

Lesson One: Rover Gears™**Grade:** Kindergarten**Content Objective:** Using the Rover Gears™ set from Learning Resources®, students will build a rover to help NASA successfully navigate different terrains.**Language Objective:** Students will be able to state and justify opinions on how their rover will work well on the Mars terrain.**STEM Career:** Engineer, Programmer, Geologist**Vocabulary:**

- Terrain: a stretch of land
- Rover: robot that roars planet surfaces in space and acts as a geologist
- NASA: National Aeronautics and Space Administration

Next Generation State Standard(s):

K-ESS2-1: Use observations to describe patterns in the natural world in order to answer scientific questions.

K-ESS2-2: Construct an argument with evidence to support a claim.

ISTE Standard(s):

1.d. Understand the fundamental concepts of technology operations, demonstrate the ability to choose, use and troubleshoot current technologies and are able to transfer their knowledge to explore emerging technologies.

3.d. Build knowledge by actively exploring real-world issues and problems, developing ideas and theories and pursuing answers and solutions.

4.c. Develop, test and refine prototypes as part of a cyclical design process.

6.d. Explore local and global issues and use collaborative technologies to work with others to investigate solutions.

Materials:

- Gears! Gears! Gears!® Rover Gears™ set
- Mars terrain pictures:
 - o <https://www.universetoday.com/14885/mars-surface/>
 - o <https://mars.jpl.nasa.gov/gallery/martianterrain/PIA00563.html>
 - o <https://www.mnn.com/earth-matters/space/stories/hang-glidern-could-drop-probes-on-mars>
- Sand
- Dirt
- Rocks

- Flat object/bin to hold the “Mars” terrain

Preparation:

- Print out the Mars pictures for students or have them uploaded on the computer to show
- Create “Mars” terrain with sand and/or dirt and place rocks on top. This will be used for students to test their rovers on. Place the terrain in a flat bin. Here is a website to help understand the Mars terrain: <https://en.wikipedia.org/wiki/Mars>

Lesson:

1. Students will need the Gears! Gears! Gears!® Rover Gears™ set
2. Introduce problem to students: NASA needs a rover that will be able to successfully navigate the Mars terrain. Students will be in charge of building this rover using the Rover Gears set™.
3. Discuss the vocabulary word terrain. What is terrain? **Terrain:** a stretch of land. What types of terrain do you see around you? **Example:** sand, grass, dirt, rocks.
4. What does the terrain look like on Mars? You can share the pictures below with students. You can also put together Mars-like terrain that students can play with.
 - a. <https://www.universetoday.com/14885/mars-surface/>
 - b. <https://mars.jpl.nasa.gov/gallery/martianterrain/PIA00563.html>
 - c. <https://www.mnn.com/earth-matters/space/stories/hang-gliders-could-drop-probes-on-mars>
5. It may also help to show the video (<https://www.youtube.com/watch?v=nQ365jzkw5w&t=21s>) to give students further ideas of what the terrain is like on Mars. The video may be for older students. For younger students, it will help to stop and talk through what they are seeing. Examples: What did the scientists think the Mars terrain was like (**cold and dry**)? What did scientists really learn (**“alive”, dirt, rocks, dry desert, once covered in water**)?
6. It may help to show the video (<https://www.youtube.com/watch?v=3-MNAX1jgbA>). Note, for younger students, it will help to instead ask students questions throughout the showing of the video to help them understand what is a rover and how it works: What is a rover (**a vehicle to help NASA learn more about Mars**)? How does the rover move (**wheels**)? What type of terrain is the rover moving on (**sand and rocks**)? Did the rover have trouble moving on the sand (**it was sliding**)? How did this help scientists get the rover ready for Mars terrain (**the desert terrain was similar to what the Mars terrain will be like. Scientists then know what they need to change on the rover**)?
7. Show the gear set that students will be using. For an add-on, you can bring in other materials to enhance the rovers. Ask the class how they think they will use the pieces to build a rover. You can have students working in pairs.
8. Share as a class the ideas students have.
9. Introduce the “Mars” terrain the students will test their rover on. You could use sand and/or dirt and place rocks on the surface.
10. Pass out the gear pieces and have students begin their creation.
11. Once students feel they’re done, have them visit the terrains to test their rovers.
12. Students test and then modify their rovers based on how their vehicles did.
13. Once everyone has tested their rover, have them share with the class. How did they build their rover? What worked well? What did they have trouble with?

Questions to Guide Students:

- When students are choosing their rover design:
 - o Why do you feel this design will work best (evidence)?
- When students are testing their rover:
 - o How is your rover moving on the “Mars” terrain?
 - o What can you improve upon with your rover?

Check for Understanding:

- Students will be checked for their understanding through the building and testing of their rovers. Once completed, students can discuss or write

Challenge: For older students, you can use the Gears! Gears! Gears!® Motorized On the Move Building Set to have them motorize their vehicle.