Introduction to Lunar Brick Mold

Introduction to NASA HUNCH Video

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

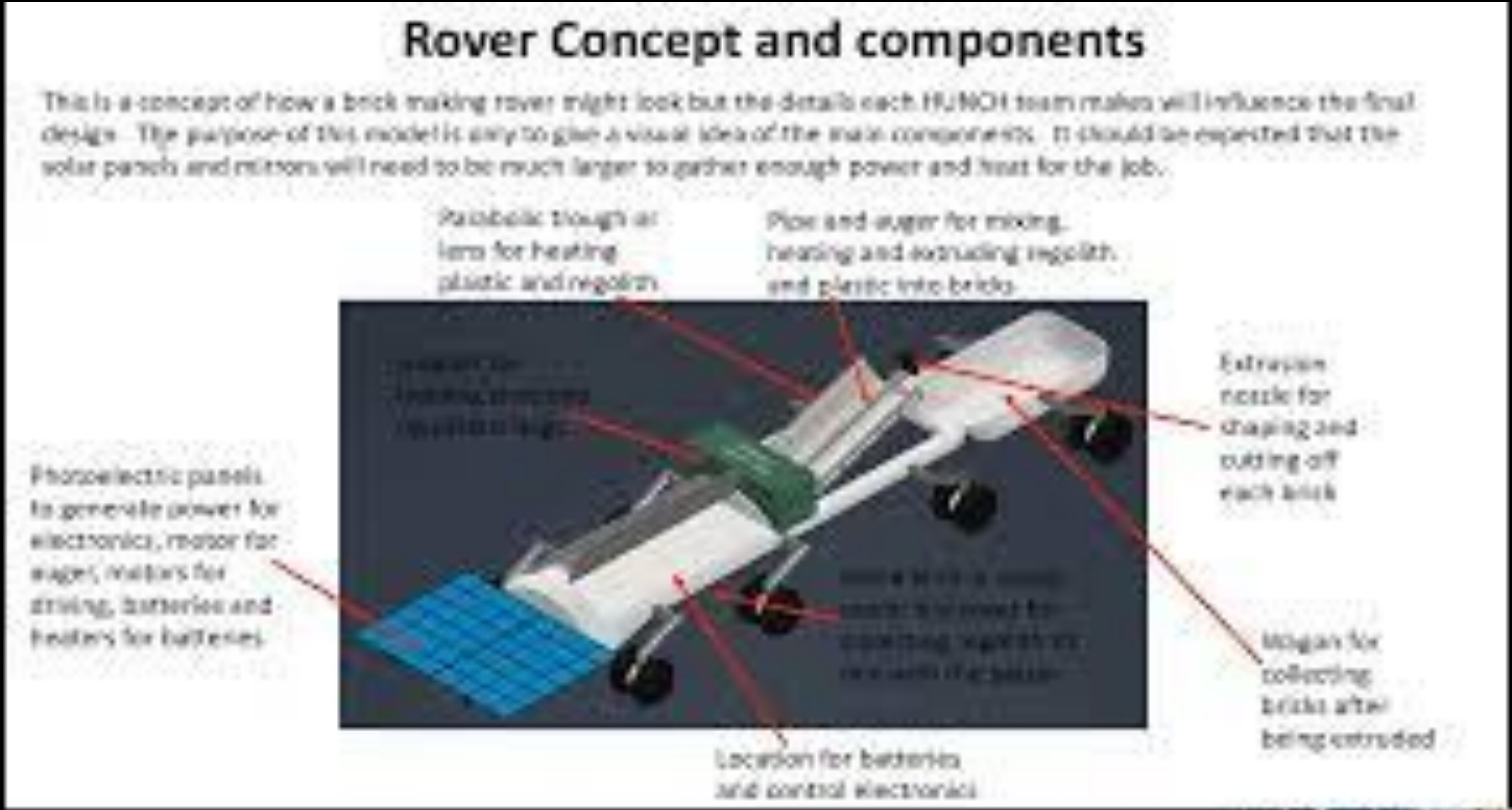
At NASA HUNCH Academy, our mission is to ignite a passion for STEM (Science, Technology, Engineering, and Mathematics) among elementary school students by providing an immersive and innovative educational experience inspired by NASA HUNCH. We strive to cultivate curiosity, critical thinking, and creativity,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

Introduction to Lunar Brick Project video



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/pipe_auger_extruder.pdf

Our objective is to develop and design a prototype of a brick mold that will be used on the lunar base in the future. Remember NASA is sending Artemis III to the moon to research for a Lunar base that would serve as a research center. In these lessons we are focusing on the mold /pattern for these lunar regolith bricks. The regolith which is the surface of the moon is like a very thin layer of sharp dust on top of rocks. These bricks will be made of lunar sand and the astronauts plastic waste shredded and melted down then it will be extruded out into a 1" x 1" x 5" brick. These bricks will be used for many different things including making buildings and roadways. In the next lesson you will learn about the soil on Earth and the Moon. Then you will investigate how big a brick mold will need to be? How tall, long, and wide ? How much should it weigh? How can we design it to be as lightweight as possible? First give your students a piece of paper to draw out their design with all your measurements given. That is how you make a blueprint, putting your ideas on paper. 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 brick mold design. Have fun, ask questions and record your data. Think like a Scientist and Engineer.

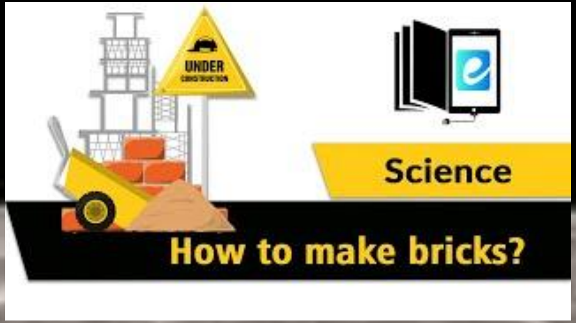
Discussion Questions

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?
How are bricks made on Earth?
How is the material different on the moon vs Earth ?
Do we need heat to make a brick?
How much material will it take to fill the mold?
How big does the mold need to be?
What type of plastic do you think NASA should use?
Is there static electricity on the moon?
How can static electricity affect our bricks?
How will making a brick on Earth be different?
How much plastic waste will the Astronauts use?
Why is it important to use plastic waste?
What would happen to plastic waste if we don't use it?

Important information

Lightweight—$1.2 million /pound to deliver materials to the moon • Should be able to last more than a 300 miles in rough conditions • 1/6th Earth gravity. The goal for the lunar brock rover is to make 100 bricks per 24 hours. Since a lunar day is about 14 days, we would like to make around 1400 bricks per lunar day. • The top few inches of lunar soil should already be around 250 degrees F if it has been sitting in the sun for long. • Do no try to heat up PVC plastic as it can off gas poisonous gasses that can kill you. • Your best option is to use grocery plastic bags which are made of polyethylene. We will start by focusing on the brick mold pattern for the Lunar brick maker. We will be investigating soil, brick weight and measurements, brick making (with salt dough) and investigating why the mold pattern is an important part of the lunar brick maker as we go through this project. Take as much time on each station as you need. In the end, your students should develop a brick mold pattern on a blueprint and in Tinkercad or other 3D cad program of the brick mold pattern 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 scientists 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.

Videos about the moon & bricks



Websites that will help

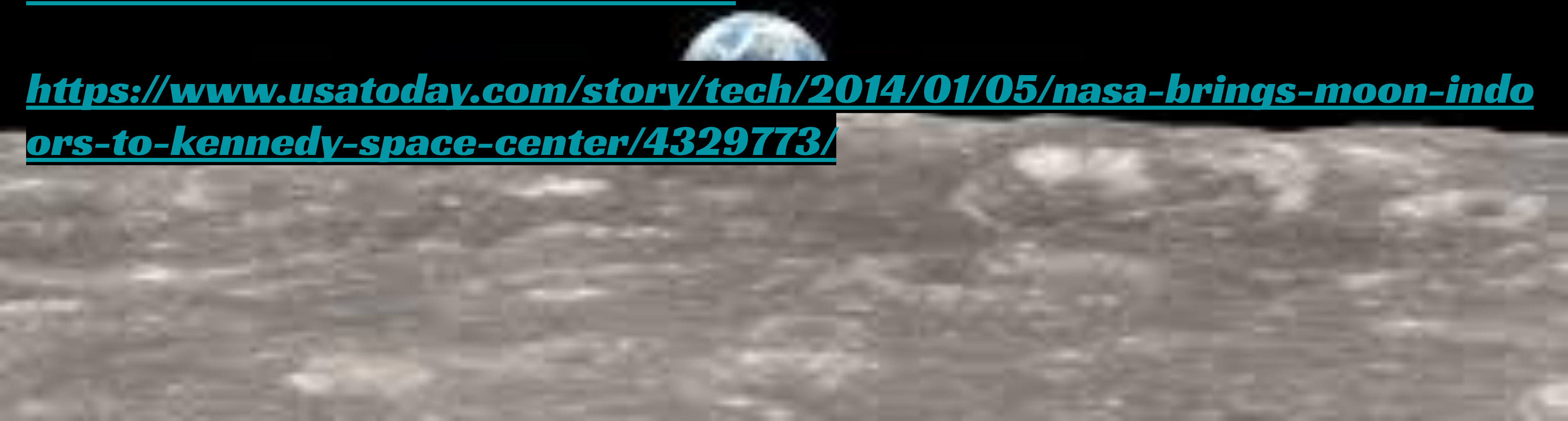
Information about the Moon.

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

https://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/



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.)