(A) Student Handout. Mars Quick Facts (1 of 2)

LOCATION - Mars is the 4th planet from the Sun.

- Mercury (1), Venus (2), Earth (3), **Mars (4)**, Jupiter (5), Saturn (6), Uranus (7), & Neptune (8).
- Because it is about 1.5 times farther from the Sun than Earth, Mars receives less solar energy.
- Mars has seasons like Earth, but they last about twice as long because Mars travels farther around the Sun in its orbit than Earth.
- With current propulsion technology, it takes a minimum of 6 months to get to Mars.
- With radio communications, communicating with Earth has at least a 4-minute delay (and as much as 20 minutes) each way, depending on where the planets are in their orbits.

GEOLOGY/GEOGRAPHY - Mars is a desert planet with a rocky, dusty terrain.

- Large polar caps of carbon-dioxide (CO_2) ice (dry ice) and water ice.
- Largest canyon in the Solar System: (Valles Marineris) - 5 miles (8km) deep, 1,800 miles (3,000km) long, The Grand Canyon in Arizona is about 800 km long and 1.6 km deep.
- Largest volcano in Solar System (Olympus Mons) – 27 km high (~89,000 ft), 3x taller than Everest.
- Surface terrain is scarred with numerous craters.
- Mars' surface area = about 1/3 the surface of Earth (about the total area of Earth's continents).

WATER - Water is in the form of underground ice - no lakes, rivers, oceans currently on the surface of Mars.

- Water is in the form of ICE, mainly underground ice (though recent discoveries suggest occasional flows of briny water on the surface!).
- Subterranean water ice found in multiple locations, with greatest abundance in the Polar Regions.

(A) Student Handout. Mars Quick Facts (2 of 2)

TEMPERATURE - Mars is very COLD!

- Mars experiences a range of temperatures depending on surface location and altitude.
- The extreme temperatures on Mars vary between -190 ° F and 75 ° F—but the warmest temperatures would only happen in the middle of the day at the equator in the summer.
- Mars is ~1.5 times farther from the Sun than Earth; lacks a thick atmosphere to hold in heat.

ATMOSPHERE - You can't breathe the air on Mars.

- The Martian atmosphere is very thin – 1/100 that of Earth's atmosphere.
- The Martian atmosphere consists primarily of carbon dioxide.
- Winds on Mars sometimes create dust storms that can cover the entire planet.

RADIATION - Mars receives deadly levels of radiation from rocks, the Sun, and space.

- Mars has a very thin atmosphere that allows more of the Sun's harmful radiation to reach the surface than we experience on Earth.
- Mars does not have a magnetic field to reduce the amount of solar radiation that reaches the surface.

GRAVITY – Mars has 1/3 gravity than we do on Earth.

- Reduced gravity would affect the way you move and interact with things. You could jump three times higher and would feel three times stronger.
- A negative aspect to this gravitational effect would be the potential loss of muscle mass if you do not exercise frequently.

(B) Student Handout. Community Quality Assessment

Directions: In the Criteria Column, fill in the criteria, one per line. In the Peer Rating Column, place a number in the appropriate boxes to rate quality for each criterion.

When directed by your teacher at the end of the lesson, complete the Self-Quality Rating by placing a number in the appropriate boxes to rate quality for each criterion.

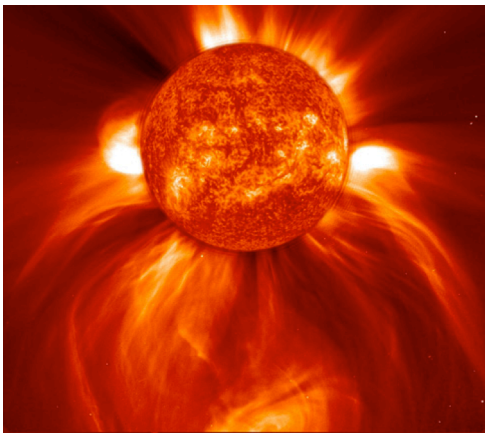
Quality Ratings:

1 = needs work, does not meet criterion
2 = good, meets criterion
3 = exceptional, exceeds criterion expectations

Criteria	Peer Quality Rating	Self-Quality Rating

(C) Student Handout. Scenario Cards (1 of 2)

Scenario 1: Solar Flare



Credit: http://pwg.gsfc.nasa.gov/istp/nicky/cme-chase.html

During a very strong flare, solar ultraviolet and x-ray emissions can increase by as much as 100 times. Flares heat the solar gas to tens of millions of degrees. The heated gas then radiates strongly across the whole electromagnetic spectrum from radio to gamma rays. This radiation can cause risks to human health and can take out communications systems.

Can your community withstand a solar flare?

1. Scientists believe hydrogen may block radiation.

2. Mars has a few small magnetic field "umbrellas," which can block some radiation from space.

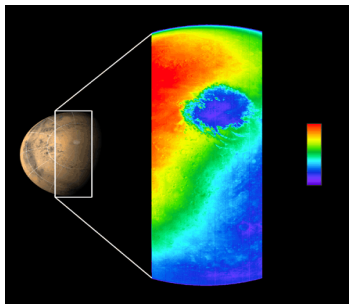
Scenario 2: Dust Storms

Dust Storm in Africa. Photo Credit: NOAA

At times, the entire planet of Mars can be covered in dust storms. Wind speed can increase to 50-100 meters per second during dust storms, and everything gets covered.

Can your community withstand a dust storm?

Scenario 3: Winter



Winter has arrived. Your community faces severe cold with temperatures potentially dropping to -190 degrees Fahrenheit (-123 degrees Celsius).

Can your community withstand an entire season of cold?

(C) Student Handout. Scenario Cards (2 of 2)

Scenario 4: Oxygen

In order to stay in shape, the members of your community have been exercising extensively.

They have more than doubled their oxygen intake.

Do you have a way to provide enough oxygen for every person for at least 2.5 years?

Scenario 5: Water

Your team calculated the amount of water needed to grow food.

However, the calculations were slightly off, and you need more water.

The people in your community still need to hydrate, and the plants need water to grow to provide enough food.

How will you increase water production for every person and for food growth?

Scenario 6: Gravity

The strongest person in your community, Captain Crusty is losing muscle mass due to the 1/3 gravity.

You need the Captain and every other community member in top physical shape.

What is your plan to overcome the 1/3-gravity effect on the human body?