

Activity Guide

How's the Weather on Mars?

Participants write and act out a brief (30-60 second) skit about the weather at a fictitious settlement on Mars. Use a green filming backdrop and Space Stage app to capture videos of the skits—using real images of Mars as a backdrop!



Credit: Space Science Institute/NCIL

Key Concepts

After doing this activity, participants will be able to:

- Describe how the weather conditions on Mars are generally cold and dry
- Convey factual information about Mars to family, friends, and peers in a fun and engaging way

Recommended Ages:

Families or other mixed-age groups, including children as young as 4 years old *with assistance from an older child, teen, or adult*

School-aged children ages 8-9

Tweens up to about age 13

Preparation Time:

1-2 hours

Activity Time:

20 minutes

Materials

- Script-writing materials:
 - Mars Factoids (below), cut into segments and tape and/or glue
 - How's the Weather on Mars? Realistic Script (below)
 - How's the Weather on Mars? Silly Script (below)
 - Colored pencils or crayons
 - Chart paper or dry erase board (and markers)
- Green Screen set up on its stand (see the Green Screen Setup and Calibration Guide in Section 4)
Tip: avoid wearing the color green
- Tablet and Space Stage App
- Optional (recommended): props and costumes, such as astronaut costumes; mittens or gloves; snow boots; ski masks; snow suits; umbrellas; sunglasses; sunscreen; a fan for wind; Styrofoam peanuts for snow
- Optional: Puppets or puppet making supplies such as googlie eyes, paper lunch sacks, socks, cardstock, popsicle sticks, colored markers, yarn, scissors, glue etc.
- Computer, speakers, projector, projection screen, and access to the Internet to provide background information

Preparation

1. When promoting the activity, emphasize that participants will need to avoid wearing green-colored clothing.
2. If possible, arrange to have at least one older child, teen, or adult available to help the groups write their scripts and hold the tablet during filming.
3. Gather materials.
4. Set up the Green Screen and provide a tablet with the Space Stage app preloaded on it. Have props and costumes available nearby.
5. **Optional:** Set up projector with videos and websites. From the National Weather Service, make note of any recent weather events in your town/area.
6. Cut Mars factoids (below) into segments and have them available along with the script templates, colored pencils and/or crayons, and tape and/or glue.
7. Print out the *How's the Weather on Mars?* Realistic and Silly Scripts.

Tip: If you do not have a Green Screen, create your own backdrop of Martian landscapes by projecting a NASA image of the surface of Mars.

Procedure

1. Introduce yourself. Help the participants learn each other's names (if they don't already).
2. Explain to the participants that they will create skits about an imagined visit to Mars, beginning with writing scripts and ending with filming their skits in front of a Green Screen.

Adapt this for younger children by introducing the activity as a puppet show where the puppets are astronauts exploring Mars. Structure the activity to use brainstorming and discussion in small groups, in place of script-writing. See below for suggestions.

3. Introduce the technology required for the activity. Find out what the participants know about Green Screens and their use in TV and film. Show a short video with tips on using Green Screen.
4. Explore sources of information on Mars and its weather by viewing short videos and photos about Mars, reading books, and/or visiting weather websites. Discuss recent weather at your location, and compare that to conditions on Mars, as reported by the Mars rover, Curiosity. Talk about what the participants thought was interesting. Optional (recommended): Post these ideas on a chart or dry erase board (or similar) for participants to incorporate into their scripts.
5. Explain to the participants that they will be writing a fictional weather report explaining to people on Earth what the weather is like on Mars, and comparing Mars weather to weather back in their hometown. Participants should pretend they are talking to someone back on Earth (a friend, or relative). The weather report will be 30-60 seconds long and should include information the participants have learned about Mars. Refer to the National Weather Service web site (www.weather.gov), and read today's weather as an example.

Procedure (continued)

6. Provide information to get them started. Say:
 - You are visiting Mars Base Alpha, and you are going to video chat home to friends and family back on Earth. Your friends and family ask, “How’s the weather?”
 - Pick interesting things about Mars to talk about in your skit, such as:
 - What the sky looks like
 - What you see on the ground and in the distance
 - Whether it’s really *really* cold today or just chilly – or if it is warm today
 - What kinds of gear you must wear to keep yourself comfortable on Mars
7. Invite the participants to form small groups and create a script, using one or more sources of ideas:
 - Interesting facts listed on the chart paper or white board
 - Mars Factoids and What’s the Weather Like on Mars? Realistic Script (see at the end of this guide)
 - What’s the Weather Like on Mars? Silly Script (see at the end of this guide)
8. If time allows, practice the skits and coach the participants in their presentation skills. Encourage them to take time to pause and take a breath between sentences, smile (if appropriate in the skit), keep arms relaxed at their sides, and look directly at the tablet’s camera.
9. Using a Green Screen and a tablet with the Space Stage app, have participants playact their weather reports. Have the person holding the tablet speak the parts of friends and family back on Earth, while the person on camera speaks the part of an astronaut on Mars. Guide participants in using the app, as needed.

Adaptations

Alternate idea (especially for younger children): Use or have participants make puppets to produce their skits! This would be a helpful adaptation for participants uncomfortable in front of the camera, plus making puppets would be fun! Work in small groups (with assistance from an older child, teen, or adult) to talk about different types of weather on Mars and how it is much colder than Earth – but there is sometimes wind, frost, or sunny days – like here on Earth! Have them select or create puppets to “explore Mars.” Brainstorm stories in small groups about their puppets and what they might say about the weather on Mars. Film the puppet shows using the Space Stage app and a green screen.

Note: If the participants wear green, they can hold up the puppets, and won’t be visible, or the puppet could be held up with string or popsicle sticks in front of the camera. Attempt it first before suggesting to participants to help with trouble shooting the best position to place the puppets.

Recommended Extension Activities

- Mars Match Game
<https://goo.gl/EeHbZa>
- Trip to Mars
<https://goo.gl/AfrguA>
- NASA Space Place Loopy Legends
<https://goo.gl/p29E62>

References

Permission to use existing text and modify NASA's MAVEN Mission's Red Planet: Read, Write, Explore! Lessons 4 and 5 provided by the University of Colorado Boulder's Laboratory for Atmospheric and Space Physics.
<https://goo.gl/9pGA9S>

About the MAVEN Mission

The Mars Atmospheric and Volatile Evolution (MAVEN) mission to Mars has instruments onboard to explore why Mars and Earth evolved in such different ways. One of the goals of the MAVEN mission is to get very accurate measurements of Mars' atmosphere. These measurements enable scientists to determine what happened to Mars' atmosphere throughout history since Mars is thought to have been warmer and wetter in the past.

Common Core for English Language Arts

Writing

- W.2.2. Write informative/explanatory texts in which they introduce a topic, use facts and definitions to develop points, and provide a concluding statement or section.
- W.3.2., 4.2, 5.2 Write informative/explanatory texts to examine a topic and convey ideas and information clearly.
- W.3.7, 4.7, 5.7 Conduct short research projects that build knowledge about a topic.

Speaking and Listening

- SL.2.2. Recount or describe key ideas or details from a text read aloud or information presented orally or through other media.
- SL.3.2. Determine the main ideas and supporting details of a text read aloud or information presented in diverse media and formats, including visually, quantitatively, and orally.

Mars Factoids

This is (name), reporting to your from (part of Mars).

The temperature is warmer at my feet than at my head.

Warm

Very cold

Cold

**70 degrees
Fahrenheit
(20 degrees Celsius)**

**-195 degrees
Fahrenheit
(-125 degrees Celsius)**

**-80 degrees
Fahrenheit
(-60 degrees Celsius)**

Windy

Dust storm

Dust devils

Clear

Daytime

Nighttime

Blue sunrise

Mid-day

Blue sunset

Icy

Snow

Dry

Pink sky

Thin clouds

Ground

Brown

Grey

Red

How's the Weather on Mars? - Realistic Script

You are visiting a Mars Base Alpha. You are calling home to friends and family and they ask, "How's the weather?" Here are some ideas of what to tell them:

- What the sky looks like
- What you see on the ground and in the distance
- Whether it's really really cold today or just chilly – or if it is warm today
- What kinds of gear you must wear to keep yourself comfortable on Mars
- How the weather compares to the weather back in your hometown on Earth

Write your script here. Add Mars factoids to your skit by gluing the words onto this sheet.

How's the Weather on Mars? - Silly Script

Hi, _____, It's me, _____, I hear the
PERSON IN THE ROOM NAME

weather is _____ there in _____ today.
TYPE OF WEATHER HOMETOWN

It's a _____ day on Mars! The sky is _____ with
ADJECTIVE COLOR

lots of _____. The ground is covered in _____.
NOUN COLOR

_____. It's as cold as a _____!
NATURAL OBJECTS FAVORITE FROZEN FOOD

Our thermometer read minus _____ degrees Fahrenheit. I definitely
NUMBER

wouldn't be walking around Mars without my _____ on today!
TYPE OF OUTDOOR CLOTHING

I'm _____ back to Base _____.
VERB ENDING IN "ING" NAME OF FAMOUS PERSON IN HISTORY

My friend, _____, promised to cook some
FAMOUS MOVIE STAR

_____ - my favorite!
ADJECTIVE HEALTHY FOOD

Destination Mars



Credit: NASA

Mars is a dry, desolate place without flowing water or vegetation. The surface is covered by fine, dusty sand, similar to a desert on Earth. Children may believe that because it is red-colored, Mars is hot. In fact, it is quite cold. Since it's farther from the Sun than Earth—about 78 million kilometers (48.5 million miles) farther out—it's also very cold at the surface. Average temperatures hover around -80 degrees Fahrenheit (-60 degrees Celsius), but the temperature can drop as low as -225 Fahrenheit (-153 degrees Celsius). Even at noon at the equator on a summer day, the warmest temperatures are usually only up to about 70 degrees Fahrenheit (about 20 degrees Celsius). The temperature drops dramatically just a few feet above the surface, so your feet would be much warmer than your head!

The diameter of Mars is 6,800 kilometers across—about half the diameter of Earth. It has only ten percent the mass of Earth. Because of the small diameter and low mass, the surface gravity on Mars is only about 1/3 the gravity on Earth (0.38 to be exact). If you weighed 45 kilograms (100 pounds) on Earth, you would weigh 17 kilograms (38 pounds) on Mars.

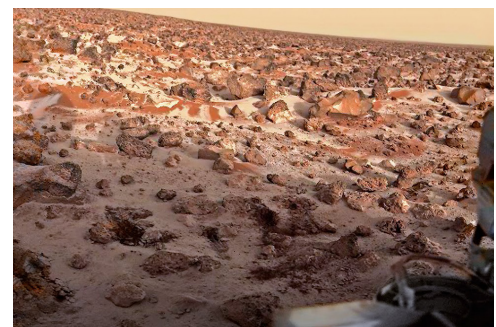
The thin atmosphere of Mars has very little oxygen, and unlike on Earth, its atmosphere does not trap much heat. The atmospheric pressure is 1/100 of Earth's. Huge sandstorms sometimes cover the face of the entire planet, but because of the low atmospheric pressure, the winds are very weak (just enough to stir up the dust). Mars has some of the same types of weather as on Earth, including dust devils, clouds, frost, and sunny days. It may even snow on Mars; NASA's Phoenix lander spotted what appeared to be a high-altitude snow storm in 2008. NASA's Mars Reconnaissance Orbiter observed dry-ice snow falling over the southern pole of Mars.

Note: The following images are all from the Space Stage App.

Mars is much colder than Earth because it is farther away from the Sun. Temperatures average a frigid -81 degrees Fahrenheit! Is your spacesuit well equipped to keep you warm?

URL: <https://goo.gl/63fy97>

Mars goes through extreme temperature changes from day to night due to a thin atmosphere and lack of water vapor. Average temperatures hover around -80 degrees Fahrenheit. Of course, temperatures vary based on seasons and distance from the equator.



NASA mission: Viking 2, 1979. Credit: NASA / JPL / Ted Stryk is licensed under CC BY-NC-SA 3.0

Destination Mars

Sunsets on Mars look very different than on Earth! Dust in the Martian atmosphere allows blue light to pass through while other wavelengths get blocked. Twilight, the time when you can still see a soft light from the sun even though it's below the horizon, is much longer on Mars – it lasts for close to two hours! This is caused by sunlight reflecting off of dust high in the atmosphere.

Mars boasts some of the biggest features in the entire Solar System! It has the largest volcano, Olympus Mons, three times taller than Mt. Everest, and the deepest and widest canyon, Valles Marineris, which is about as long as the United States is across, making it four times longer and, in places, four times deeper than the Grand Canyon!

URL: <https://goo.gl/r4cH4Z>

Valles Marineris is the largest canyon in the Solar System. Valles Marineris is sometimes called “The Grand Canyon of Mars,” but this Martian canyon is much deeper, longer, and wider than its terrestrial counterpart. It could stretch across the entire United States! It is approximately 2500 miles long, 400 miles across, and 4 miles deep!

Scientists believe that the canyon formed billions of years ago as the Martian crust cooled and cracked.

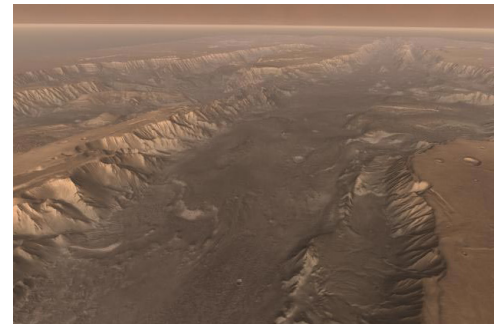
URL: <https://goo.gl/tVNQaF>

Rising approximately 18,000 feet above the surrounding Martian landscape, Mount Sharp is taller than any peak in the continental United States. Still, it's not even a quarter of the height of Olympus Mons, the tallest peak on Mars. Scientists study the mountain's layers to better understand early Martian environments.

URL: <https://goo.gl/w2pWvY>



NASA Mission: Curiosity Rover, 2015



NASA/JPL/Arizona State University, “Flight Into Mariner Valley”, 2006



NASA mission: Curiosity Rover, 2015

Destination Mars

Studying the rocks, minerals, and landscapes on Mars's surface helps scientists better understand past Martian environmental conditions. This region on Mars likely had environmental conditions in its past that were suitable for supporting life.

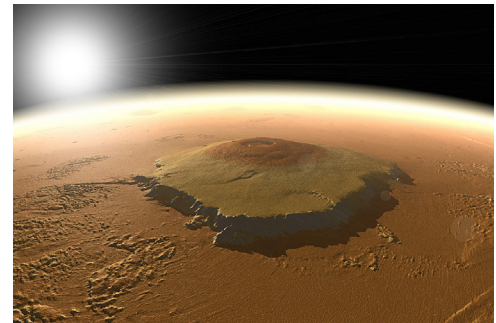
URL: <https://goo.gl/os9Ac3>



NASA Mission: Curiosity Rover, 2015

At over 90,000 feet tall, Olympus Mons is the largest known volcano in the entire Solar System. For perspective, Olympus Mons is three times as tall as Mt. Everest and as wide as the state of Arizona. Since the gravity on Mars is 62% lower than on Earth, climbing it should be a breeze!

URL: <https://goo.gl/dnh2Zk>



NASA/Mola Science Team/ O. de Goursac, A. Lark,
9 May 2012

Imagine what it would be like to go for a visit! Scientists and engineers are considering what it would take for humans to explore Mars. It's important to consider what a human would need to take with them just to step out onto the surface and take a quick glance around. If we want to visit the planet Mars and stay for any period of time, we have to consider the complexities involved in engineering an interplanetary journey and what a human needs to survive and thrive in a completely different environment. Along with our basic requirements of food, water, clothing, shelter, and oxygen, what else do we use and do every day that makes us not only able to survive, but keeps us happy and healthy, both mentally and physically, on Earth? These are questions scientists and engineers have when trying to design a space mission involving humans, whether they are simply going into orbit around Earth, staying for awhile in the International Space Station, or traveling farther out into space.

Humans require a lot to keep them alive, and that makes sending humans into space both risky and expensive. A long mission to Mars would not only be dangerous, but very physically and mentally taxing on the participants. Huge amounts of equipment are required to provide radiation protection, oxygen, waste removal, food, and exercise equipment. In space, muscles degrade, bones deteriorate, and the heart shrinks. Just to get to Mars would be an amazing feat for a human.

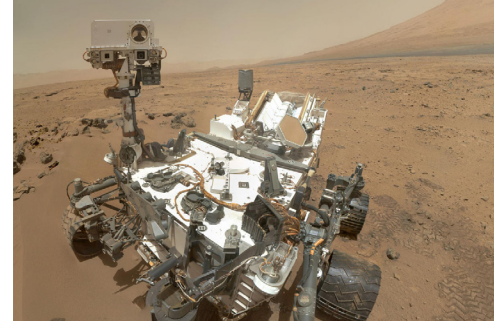
Once there, the shelter would have to be shielded from harmful radiation (e.g. from the Sun). Water and energy would have to be generated, and food would have to be grown. A trip to Mars would be for scientific research and that would include bringing transportation, digging equipment, and scientific instruments. To top it all off, some of the equipment would arrive needing assembly!

Destination Mars

Does the risk outweigh the benefit? Many would argue, “yes,” yet there are many reasons to push the limits of our capabilities by exploring *farther* and *farther*, both on Earth and off.

NASA’s Curiosity rover has many different tools to help it complete its mission, including a scoop that helps it collect rock samples.

URL: <https://goo.gl/SeZ6kA>



NASA mission: Curiosity Rover, 2012

Supporting Media

Videos, images, and websites can be incorporated before, during, or after Mars-related activities.

Green Screen Filming Tips

- “How Does a Green-Screen Work?”
<https://goo.gl/wbZu2e>

Mars Background Information

- Mars in Minute: Is Mars Red Hot? (NASA JPL)
<https://goo.gl/wJmr2j>
- Mars in a Minute: Is Mars Really Red? (NASA JPL)
<https://goo.gl/KXnyWe>
- Mars 101 (National Geographic)
<https://goo.gl/mSrcHL>
- Learn about Mars Facts with Pictures!
<https://goo.gl/woVuca>
- The Mysteries of Life with Tim and Moby: Is there Life on Mars (Brain Pop)
<https://goo.gl/6RW6FV>
- Mars Lithograph, NASA Educational Product LG-2013-07-569-HQ:
<https://goo.gl/aXmKSb>
- Check out Rover POV: Five Years of Curiosity Driving on Mars to find out what driving NASA’s Curiosity rover on Mars is like!
<https://goo.gl/4tYqsN>

Destination Mars

Near-real-time Weather Data

- Access to Mars weather updates from the Curiosity rover on Mars (cut and paste into browser)
<https://goo.gl/ChPXJo>
- Access to weather website such as National Weather Service:
<https://goo.gl/YV8UGF>

What's the Weather Like on Mars?

- Wispy Blue Clouds Over Mars:
<https://goo.gl/EYVaSv>
- Clouds over the Eastern Martian Horizon:
<https://goo.gl/LzmLhx>
- Clouds Sailing Overhead on Mars:
<https://goo.gl/f9Co3J>
- Clouds Sailing Above Martian Horizon:
<https://goo.gl/JeGqii>
- Frost at the Viking 2 landing site:
<https://goo.gl/8cfh3r>
- The Serpent Dust Devil of Mars:
<https://goo.gl/HtMr2F>
- NASA's Curiosity Sees Blue Sunset On Mars:
<https://goo.gl/QsWVs1>
- Seasonal Cycles at Gale Crater (as measured by NASA's Mars rover Curiosity):
<https://goo.gl/5qYn3W>

Mars Scenery

- Take a tour of Valles Marineris in NASA's Flight Into Mariner Valley video.
<https://goo.gl/8n959c>
- Use NASA's Mars Trek website to get a firsthand view of the Martian surface!
<https://goo.gl/iB1VGH>

Human Exploration of Mars

- Mars: Enduring the Journey (National Geographic)
<https://goo.gl/MRud3v>
- Mars: How to get to Mars (National Geographic)
<https://goo.gl/z6taHs>
- Today I learned how to transform Mars into our second home (National Geographic)
<https://goo.gl/CiZ25x>