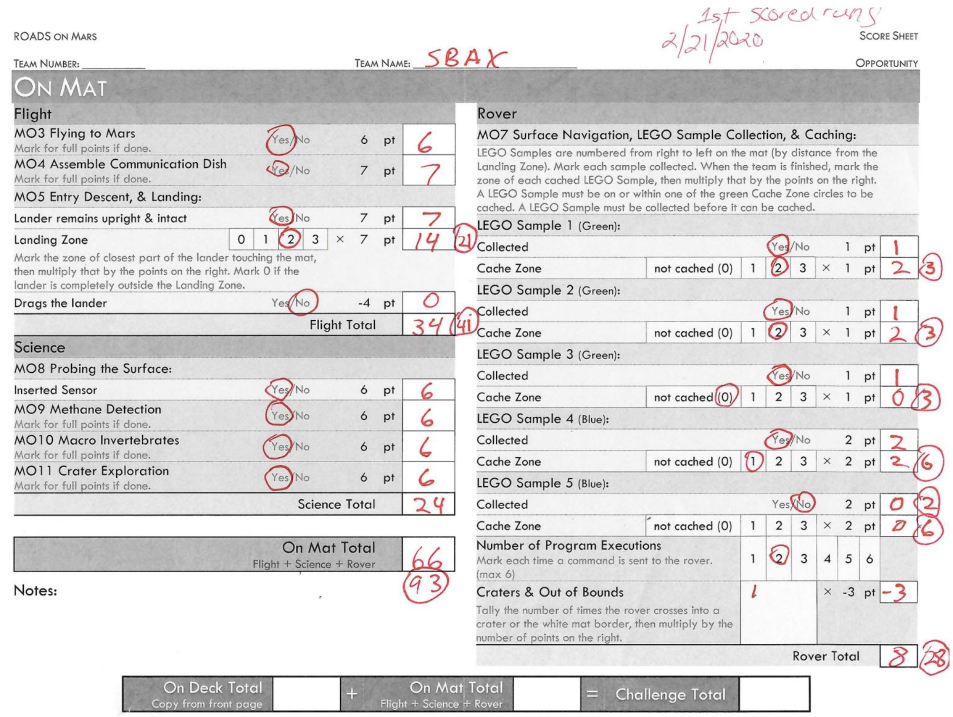
SBAX Mars Lander

Practicing

Over the next few weeks we had several practices. Our biggest challenge was getting the robot alignment correct. We also had some issues with getting our mini drone to fly properly when it was connected to wifi and learned we were using a smartphone that was too old to run the application properly.



As we got closer to the district challenge we started doing complete runs and scoring them to get familiar with the point system.



ROADS ON MARS

1st scored runs
2/21/2020

SCORE SHEET

TEAM NUMBER: __________ TEAM NAME: SBAX

OPPORTUNITY

ON MAT

Flight

MO3 Flying to Mars Mark for full points if done.	[✓ Yes]/No	6	pt	6	
MO4 Assemble Communication Dish Mark for full points if done.	[✓ Yes]/No	7	pt	7	
MO5 Entry Descent, & Landing:					
Lander remains upright & intact	[✓ Yes]/No	7	pt	7	
Landing Zone Mark the zone of closest part of the lander touching the mat, then multiply that by the points on the right. Mark 0 if the lander is completely outside the Landing Zone.	0 1 [✓ 2] 3 ×	7	pt	14	㉑
Drags the lander	Yes/[✓ No]	-4	pt	0	
Flight Total				34	㊶

Science

MO8 Probing the Surface:				
Inserted Sensor	[✓ Yes]/No	6	pt	6
MO9 Methane Detection Mark for full points if done.	[✓ Yes]/No	6	pt	6
MO10 Macro Invertebrates Mark for full points if done.	[✓ Yes]/No	6	pt	6
MO11 Crater Exploration Mark for full points if done.	[✓ Yes]/No	6	pt	6
Science Total				24

On Mat Total Flight + Science + Rover	66 (93)

Notes:

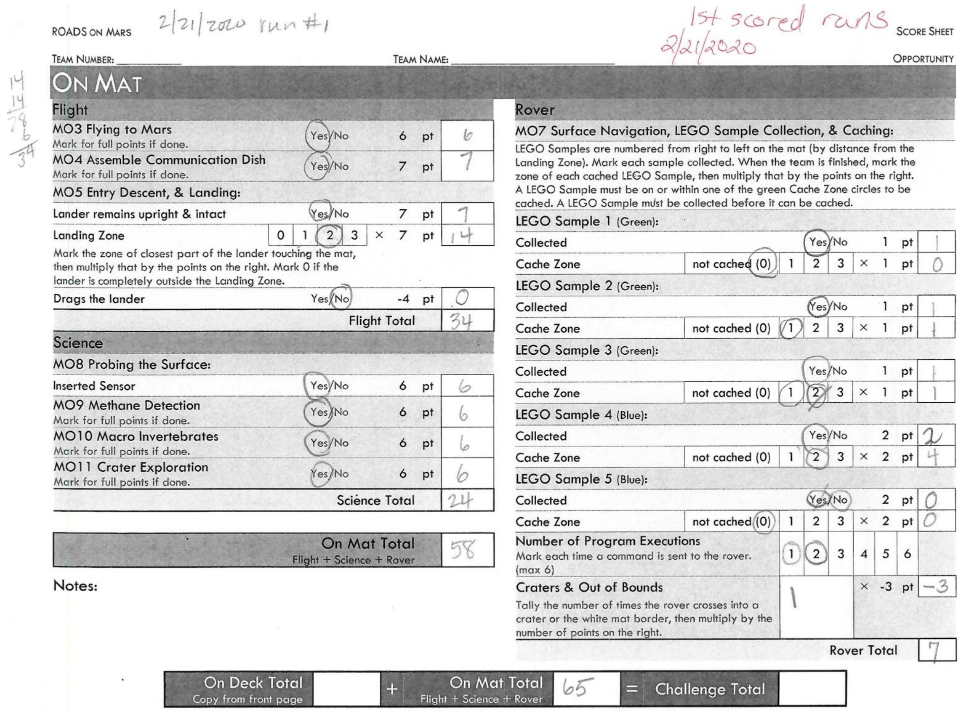
Rover

MO7 Surface Navigation, LEGO Sample Collection, & Caching:

LEGO Samples are numbered from right to left on the mat (by distance from the Landing Zone). Mark each sample collected. When the team is finished, mark the zone of each cached LEGO Sample, then multiply that by the points on the right. A LEGO Sample must be on or within one of the green Cache Zone circles to be cached. A LEGO Sample must be collected before it can be cached.

LEGO Sample 1 (Green):										
Collected				[✓ Yes]/No		1	pt	1		
Cache Zone	not cached (0)	1	[✓ 2]	3	×	1	pt	2	③	
LEGO Sample 2 (Green):										
Collected				[✓ Yes]/No		1	pt	1		
Cache Zone	not cached (0)	1	[✓ 2]	3	×	1	pt	2	③	
LEGO Sample 3 (Green):										
Collected				[✓ Yes]/No		1	pt	1		
Cache Zone	not cached [✓ (0)]	1	2	3	×	1	pt	0	③	
LEGO Sample 4 (Blue):										
Collected				[✓ Yes]/No		2	pt	2		
Cache Zone	not cached (0)	[✓ 1]	2	3	×	2	pt	2	⑥	
LEGO Sample 5 (Blue):										
Collected				Yes/[✓ No]		2	pt	0	②	
Cache Zone	not cached (0)	1	2	3	×	2	pt	0	⑥	
Number of Program Executions Mark each time a command is sent to the rover. (max 6)	1	[✓ 2]	3	4	5	6				
Craters & Out of Bounds Tally the number of times the rover crosses into a crater or the white mat border, then multiply by the number of points on the right.	1				×	-3	pt	-3		
Rover Total								8	㉘	

On Deck Total Copy from front page		+ On Mat Total Flight + Science + Rover		= Challenge Total	



ROADS ON MARS 2/21/2020 run #1

1st scored runs
2/21/2020

SCORE SHEET

TEAM NUMBER: __________ TEAM NAME: __________

OPPORTUNITY

14
14
78
6
34

ON MAT

Flight

MO3 Flying to Mars Mark for full points if done.	[✓ Yes]/No	6	pt	6
MO4 Assemble Communication Dish Mark for full points if done.	[✓ Yes]/No	7	pt	7
MO5 Entry Descent, & Landing:				
Lander remains upright & intact	[✓ Yes]/No	7	pt	7
Landing Zone Mark the zone of closest part of the lander touching the mat, then multiply that by the points on the right. Mark 0 if the lander is completely outside the Landing Zone.	0 1 [✓ 2] 3 ×	7	pt	14
Drags the lander	Yes/[✓ No]	-4	pt	0
Flight Total				34

Science

MO8 Probing the Surface:				
Inserted Sensor	[✓ Yes]/No	6	pt	6
MO9 Methane Detection Mark for full points if done.	[✓ Yes]/No	6	pt	6
MO10 Macro Invertebrates Mark for full points if done.	[✓ Yes]/No	6	pt	6
MO11 Crater Exploration Mark for full points if done.	[✓ Yes]/No	6	pt	6
Science Total				24

On Mat Total Flight + Science + Rover	58

Notes:

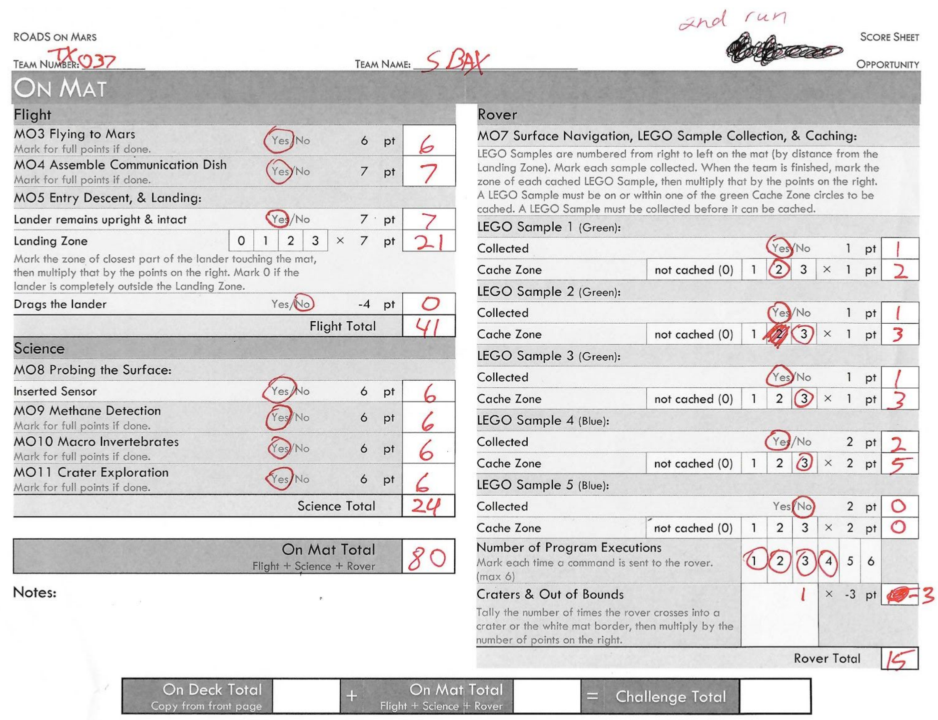
Rover

MO7 Surface Navigation, LEGO Sample Collection, & Caching:

LEGO Samples are numbered from right to left on the mat (by distance from the Landing Zone). Mark each sample collected. When the team is finished, mark the zone of each cached LEGO Sample, then multiply that by the points on the right. A LEGO Sample must be on or within one of the green Cache Zone circles to be cached. A LEGO Sample must be collected before it can be cached.

LEGO Sample 1 (Green):									
Collected				[✓ Yes]/No		1	pt	1	
Cache Zone	not cached [✓ (0)]	1	2	3	×	1	pt	0	
LEGO Sample 2 (Green):									
Collected				[✓ Yes]/No		1	pt	1	
Cache Zone	not cached (0)	[✓ 1]	2	3	×	1	pt	1	
LEGO Sample 3 (Green):									
Collected				[✓ Yes]/No		1	pt	1	
Cache Zone	not cached (0)	[✓ 1]	~~[✓ 2]~~	3	×	1	pt	1	
LEGO Sample 4 (Blue):									
Collected				[✓ Yes]/No		2	pt	2	
Cache Zone	not cached (0)	1	[✓ 2]	3	×	2	pt	4	
LEGO Sample 5 (Blue):									
Collected				~~Yes~~/[✓ No]		2	pt	0	
Cache Zone	not cached [✓ (0)]	1	2	3	×	2	pt	0	
Number of Program Executions Mark each time a command is sent to the rover. (max 6)	[✓ 1]	[✓ 2]	3	4	5	6			
Craters & Out of Bounds Tally the number of times the rover crosses into a crater or the white mat border, then multiply by the number of points on the right.	1				×	-3	pt	-3	
Rover Total								7	

On Deck Total Copy from front page		+ On Mat Total Flight + Science + Rover	65	= Challenge Total	



2nd run

ROADS ON MARS · SCORE SHEET

TEAM NUMBER: TX037 · TEAM NAME: S BAX · [redacted] OPPORTUNITY

ON MAT

Flight

MO3 Flying to Mars Mark for full points if done.	[✓ Yes]/No	6	pt	6
MO4 Assemble Communication Dish Mark for full points if done.	[✓ Yes]/No	7	pt	7
MO5 Entry Descent, & Landing:				
Lander remains upright & intact	[✓ Yes]/No	7	pt	7
Landing Zone Mark the zone of closest part of the lander touching the mat, then multiply that by the points on the right. Mark 0 if the lander is completely outside the Landing Zone.	0 1 2 3 ×	7	pt	21
Drags the lander	Yes/[✓ No]	-4	pt	0
	Flight Total			41

Science

MO8 Probing the Surface:				
Inserted Sensor	[✓ Yes]/No	6	pt	6
MO9 Methane Detection Mark for full points if done.	[✓ Yes]/No	6	pt	6
MO10 Macro Invertebrates Mark for full points if done.	[✓ Yes]/No	6	pt	6
MO11 Crater Exploration Mark for full points if done.	[✓ Yes]/No	6	pt	6
	Science Total			24

On Mat Total Flight + Science + Rover	80

Notes:

Rover

MO7 Surface Navigation, LEGO Sample Collection, & Caching:

LEGO Samples are numbered from right to left on the mat (by distance from the Landing Zone). Mark each sample collected. When the team is finished, mark the zone of each cached LEGO Sample, then multiply that by the points on the right. A LEGO Sample must be on or within one of the green Cache Zone circles to be cached. A LEGO Sample must be collected before it can be cached.

LEGO Sample 1 (Green):								
Collected		[✓ Yes]/No				1	pt	1
Cache Zone	not cached (0)	1	[✓ 2]	3	×	1	pt	2
LEGO Sample 2 (Green):								
Collected		[✓ Yes]/No				1	pt	1
Cache Zone	not cached (0)	1	2	[✓ 3]	×	1	pt	3
LEGO Sample 3 (Green):								
Collected		[✓ Yes]/No				1	pt	1
Cache Zone	not cached (0)	1	2	[✓ 3]	×	1	pt	3
LEGO Sample 4 (Blue):								
Collected		[✓ Yes]/No				2	pt	2
Cache Zone	not cached (0)	1	2	[✓ 3]	×	2	pt	5
LEGO Sample 5 (Blue):								
Collected		Yes/[✓ No]				2	pt	0
Cache Zone	not cached (0)	1	2	3	×	2	pt	0
Number of Program Executions Mark each time a command is sent to the rover. (max 6)	[✓ 1]	[✓ 2]	[✓ 3]	[✓ 4]	5	6		
Craters & Out of Bounds Tally the number of times the rover crosses into a crater or the white mat border, then multiply by the number of points on the right.	1				×	-3	pt	-3
						Rover Total		15

On Deck Total Copy from front page		+	On Mat Total Flight + Science + Rover		=	Challenge Total

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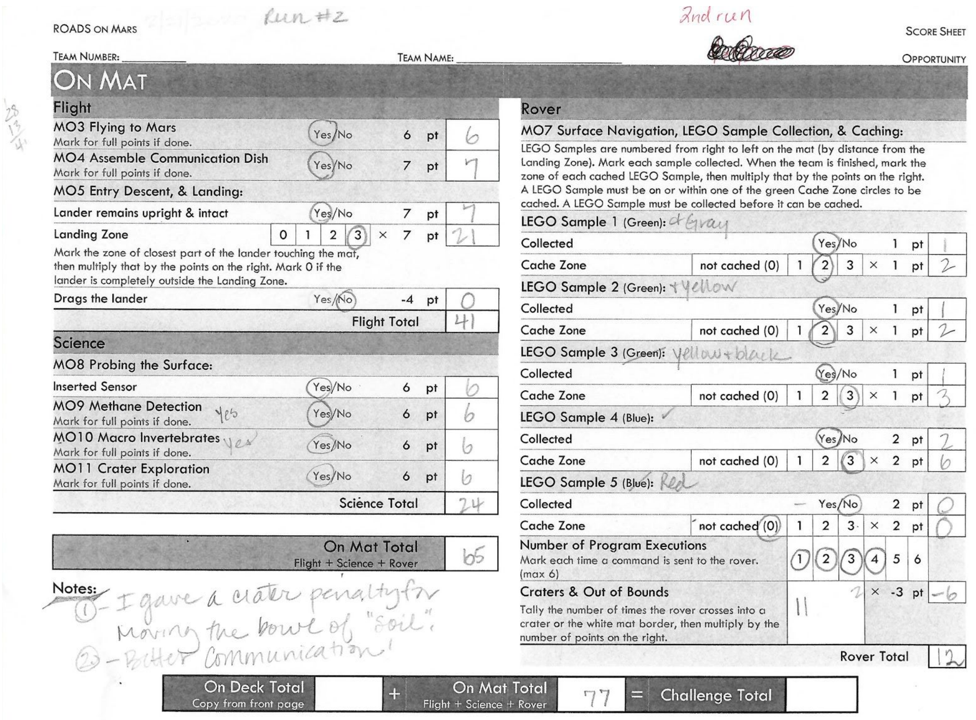


Run #2 · 2nd run

28
13
41

ROADS ON MARS · SCORE SHEET

TEAM NUMBER: ______ · TEAM NAME: ______ · [redacted] OPPORTUNITY

ON MAT

Flight

MO3 Flying to Mars Mark for full points if done.	[✓ Yes]/No	6	pt	6
MO4 Assemble Communication Dish Mark for full points if done.	[✓ Yes]/No	7	pt	7
MO5 Entry Descent, & Landing:				
Lander remains upright & intact	[✓ Yes]/No	7	pt	7
Landing Zone Mark the zone of closest part of the lander touching the mat, then multiply that by the points on the right. Mark 0 if the lander is completely outside the Landing Zone.	0 1 2 [✓ 3] ×	7	pt	21
Drags the lander	Yes/[✓ No]	-4	pt	0
	Flight Total			41

Science

MO8 Probing the Surface:				
Inserted Sensor	[✓ Yes]/No	6	pt	6
MO9 Methane Detection Yes Mark for full points if done.	[✓ Yes]/No	6	pt	6
MO10 Macro Invertebrates Yes Mark for full points if done.	[✓ Yes]/No	6	pt	6
MO11 Crater Exploration Mark for full points if done.	[✓ Yes]/No	6	pt	6
	Science Total			24

On Mat Total Flight + Science + Rover	65

Notes:

① - I gave a crater penalty for Moving the bowl of "soil".

② - Better Communication!

Rover

MO7 Surface Navigation, LEGO Sample Collection, & Caching:

LEGO Samples are numbered from right to left on the mat (by distance from the Landing Zone). Mark each sample collected. When the team is finished, mark the zone of each cached LEGO Sample, then multiply that by the points on the right. A LEGO Sample must be on or within one of the green Cache Zone circles to be cached. A LEGO Sample must be collected before it can be cached.

LEGO Sample 1 (Green): + Gray								
Collected		[✓ Yes]/No				1	pt	1
Cache Zone	not cached (0)	1	[✓ 2]	3	×	1	pt	2
LEGO Sample 2 (Green): + Yellow								
Collected		[✓ Yes]/No				1	pt	1
Cache Zone	not cached (0)	1	[✓ 2]	3	×	1	pt	2
LEGO Sample 3 (~~Green~~): yellow + black								
Collected		[✓ Yes]/No				1	pt	1
Cache Zone	not cached (0)	1	2	[✓ 3]	×	1	pt	3
LEGO Sample 4 (Blue): ✓								
Collected		[✓ Yes]/No				2	pt	2
Cache Zone	not cached (0)	1	2	[✓ 3]	×	2	pt	6
LEGO Sample 5 (Blue): Red								
Collected		Yes/[✓ No]				2	pt	0
Cache Zone	not cached [✓ (0)]	1	2	3	×	2	pt	0
Number of Program Executions Mark each time a command is sent to the rover. (max 6)	[✓ 1]	[✓ 2]	[✓ 3]	[✓ 4]	5	6		
Craters & Out of Bounds Tally the number of times the rover crosses into a crater or the white mat border, then multiply by the number of points on the right.	11			2	×	-3	pt	-6
						Rover Total		12

On Deck Total Copy from front page		+	On Mat Total Flight + Science + Rover	77	=	Challenge Total

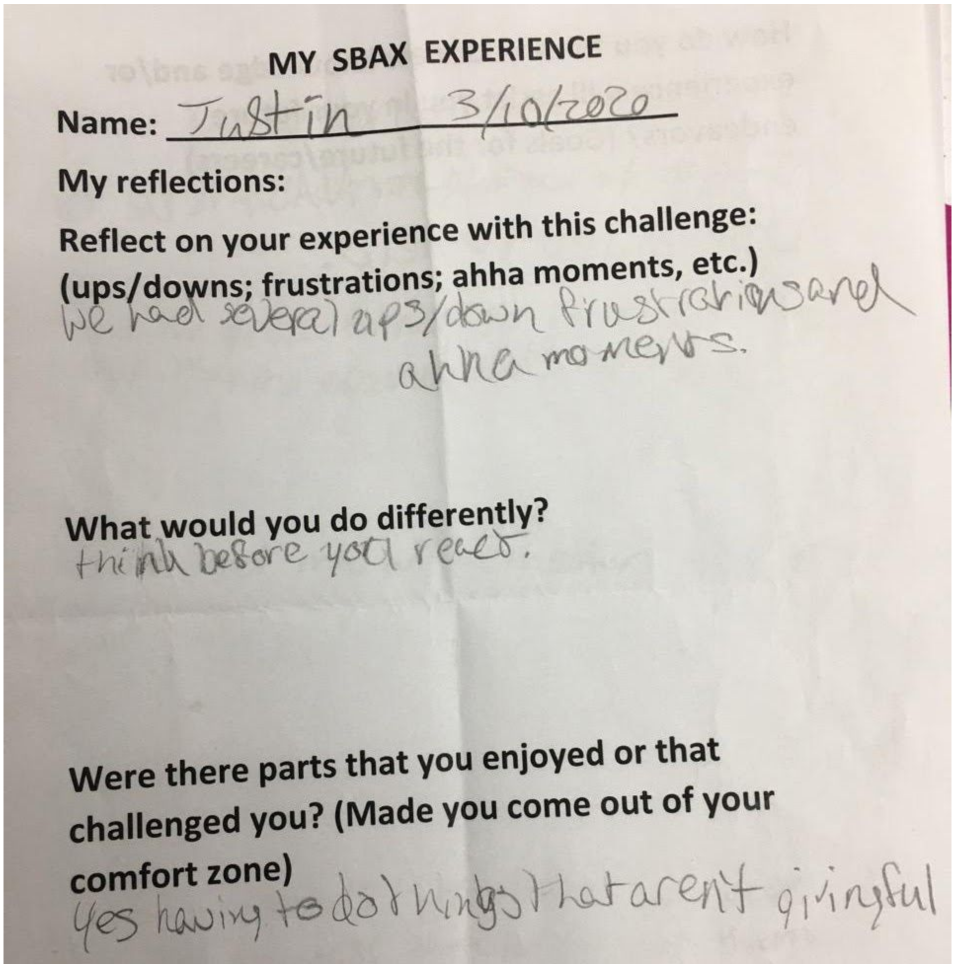
SBAX Competition Run Script

“5-4-3-2-1 SBAX Texas 037 Begin your Mission!”

COMMANDER	**CREW RESPONSE**	**<ACTION>**
“Science Ready?”	**Science**: “Ready Commander!”	
“CapCom Ready?”	**CapCom**: “Ready Commander!”	
“EVA Ready?”	**EVA**: “Ready Commander!”	
“Pilot Ready?”	**Pilot**: “Ready Commander!”	
“All Systems Ready! Launch!”		<Pilot launches drone>
		<Build satellite>
		<Deliver satellite>
	CapCom: “Ready for Landing!”	
“Pilot, you may land!”		<Pilot drops lander in LZ>
		<Pilot lands drone>
“Pilot, align the rover”		<Pilot places/aligns robot and mini drone> <CapCom assists with alignment>
	CapCom: “Good from this perspective”	<Give pilot thumbs up>
“Pilot, return to your position.”		<Pilot returns to his spot>
<<<<<PAUSE. DEEP BREATH.>>>		
“Pilot, launch crater mission.”		<Pilot launches mini drone>
		<Pilot flies to crater>
		<Science officer shoots crater photo>
	Science: “Crater mission	

	complete!”	
	CapCom: “Peanut butter!”	
“Jelly!”	**EVA**: “Time!”	<EVA sends robot start command>
“Pilot, you may land.”		<Pilot lands mini drone in LZ>
	CapCom: “Sample 1 collected.”	<CapCom communicates with EVA to complete sample collection>
“Science officer go to your station.”		<Science officer goes to methane table>
	CapCom: “Sample 2 collected.” **CapCom**: “Sample 3 collected.” **CapCom**: “Sample 4 collected.”	<CapCom will either order stop to adjust at Sample 5 or give the go ahead>
	CapCom: “Sample 5 collected.”	<robot deposits samples in drop zone>
	CapCom: “Sample retrieval complete!”	<Everyone breathe!>
<<<<<PAUSE. RELAX.>>>		
“Ready for Probe Mission??”		<CapCom communicates with EVA if changes are needed to probe program>
	CapCom: “Probe Systems Ready!”	
“EVA, Activate Probe!”		<EVA sends probe command>
	CapCom: “Probe Mission Complete”	<Everyone stay still!>
“All missions complete.”		

Reflections



MY SBAX EXPERIENCE

Name: Justin 3/10/2020

My reflections:

Reflect on your experience with this challenge: (ups/downs; frustrations; ahha moments, etc.)

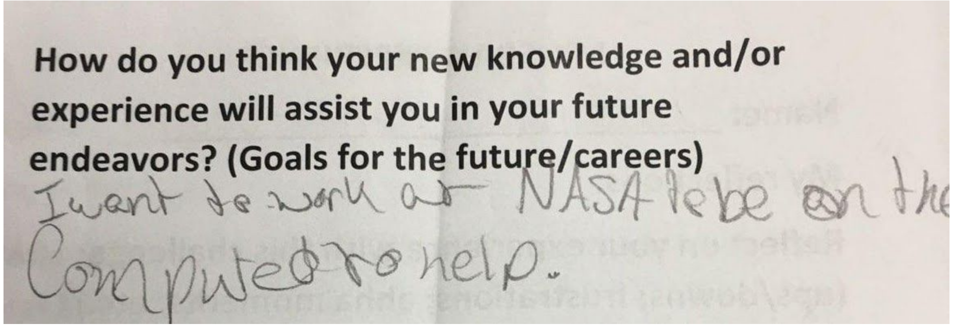
We had several ups/down frustrations and ahha moments.

What would you do differently?

think before you react.

Were there parts that you enjoyed or that challenged you? (Made you come out of your comfort zone)

Yes having to do things that aren't givingful



How do you think your new knowledge and/or experience will assist you in your future endeavors? (Goals for the future/careers)

I want to work at NASA to be on th

Computer to help.

MY SBAX EXPERIENCE

Name: Kenneth Clay Hughes

My reflections:

Reflect on your experience with this challenge: (ups/downs; frustrations; ahha moments, etc.)

This challenge has taught me how importent it is to have teamwork. It has also taught me that I would allways have fun too. Most importently to allways try to have prid in what you are doing as a team.

What would you do differently?

I wish I would have joined in and helped build the robot more instead not knowing how they built it on certain parts.

Were there parts that you enjoyed or that challenged you? (Made you come out of your comfort zone)

Yes. One of them where messing up in front of the whole crowd.

How do you think your new knowledge and/or experience will assist you in your future endeavors? (Goals for the future/careers)

~~Being patent getting the job right as maybe being an engineer.~~

One goal I have in the future in robotics is to learn more about the programming part of robotics. Also the teamwork can benefit future jobs and careers.

MY SBAX EXPERIENCE

Name: Sully Kimbrell

My reflections:

Reflect on your experience with this challenge: (ups/downs; frustrations; ahha moments, etc.)

I really enjoyed this whole expierence. At times it was frustrating and difficult. We had disagreements but learned how to fix them.

What would you do differently?

Time. The only time we had to work on this was after school and on weekends. It was challenging to get all missions done in a short period of time. to meet the deadlines.

Were there parts that you enjoyed or that challenged you? (Made you come out of your comfort zone) Flying the drone was challenging, to learn how to make adjustments quickly when the central air system would come on.

I got lots of enjoyment out of building the robot. The successful runs we had on the mat with the robot. Also enjoyed hanging out with my teammates (my friends.)

How do you think your new knowledge and/or experience will assist you in your future endeavors? (Goals for the future/careers)

Learning how to program and build the robot I think will help me when I get to high school robootics and get me scholarships for college. And in the longrun will help me get an awesome job some day.

MY SBAX EXPERIENCE

Name: Brody Parswell

My reflections:

Reflect on your experience with this challenge: (ups/downs; frustrations; ahha moments, etc.)

I had some frustrations with the programming and the rack andpinion system for the rover.

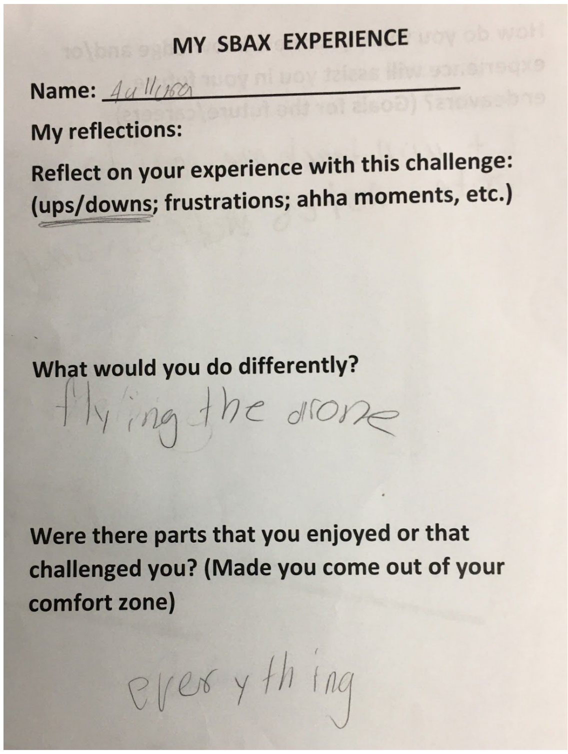
What would you do differently?

I would spend more time observing and giving program changes onthe fly because that would make the whole teamwork faster.

Were there parts that you enjoyed or that challenged you? (Made you come out of your comfort zone) When we tried out for the drone pilot it challenged me to have gentle hands.

How do you think your new knowledge and/or experience will assist you in your future endeavors? (Goals for the future/careers)

I think that robotics will give me a better observation skills for my future.



MY SBAX EXPERIENCE

Name: [illegible]

My reflections:

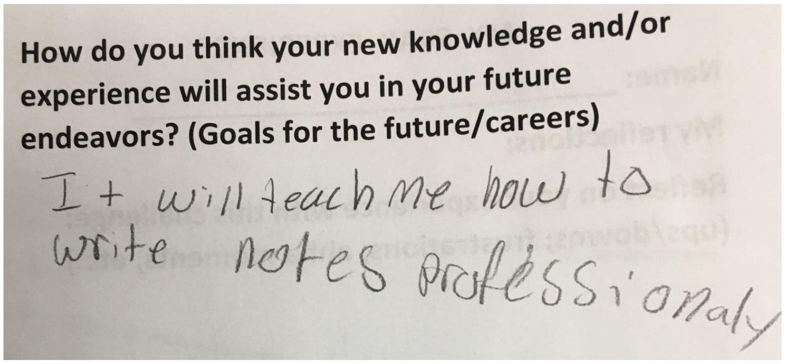
Reflect on your experience with this challenge: (ups/downs; frustrations; ahha moments, etc.)

What would you do differently?

flying the drone

Were there parts that you enjoyed or that challenged you? (Made you come out of your comfort zone)

everything

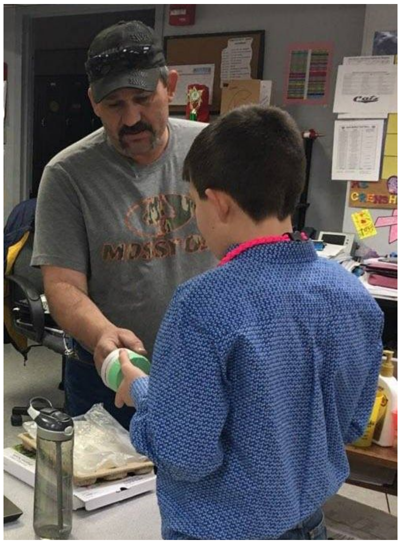


How do you think your new knowledge and/or experience will assist you in your future endeavors? (Goals for the future/careers)

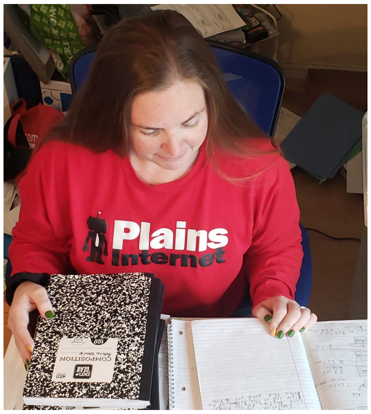
It will teach me how to write notes professionaly

SBAX MENTORS

Kevin Bain: Sunray Ag Producers

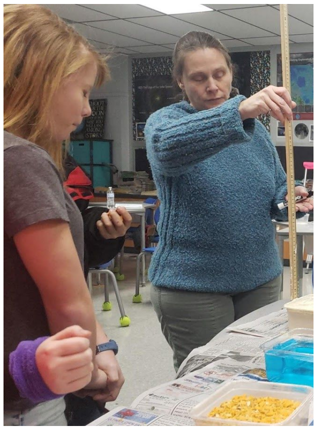


Amber Kimbrell: Farmer, Business Owner, Mom, Secretary



Heath Kimbrell: Farmer, Businessman, Inventor

Anissa Purswell: Engineer



Troy Turley: Railroad Commission Inspector

Credits

We would like to thank our mentors:

Anissa Purswell
Amber Kimbrell
Heath Kimbrell
Troy Turly
Gina Bain
Kevin Bain

We would also like to thank our sponsors:

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Scrub Depot
Ag Producers-Brett Brown
R&B Air
Seed Inc.
Don & Carolyn Kimbrell
Kimbrell Farms Spraying
Stacy Nelson
12 Stars of Texas
Tonya Canales
Susie Bain
Sunray HS Robotics
SBAX Parents & Families

Additional Pictures


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TURLEY
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ROADS
BAIN
HUGHES
KIMBRELL
Catz
2020
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Thank You!