



# Investigating Mars with NASA's Curiosity Rover Data

Grade: 8

*Lesson Duration: 45 Minutes*

Course Name(s): Earth Science

Lesson Author: Scott Peterson, Mamaroneck, NY

## BIG IDEAS

*Students will use real data from NASA's Curiosity Rover mission to explore the geology and climate of Mars, examining the rover's discoveries and understanding Mars' potential to have supported water or life.*

## EDUCATION STANDARDS

Science Performance Expectations (or state Science standard):

**MS-ESS1-3:** Analyze and interpret data to determine scale properties of objects in the solar system.

<b>MS-ESS2-2:</b> Construct an explanation based on evidence for how geoscience processes have changed Earth’s surface at varying time and spatial scales.		
Science and Engineering Practices:	Disciplinary Core Ideas:	Crosscutting Concepts:
Analyzing and interpreting data.  Constructing explanations and designing solutions.	ESS1.B: Earth and the Solar System ESS2.A: Earth Materials and Systems	Scale, proportion, and quantity  Cause and effect
<b>Common Core State Standards:</b>  <i>ELA: ELA-Literacy.RST.6-8.1: Cite specific textual evidence to support analysis of science and technical texts.</i>		
<b>ITEEA Standards: None</b>		
<b>Other Standards: None</b>		

# MEASURABLE STUDENT LEARNING OBJECTIVES

*Students will be able to analyze and interpret data from NASA’s Curiosity Rover mission to describe the geological features of Mars.*

*Students will compare the climate of Mars to Earth, explaining the potential for water and life on Mars based on real data.*

# MATERIALS NEEDED

*Computers or tablets with internet access*

*NASA's Curiosity Rover data (available online)*

*Projector/Smartboard*

*Student handouts with guided questions*

# ENGAGING CONTEXT/PHENOMENON

*The lesson will start with a brief video from Curiosity's mission, showcasing Mars' landscape and Gale Crater. Students will discuss what they know about Mars and its exploration. The phenomenon centers around understanding how Mars' landscape informs scientists about its potential to have supported life.*

## DATA INTEGRATION

*Students will use real data from NASA's Curiosity Rover, including soil composition, rock layers, and atmospheric conditions, to analyze Mars' geological history and climate. They will interpret this data to hypothesize about Mars' ability to support life.*

## TEACHER BACKGROUND KNOWLEDGE

*Teachers should have a basic understanding of NASA's Curiosity mission, the geological processes on Mars, and how to navigate the Mars Exploration Program's data. Familiarity with key scientific terms related to planetary geology is essential.*

## DIFFERENTIATION OF INSTRUCTION

***For advanced students:*** Provide additional data on methane levels and the significance of organic molecules.

***For students needing support:*** Offer a simplified version of the data and provide additional guidance during the exploration phase.

## REAL-WORLD CONNECTIONS FOR STUDENTS

*This lesson connects space exploration to the broader understanding of life beyond Earth. The ongoing search for water and life on Mars aligns with real-world efforts to discover habitable planets, and Curiosity's mission exemplifies the collaboration between scientists and engineers to achieve this goal.*

## POSSIBLE PRIOR or MISCONCEPTIONS

*Students may believe that Mars is too cold and barren to have ever supported life.*

*They might assume that the presence of water automatically means life existed on Mars.*

## LESSON PROCEDURE

5E	Details of 5E Lesson Implementation (Visit <a href="#">BSCS</a> to learn more about the 5E instructional model)
<b>Engage</b>	<p><b>Lesson Objective:</b> Students will be able to analyze and interpret data from NASA's Curiosity Rover mission to describe the geological features of Mars.</p> <p><b>Standards Addressed:</b> MS-ESS1-3</p> <p><b>Materials &amp; Resources:</b> Video from NASA's Curiosity mission</p> <p><b>Procedure:</b> Show a video or image of Mars from Curiosity's mission. Ask students to brainstorm what they think the rover is looking for on Mars. Discuss the significance of finding water on another planet.</p> <p><b>Formative Assessment:</b> Assess prior knowledge based on student responses.</p> <p><b>Modifications:</b> Provide visuals and simplified explanations for students who may need them.</p>

<p><b><u>Explore</u></b></p>	<p><b>Lesson Objective:</b> Students will compare the climate of Mars to Earth, explaining the potential for water and life on Mars based on real data.</p> <p><b>Standards Addressed:</b> MS-ESS1-3, MS-ESS2-2</p> <p><b>Materials &amp; Resources:</b> NASA's Curiosity Rover data, guided worksheets</p> <p><b>Procedure:</b> Demonstrate how to access and interpret Curiosity's data. Students work in pairs to analyze rock formations, soil data, and atmospheric measurements.</p> <p><b>Formative Assessment:</b> Worksheets with observations and responses.</p> <p><b>Modifications:</b> Simplify tasks for students who need extra guidance and offer support through paired work.</p>
<p><b><u>Explain</u></b></p>	<p><b>Lesson Objective:</b> Students will compare the climate of Mars to Earth, explaining the potential for water and life on Mars based on real data.</p> <p><b>Standards Addressed:</b> MS-ESS2-2</p> <p><b>Materials &amp; Resources:</b> Student worksheets, projector</p> <p><b>Procedure:</b> Students share their findings in a class discussion, focusing on key data such as rock layers and methane levels. Discuss how this data informs scientists about Mars' climate and geological history.</p> <p><b>Formative Assessment:</b> Evaluate student participation in discussion and their ability to explain their findings.</p> <p><b>Modifications:</b> Allow students who struggle with speaking to write down their explanations or present in small groups.</p>
<p><b><u>Elaborate</u></b></p>	<p><b>Lesson Objective:</b> Students will compare the climate of Mars to Earth, explaining the potential for water and life on Mars based on real data.</p> <p><b>Standards Addressed:</b> MS-ESS1-3</p> <p><b>Materials &amp; Resources:</b> NASA data, guided questions</p> <p><b>Procedure:</b> Students compare Mars' landscape to Earth, discussing similarities and differences. They hypothesize what Mars' geological features suggest about its potential to support life.</p> <p><b>Summative Assessment:</b> Completed worksheets with comparisons and hypotheses.</p> <p><b>Modifications:</b> Provide sentence starters or examples to guide students in forming their hypotheses.</p>

<b><u>Evaluate</u></b>	<p><b>Lesson Objective:</b> Students will compare the climate of Mars to Earth, explaining the potential for water and life on Mars based on real data.</p> <p><b>Standards Addressed:</b> MS-ESS2-2</p> <p><b>Materials &amp; Resources:</b> Reflection prompts</p> <p><b>Procedure:</b> Students write a paragraph explaining the importance of Curiosity's mission and how its data has expanded our understanding of Mars.</p> <p><b>Summative Assessment:</b> Reflection paragraphs and participation in class discussions.</p> <p><b>Modifications:</b> Provide graphic organizers or prompts for students who need additional help structuring their reflections.</p>
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## REFERENCES

NASA Mars Exploration Program: <https://mars.nasa.gov/msl/>

NGSS Standards: <https://www.nextgenscience.org/>