Gr 5/6 - Mission to Mars

INTRO - Space + Mars + NASA Engineers **10 min** **1- Class sits in circle for intro**	Hi everyone! My name is __ and I'm here from Science North! Today we are going to talk about something very, very far away. It's found in outer space and is known as the red planet… any ideas? MARS. Mars is the 4th planet from the sun and is the closest planet to us! It is known as the red planet because it is full of iron oxide, which is the components of rust - the stuff you might see on an old car! There is so much we don't know about Mars and space in general because it is so vast. This is why we have the Canadian Space Agency and organis zations like NASA. Although Mars is 56 MILLION km away (think about that - 56 MILLION km! That's like us travelling around the Earth 1,600 times!), we have sent many missions to mars to try and gain knowledge about our neighbouring planet, like the geology, history, and potential for life. You may have heard of the Opportunity and Curiosity rovers *Show picture/pass around*. Opportunity has been on Mars since 2004 and has lasted 14 years longer than expected. As of January 2018, Opportunity had travelled 48 km. Curiosity, which launched 7 years ago, has been on Mars for 6 years. Curiosity has given us a lot of discoveries, as it has found potential stepping stones for life and water on Mars. It also found methane in the atmosphere which likely reduces the chances of life on Mars. NASA In Sight landed on mars on Nov 26 2018 - with goals to assess interior bedrock, magnetic field, climate, formation history, and potential for life and human exploration. *Keep up to date with InSight discoveries to give to classes:* https://mars.nasa.gov/insight/ Why do you think it's important to gather information about space and planets like Mars? *Promotes engagement in science, tech, and engineering* *We gather a lot of info about Earth from space* *Other habitable planets (Earth has 5,6 BILLION PEOPLE)* *To find natural resources* Now that we've talked a little about Mars, we are going to go on a little adventure to see what Mars looks like using VIRTUAL REALITY (*they may remember from last year so give quick recap on rules - stay seated, they should always hear bluecoat voice, and hold headset with two hands. This can be done in partners to save bluecoat time. If student has EA or assistance, give to adult to assist with that student)*. *FYI Mars Facts:* *Size: About half the size of Earth (6,792 km)* *Temp: -153 to 20 °C* *Gravity: About ⅓ Earth's gravity (a person who weighs 100 kg on Earth would weigh only 38 kg on Mars)* *Atmosphere: 7.5 milibar of pressure (Earth is 1000)*	Set up Picture of Curiosity + In Sight Have VR headsets ready to go (can even have ready in line/circle for class)

	Mars exploration info: https://mars.nasa.gov/programmissions/science/	
Challenge 1: Protect Mother board **20 min** **1 - Group Chat (circle)** **2 - Designing in groups of 3**	Now that we know a little bit about Mars, we are going to have a design challenge. We are going to pretend we are engineers at the Canadian Space Agency working with NASA and need to send a lander to Mars to gather information about the planet. We want to learn more about the environment, the climate, and if there is water somewhere below the surface. To gather this information, I have this special **MOTHER BOARD COMPUTER** *show bluetooth device* that we will be launching to the surface of Mars. These motherboards connect to your phone back on Earth and will send information about the flight of your lander. We can look at how fast your motherboard is travelling, and the G force it experiences when it lands. *GForce: The gravitational force, measurement of the type of acceleration that causes a perception of weight* *Show how to use app and what the data means.. Show them launch pad (wind tunnel) and how it works. Let students try out app to make sure they understand* Your first task is to protect this **motherboard** as **the launching acceleration and landing can** definitely damage the computer and break it before it sends any information to Earth. Keep in mind this is a VERY expensive project and you have 25 million dollars to spend in order to successfully land your mother board. I will be giving each of you 25 million dollars to spend on materials to protect your lander. This means you need to budget your money properly and plan out your design before you buy. You will be working in groups of 3 and you will need to fill out a budget sheet and a design drawing of what you want your lander to look like. Keep in mind the major goal is to protect your motherboard when it lands. We have a variety of materials available here, like shocks absorbers (hold up Qtips and cotton balls), suspension materials (hold up elastics and toothpicks). Remember that we are launching this into space, and so the heavier your lander is, the more fuel it will take to launch from earth. Good luck engineers! *5 mins Give each group a budget sheet + diagram space. Get assistance from teacher to group students (ensure those with extra needs get information properly, calculators available if needed)* *Once they have budgeted, they can come up for a Bluetooth sensor and tablet – quickly repeat how to read data on app. Give them requested supplies and tell them to start building – you have 10 minutes* Whoever has their design complete can come up and test out their design. This is the first step – you may need to change things after testing. I want you to record the G Force which will indicate the impact force once the lander hits the surface of mars. If your lander is too heavy you may need to rework your design. There is a bonus if you land in this	Inventory items (cotton balls, Qtips, toothpicks, paper, elastics, glue, tape, etc.) Brainstorm sheet + dry erase markers Fake money (print out in million dollar increments) Bluetooth sensor (x11) VR phones (x11)

	Mars “Sweet spot” (or safest area) which is thought to contain valuable minerals for Earth. *Have students test their design out and change certain things after testing.*	
Challenge 2: Parachute **Time** **15 min** **Designing in groups of 3**	I’ve sent your designs to the head engineer at Canadian Space agency and they have determined that there is still too much impact force on your landers. This means we need to change our design and add something else to reduce impact – a parachute! I’ve added plastic bags, cloth, tissue paper, and rope to our inventory and you each get an additional 5 million dollars to spend on these. You have 10 minutes to add a parachute to your lander to reduce the impact! Remember, we are still trying to land in the sweet spot! GO! Don’t forget to mark down your G force data from your science journal!	Plastic bags Rope Tissue paper
EXTRA Challenge 3: Dust Tornado **Time permitting**	The final challenge is to see if you can guess where your lander will land now that there is a secondary force in play. On Mars there is often dust tornados blowing around. On the day you send your lander out there is a vicious dust tornado hitting very close to your landing spot and will change where your lander lands (thus changing the environment it is getting information about!). Your job now is to guess where you think your lander will land now that this secondary force is in play. *Show class the fan at the end of the KODO tube*. Each group is going to get a sticker that they will place in the spot where you think your lander will end up. Remember that each of your landers are different so each lander will likely have a different landing location. You have 3 minutes to guess! Make sure to take a part all of your landers CAREFULLY to not break the sensor and return all materials that can be reused to our inventory and join me back in the circle!	Extra Fan or leaf blower
Conclusion:	So we just did an entire space engineering challenge to explore the flight of projectiles, G force, and secondary forces. Does anyone want to share some good or bad things about their lander design? Did your landers hit the sweet spot? How did the parachute affect your landing? If this was real life and we were sending things into space, what things would we have to consider? (we wouldn’t be in a gym on Earth!) *Gravity, distance, forces, time, weather* I hope you all enjoyed being space engineers for the day! Before we go, does anyone have any questions about space or Mars or being an engineer? Thank you! I’ll see you next year with something even COOLER!	

Design sheet:

Mission to Mars: Design and Budget

Draw your protection plan:			

Material Budget			
Item	**Price**	**Quantity**	**Total $** (Price x Quantity)
i.e. *Cotton Balls*	*$1,000,000*	*3*	*$1,000,000 x 3 = $3,000,000*
		GRAND TOTAL	

Curriculum links:

GRADE 5

Understanding structures and mechanisms

- Structures and mechanisms throughout our environment have forces that act on and within them
- We can measure forces in order to determine how they affect structures and mechanisms

1.1: Analyze the effects of forces from natural phenomenon

GRADE 6

Understanding Structures and Mechanisms: Flight

2.2: Use scientific inquiry/experimentation skills to investigate the properties of air

2.4: Use technological problem-solving skills to design, build, and test a flying device

2.5 Use appropriate science and technology vocabulary, including aerodynamics, compress, flight, glide, propel, drag, thrust, lift

3.1 Identify the properties of air that make flight possible

3.6: Describe ways in which the four forces of flight can be altered

Understanding Earth and Space Systems: Space

1.2 Evaluate the social and environmental costs and benefits of space exploration

2.3 Use scientific inquiry/research to investigate scientific and technological advances that allow humans to adapt to life in space

2.4: Use appropriate science and technology vocabulary

2.5 Use a variety of forms to communicate with different audiences for a variety of purposes

3.1: Identify components of the solar system

3.4: Identify the technological tools and devices needed for space exploration

3.5: Describe the effects of the relative position and motions of the earth, moon, and sun