



Mars Rover Celebration

Curriculum Module

Week 4: Understanding Rovers

Lesson 10: Landing, Moving, and Surviving Conditions



Educational Product	
Educators & Students	Grades 3-5

www.marsrover.org

Week 4: Understanding Rovers

LESSON 10:	LANDING, MOVING, AND SURVIVING CONDITIONS
GRADE LEVEL:	3-5
LENGTH:	2 DAYS
VOCABULARY:	conditions problematic strategy

MATERIALS:

- Student Science Notebooks
- Video: [Mars in a Minute - How Do You Land on Mars?](#)
- Science Notebooks
- Computers with Internet access and/or additional resource materials

ESSENTIAL QUESTION:

Why is the method you chose for landing your Rover on Mars the best one for your mission?

LESSON OBJECTIVE(S):

Students will be able to:

- Examine different methods for landing rovers on Mars
- Determine which landing strategy is best suited to land the team's rover
- Research solutions to different problems that may occur once the rover lands on Mars
- Learn how to write in a persuasive manner
- Present a well-written persuasive argument to teammates

ENGAGEMENT

1. At the beginning of this lesson, and using the attached documents, present the Essential Question and Key Vocabulary for students to consider during the lesson.
2. Remind students that they have learned about Mars, developed their scientific or technological question, and determined the requirements and criteria for their rovers.
3. Now they will begin to focus on how they will land their rovers on Mars. Ask students to use their Science Notebooks to brainstorm different ways they could land a rover on Mars.
4. Then, introduce the video [Mars in a Minute - How Do You Land on Mars?](#) (Runtime 1:00) and discuss the three ways that NASA has used for landing crafts on the surface and some details they learned during the video.

Note: Students may need to work with a partner or watch the video again to record all needed information.

EXPLORATION

1. Using the Science Notebook as a guide, each student in the team will choose a different landing strategy. Students may choose from:
 - Cushion balloons with retro rockets
 - Retro rockets and landing lights
 - Jet pack then gently lowered with cables
 - Student-generated landing strategy
2. Once each student has chosen their landing strategy, they will work with other students assigned to that same strategy. Students will research their one landing strategy in these temporary groups and record their research in their Science Notebooks.
3. When the teacher has determined that enough research has been gathered, students may return to their teams.
4. Present the mini-lesson to demonstrate to students how to write persuasively.
5. Allow students time to write persuasively why their landing strategy should be chosen by the team. When students have finished writing, students should present their findings. With the information presented by their team members, students will decide how they will land their rover on Mars.
6. Then, students will begin focusing on rover movement (wheels, track, rails, etc.) and rover survival (temperature, environment, atmosphere, etc.)
7. Working as a team, students will use the research gathered throughout the project to work through the questions in their Science Notebooks that focus on how their rover will move and survive in the conditions on Mars.

EXPLANATION

1. At the end of the lesson, bring students together to discuss and review how their rovers will land on Mars.
2. Then, ask students to share their thoughts on how their rovers will move once on the planet as well as how the rovers will survive Mars' harsh conditions.

ELABORATION

1. If time allows, students may add their additional information (landing, moving, surviving) to their team chart papers. Students should focus on comparing their multiple solutions and determining how likely each one is to meet the criteria and constraints of the problem.

EVALUATION

1. During this lesson, the teacher is encouraged to use formative assessments to determine and deepen student understanding. Teachers may wish to grade students' science notebooks to establish student understanding or assess student graphs and analyses/summaries.
2. Teachers are encouraged to create their own grade-level and ability-level assessments so as to best meet the needs of their students.

SUPPLEMENTAL RESOURCES

Mars in a Minute - How Do You Land on Mars?

<http://www.jpl.nasa.gov/education/videos/playVideo.cfm?videoID=30>

Mars in a Minute - How Hard it is for Curiosity to Land on Mars

<http://www.jpl.nasa.gov/video/index.php?id=1087>

Follow Curiosity's Descent to Mars

<http://mars.jpl.nasa.gov/msl/multimedia/interactives/edlcuriosity/index-2.html>

How to Land a Rover- Video

<http://www.pbs.org/wgbh/nova/insidenova/2012/08/how-to-land-a-mars-rover-video.html>

In-situ Exploration and Sample Return: Entry, Descent, and Landing

http://marsrover.nasa.gov/technology/is_entry_descent_landing.html

Entry, Descent, and Landing Configuration

<http://mars.jpl.nasa.gov/msl/mission/spacecraft/edlconfig/>

The Challenge of Landing on Mars

http://www.nasa.gov/vision/universe/solarsystem/mars_challenges.html

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