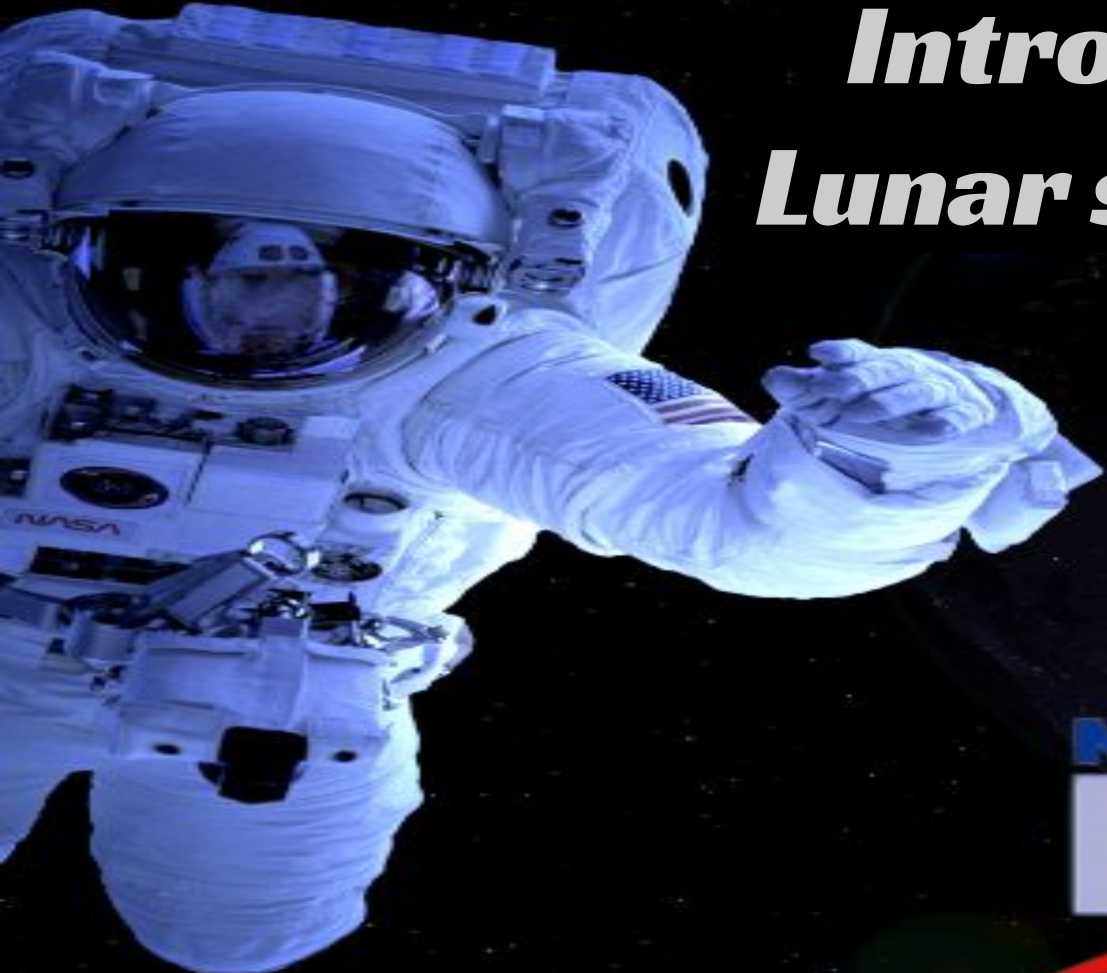
Introduction to Lunar scooter wheel



NASA HUNCH ACADEMY

Introduction to NASA HUNCH Video

Mission Statement: Empowering Elementary School Students in STEM through NASA HUNCH Academy

At NASA HUNCH Academy, our mission is to ignite a passion for STEM (Science, Technology, Engineering, and Mathematics) among elementary school students by providing an immersive and innovative educational experience inspired by NASA HUNCH. We strive to cultivate curiosity, critical thinking, and creativity, laying the foundation for future leaders in space exploration and technology.

Vision Statement: Fostering a Generation of Young Explorers and Innovators

Our vision at NASA HUNCH Academy is to create a dynamic learning environment where elementary school students can thrive in STEM fields. We envision a future where every child is equipped with the knowledge, skills, and inspiration needed to contribute to space exploration and technological advancements. Through hands-on experiences, collaboration, and mentorship, we aim to nurture a community of young explorers and innovators who will boldly shape the future of science and technology.

NASA and Moon landing videos

Objective

Read over the NASA HUNCH powerpoint, visit the websites and watch the videos for information
https://www.hunchdesign.com/uploads/2/2/0/9/22093000/lunar_scooter_wheels.pdf
Our Objective is to develop and design a prototype of a wheel that will be used on the lunar scooter.That will help our astronauts explore the surface fo the moon. First we will be focusing on the tread pattern for these wheels. How important the tread pattern is to a wheel. The wheels will need to be lightweight but will still be able to climb rough rocky terrain on the moon. The surface of the moon is like a very thin layer of sharp dust on top of rock and sand ike material called the regolith. We do not want our wheel to toss that sharp dust up on the astronauts suits. The astronauts safety is our greatest concern. Our wheels must be no larger than 18 inches diameter ,with ½ inch axles , No wider than 10 inches. Expect a speed range of 0 to 15 mph in very rough terrain with soft soil, rocks and potholes. Our front wheel steers the scooter and the rear wheel proples the scooter forward. How big do you think a scoot tire needs to be? How Tall, long, wide & round? How much should it weigh? How can we design it to be as lightweight as possible? First draw out your design with all your measurements. That is how you make a blueprint. Then later we will come back to this blueprint and add your information to tinkercad or a 3D printing cad program of your choice. Blue prints are a very important part of the design process. We will be conducting some investigation stations that will help us with our tread design. Have a fun, Ask questions and record your data like a Scientist and Engineer.

Introduction to Lunar Scooter Wheel video

Discussion Questions

What is the surface of the Moon like?
How much gravity is on the Moon?
What is the environment like on the Moon?
How long is a day on the Moon?
What does the tread of the tire actually do?
How does Friction affect a tire?
What is Traction?
Why is Traction important?
Does the size of a tire change the way it works?
What size do you think a scoot wheel is?
Is it bigger or smaller than a car tire?
Why do you think this is?
Are all tires the same size?
Why do you think our tire needs to be a smaller size?
Do you know how to measure a tire?
Does adding weight to a tire make a difference on it’s traction?
Will the tire tread leave a pattern on the surface of the moon?
How will what the surface made of effect the tread pattern we design?
What do you think the best tread pattern will be?
Why do you think this will be the best tread pattern for the Lunar Scooter?

Other information

Lightweight—$1.2 million /pound to deliver materials to the moon • Should be able to last more than 300 miles in rough conditions • 1/6th Earth gravity. Front and rear wheels can be the same or different—be prepared to defend either. • Is there a reason to have both wheels as drivers or should one drive and the other be free?—why? • There is value to both narrow and wide tires you are shooting for what works best for this application and environment. On Earth, the astronauts + the space suit + the scooter + the rock samples will weigh around 500 to 600 lbs. On the moon, this will be around 83 to 100 lbs. Design your wheels to meet this need. We will start by focusing on the tread pattern for this scooter wheel. Then we will design the entire wheel. We will be investigating soil, tire weight and measurements, and tread patterns as we go through this project. Take as much time on each station as you need. In the end, your students should develop and scooter wheel in Tinkercad or other 3D cad program. Or a blueprint of the wheel to submit to the NASA HUNCH Academy with a brochure of your work and progress with this project. The most important thing is to get your students thinking like Scientist and Engineers. We want every student to know that they are the future of space travel and all of them can do great thing. Keep looking to the stars and beyond.

Websites that will help

Information about the Moon.

https://solarsystem.nasa.gov/moons/earths-moon/in-depth/#:~:text=Nearly%20the%20entire%20Moon%20is,are%20known%20as%20the%20highlands

https://www3.nasa.gov/specials/wheels/

https://kids.nationalgeographic.com/history/article/moon-landing

https://lasp.colorado.edu/2020/09/02/lasp-researchers-develop-method-to-clean-lunar-dust-from-surface/

https://www.usatoday.com/story/tech/2014/01/05/nasa-brings-moon-indoors-to-kennedy-space-center/4329773/

https://airandspace.si.edu/collection-objects/wheel-lunar-rover/nasm_A19750830000

Videos about the moon

Elementary Math Standards for Georgia

MGSE2.MD.1 Measure the length of an object by selecting and using appropriate tools such as rulers, yardsticks, meter sticks, and measuring tapes.

MGSE2.MD.2 Measure the length of an object twice, using length units of different lengths for the two measurements; describe how the two measurements relate to the size of the unit chosen. Understand the relative size of units in different systems of measurement. For example, an inch is longer than a centimeter. (Students are not expected to convert between systems of measurement.)

MGSE2.MD.3 Estimate lengths using units of inches, feet, centimeters, and meters.

MGSE2.MD.4 Measure to determine how much longer one object is than another, expressing the length difference in terms of a standard-length unit.

MGSE3.MD.4 Generate measurement data by measuring lengths using rulers marked with halves and fourths of an inch. Show the data by making a line plot, where the horizontal scale is marked off in appropriate units – whole numbers, halves, or quarters.

MGSE4.MD.1 Know relative sizes of measurement units within one system of units including km, m, cm; kg, g; lb, oz.; l, ml; hr, min, sec. a. Understand the relationship between gallons, cups, quarts, and pints. b. Express larger units in terms of smaller units within the same measurement system. c. Record measurement equivalents in a two-column table.

MGSE4.MD.2. Use the four operations to solve word problems involving distances, intervals of time, liquid volumes, masses of objects, and money, including problems involving simple fractions or decimals, and problems that require expressing measurements given in a larger unit in terms of a smaller unit. Represent measurement quantities using diagrams such as number line diagrams that feature a measurement scale.

MGSE5.MD.1 Convert among different-sized standard measurement units (mass, weight, length, time, etc.) within a given measurement system (customary and metric) (e.g., convert 5cm to 0.05m), and use these conversions in solving multi-step, real word problems.

Elementary Science standards

S2E2. Obtain, evaluate, and communicate information to develop an understanding of the patterns of the sun and the moon and the sun's effect on Earth. a. Plan and carry out an investigation to determine the effect of the position of the sun in relation to a fixed object on Earth at various times of the day. b. Design and build a structure that demonstrates how shadows change throughout the day. c. Represent data in tables and/or graphs of the length of the day and night to recognize the change in seasons. d. Use data from personal observations to describe, illustrate, and predict how the appearance of the moon changes over time in a pattern. (Clarification statement: Students are not required to know the names of the phases of the moon or understand the tilt of the Earth.)

S3E1. Obtain, evaluate, and communicate information about the physical attributes of rocks and soils. a. Ask questions and analyze data to classify rocks by their physical attributes (color, texture, luster, and hardness) using simple tests. (Clarification statement: Mohs scale should be studied at this level. Cleavage, streak and the classification of rocks as sedimentary, igneous, and metamorphic are studied in sixth grade.) b. Plan and carry out investigations to describe properties (color, texture, capacity to retain water, and ability to support growth of plants) of soils and soil types (sand, clay, loam). c. Make observations of the local environment to construct an explanation of how water and/or wind have made changes to soil and/or rocks over time. (Clarification statement: Examples could include ripples in dirt on a playground and a hole formed under gutters.)

S4E2. Obtain, evaluate, and communicate information to model the effects of the position and motion of the Earth and the moon in relation to the sun as observed from the Earth. a. Develop a model to support an explanation of why the length of day and night change throughout the year. b. Develop a model based on observations to describe the repeating pattern of the phases of the moon (new, crescent, quarter, gibbous, and full). c. Construct an explanation of how the Earth's orbit, with its consistent tilt, affects seasonal changes

S5E1. Obtain, evaluate, and communicate information to identify surface features on the Earth caused by constructive and/or destructive processes. a. Construct an argument supported by scientific evidence to identify surface features (examples could include deltas, sand dunes, mountains, volcanoes) as being caused by constructive and/or destructive processes (examples could include deposition, weathering, erosion, and impact of organisms). b. Develop simple interactive models to collect data that illustrate how changes in surface features are/were caused by constructive and/or destructive processes. c. Ask questions to obtain information on how technology is used to limit and/or predict the impact of constructive and destructive processes. (Clarification statement: Examples could include seismological studies, flood forecasting (GIS maps), engineering/construction methods and materials, and infrared/satellite imagery.)