

Meet Our New Century School Team SPACE XCursions

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Have you ever wanted to travel to Mars?.....

Well your in luck, our machine will take you to Mars and show you how people live and play on Mars! Our machine will launch a SpaceX Falcon Heavy rocket and you will venture with the crew to Mars. Once you arrive on Mars, you will see it's beautiful valleys, it's volcanoes, and domes and engineered habitats. You will also see how people survive, raising fresh food in hydroponic labs. And you will see how people work and play: you will explore deep shaft mines and the volcanic activity of Olympus Mons. After your tour, you will fall in love with Mars and want to return and stay forever.





our team name	Big poster
Machine Design D P a ce 3. Launch safely 2. Grow food and find water 1 Launch safely 4. Energy - wind, solar?	design
5. Explore 6. Mine natural resources - use and sell on Earth 7. Manufacture things we need	Need 10 steps - some ideas should have many steps
Tionet	Nars

Step 1 : Time to Roll (Advanced)

In Step 1, we deliver the astronauts to the launch gantry with a Tesla Model X like NASA. We first built an inclined plane /ramp and then tested the slope of the ramp. We built a gauge to accurately measure the slope using a large protractor as well as an app called Measure. You can see in the picture that the gauge has increments. The increments are 3,5,8, and 10 degrees.





Then we tested the 2.0oz car on the inclined plane/ramp/slope with 3,5,8 and 10 degrees. The 2.0 oz car didn't have enough mass or acceleration = force to move the pool ball. We recorded the information. Then we tested the 9.5oz Tesla Model X. It didn't have enough force at 3 degrees but it provided enough force to move the pool ball at 5,8 and 10 degrees. At 8 and 10 degrees the pool ball wanted to bounce off the ramp so we selected 5 degrees. We designed and tested a collected the information before we decided the best weight and slope. Table

	3 degrees	5 degrees	8 degrees	10 degrees	
2.0 oz car	No	No	No	No	
9.5 oz car	No	Yes	Yes	Yes	



Step 2: X-Ball

The Tesla will be held back by a rubber band so it doesn't fall off the inclined plane/ramp.

Like Step 1, we tested so that the force of the Tesla pushes the rubber band and the collides with the pool ball and transfers the kinetic energy to the other pool ball. The Tesla stays on the ramp and the pool ball rolls to the next ramp.



Step 3: Ready to Launch

The pool ball roll downs an inclined plane/ramp at 6 degrees. We didn't want the ramp to be too steep because we wanted the pool ball to stop at the switch ON THE RAMP. The pool ball stops because of the straws.

The pool ball pushes the axel through the straw and transfer the energy and pushes the other pool ball down

the same ramp.



This was one of the easiest and funnest steps we did .

Step 4: Chill Out



Step 5: 3.2.1 Blast Off

The pool ball falls down directly into the can. The mass of the pool ball is 6.9 ounces and is enough to lift the rocket using the pulley system because the rocket only weighs 6.5 ounces. The pulley system raises the rocket out the launch gantry slowly because the masses on either end of the pulley are basically the same mass.







Rocket

Step 6: Solar Melt

The blue marbles represent ice on Mars. The rocket deploys the solar panel which then melts the ice and turns the ice into water. The water flows down a two-channel inclined plane/ramp. One channel flows into a cistern. This water is important to us to drink, shower and swim. The other channel flows to the hydroponics grow lab.

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Step 7: Made You Grow

The water/marbles flow onto the highside of the lever/platform. The water is very important to the growth of plants for food. The mass of the marble causes the lever to tip over thus causing the highside of the lever to fall. This weight also causes the other side of the lever to rise up and deploy a 4 wheeled Monster Truck (see next Step for the Truck).



Step 8: Valley Ride

This is the simplest and most exhilarating step. You ride in a Monster Truck down a steep inclined plane/ramp(no helmet required but screaming is optional). We created a very steep slope/inclined plane so that the truck has serious force. But you will experience that soon with your impending doom when you hit the book full force.



Step 9: Fluid Power

The Monster Truck collides full force into the book which causes the kinetic energy from the Monster Truck to transfer to the book which is tilted upright. The book now falls and lands on the syringe causing the fluid/vinegar to flow into the tube and into the flask.



Step 10: Olympus Mons Tantrum

The vinegar flows into the flask and chemically interacts with the baking soda. The chemical reaction forms carbon dioxide gas but since it is a closed system the energy is conserved and the gas rises and fills the balloon. This represents the eruption of Olympus Mons.



Step 11: Boring into Mars

The mining of Mars is important because we need materials to build habitats and for high tech tools. We are studying the Mars Sample Return Campaign to learn how to bring samples of Martian rocks and soil safely back to Earth. Maybe the materials could be sold on Earth for cash to pay for our future trips and projects.

In our masine, the mining car rolls down an inclined plane/ramp to explore the resources. We used a Lego track and a cooling radiator from an overhead projector we took apart for Step 11. And we found out about the Boring Company that could help us mine Mars.





Step 12: Roadster Home

Simple but cool

The mining car delivers the rare minerals to the Tesla Roadster and now it's time to head home. The mining car nudges the Roadster gently so that there is no damage to the vehicle. That small amount of energy is enough to slowly push the Tesla down the inclined plane/ramp. This is like the crazy idea to send a Tesla Roadster to Mars. We will find that car and return it to Earth.





Step 13: Light It Up!

The Tesla Roadster rolls down an inclined plane/ramp and at the end of the ramp is a switch. The Tesla Roadster stops directly on the switch which activates an led light and lights the whole machine up. We designed an electrical circuit just for this step for bonus points.







Marsland Board Game



We decided to make a game and have fun with other students like our younger brothers and sisters. So we used the board game Candyland and changed the steps so that we would get to Mars. Students would learn about the model and we would share how much we learned.

				21
		Materials Li	ist	
	A	B C	D E	
	1 Material	Steps Renewable	Cost	
	2 Plywood	- <u> </u>	\$48.00	
	3 Model Tesla	Step 1 👻	borrowed toy	
	4 Pool Balls	Step 1 👻	borrowed	
	5 Cardboard	Step 1 👻	\$0.00	
	6 Pool Balls	Step 2 🔻	borrowed toy	
	7 Elastic Band	Step 2 🔻	\$0.00	
	8 Wires	Step 3 💌	\$1.20	
	9 Tin Foil	Step 3 💌	From home	
	10 battery 9V	Step 3 🔻	\$2.20	
	11 Cardboard	Step 3 🔻	\$0.00	
	12 pulley	Step 4 🔻	\$1.89	
	13 rocket - Lego	Step 5 🔻	borrowed toy	
	14 cardboard gantry	Step 5 🔻	\$0.00	
	15 wood for gantry	Step 5 🔻	dumster - was a room divider	
	16 solar panel	Step 6 🔻	recycled package material	
	17 marbles	Step 6 🔻	\$3.70	
	¹⁸ cardboard	Step 7 👻	\$0.00	
	19 cistern	Step 7 👻	tupperwear borrowed from teacher	
	20 Lego trees	Step 7 🔻	borrowed toy	
	21 straw	Step 7 👻	McDonalds	
	22 vehicle - Monster Truck	Step 8 🔻	borrowed toy	
	23 Track	Step 8 🔻	borrowed toy	
	24 cardboard	Step 8 🔻	\$0.00	
	25 Mars book	Step 9 🔻	Library	
	26 Syringe	Step 9 👻	\$5.30	
	27 Vinegar	Step 9 🔻	\$3.20	
	28 Baking Soda	step 10 ▼	\$3.40	
1	29 Blass Beaker	step 10 ▼	from science class	
	30 Balloons - 12	step 10 🔻	\$2.60	
	31 cardboard	step 11 ▼	\$0.00	
	32 Lego train	step 11 🔻 🗌	borrowed lego toy	
	33 Tesla car	step 12 🔻	borrowed toy	
	34 Track	step 12 🔻	borrowed toy	
	35 battery	step 13 👻 🗌	\$2.90	
	36 LED Lights	step 13 🔻	\$3.89	
	37 Tin Foil	step 13 🔻 🗌	From home	
	38		\$78.28	
	39			











Team Reflection by Amal Abdalla

When we first started we had an idea, but the idea didn't work. So, we got a new idea about Mars and SpaceX and NASA and a new machine. Sometimes our communication was not the best, but eventually we worked well together. While we were building the machine, I learned a lot of new facts about Mars. Before now, I really wasn't a science person. Now I am more interested in space and I want to learn more facts about more planets. The most interesting thing I learned about Mars is that one year on Mars is 687 days long.

And after the Mankato competition our coach showed us the judges comments about what we did well and how we did not do as well. We talked about the information and decided what to keep and what we need to do to improve. There was so much to do so when decided to chose the steps we could make better and who was able to get that done. We even decided to add electrical and chemical steps to challenge us and get more points.

Challenges-communication

Successes- we learned how to give everyone a chance to work and toward the end our communication got better. There was so much to do. At the 3M speaker at Mankato taked about communicating and do what you really want to do even if you have never done that before. His father did not do that until he was 70 years old.

I did not know we could do so much and that my friends could do things I never did and they never did before.

Bibliography

For Machine Design Ideas:

Mankato State University Resources: <u>https://engineering.mnsu.edu/engineering-machine-design-contest/resources/</u> Our favorite Rube Goldberg video: <u>OK Go - This Too Shall Pass - Rube Goldberg Machine - Official Video</u> Our favorite KAPLA video - 2 MILLION views: <u>https://www.youtube.com/watch?v=XULZ3Rm7TXE</u>

SpaceX: Mars and Beyond: <u>https://www.spacex.com/human-spaceflight/mars/</u>. So many great ideas and cool rockets like Falcon Heavy and videos

NASA and Mars Rovers: <u>https://mars.nasa.gov/mer/</u>

NASA and Growing Food in Space:

https://www.nasa.gov/directorates/spacetech/spinoff/NASA_Research_Launches_a_New_Generation_of_Indoor_Farming

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