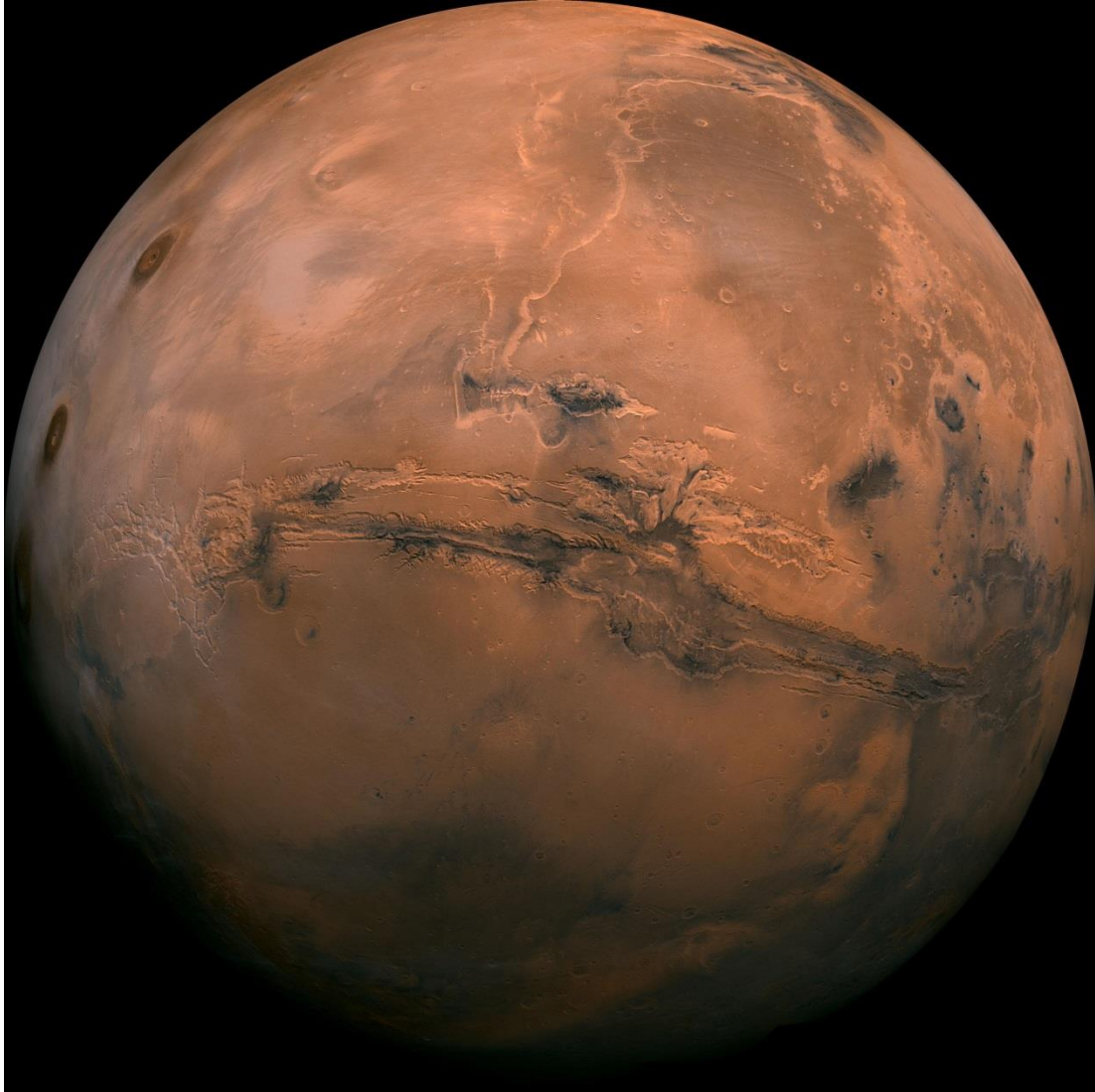


SO YOU WANNA BE A MARTIAN?



Rising Grades 6th through 8th
SPARK Camp 2017

Introduction

Rationale

Mars has long been the subject of stories, a source of intrigue, and the focus of decades of research and exploration. The Red Planet has been part of our collective social identity; it has inspired popular culture icons like Marvin the Martian of Bugs Bunny fame, the 1960's science fiction comedy sitcom *My Favorite Martian*, and, most recently, the award winning Hollywood blockbuster movie *The Martian*, just to name a few.

Because Mars has the potential to support human habitation, Mars has been a catalyst for developing new technology and capabilities. Because Mars is similar to Earth, it can provide insight into the future of our planet. Because Mars is within our reach, we are determined to explore the Red Planet. There are significant challenges to exploring and studying Mars. However, organizations like NASA and SpaceX are paving the way for a human mission to Mars.

We will need bright minds with new ideas to solve the challenges of space travel and exploration. During this unit, students will explore the environmental conditions of Mars, take a personality test, develop a proposal for the members of a crew, design the living space, and tackle a moral dilemma associated with a mission to Mars. These experiences will help students get to know Mars and get to know themselves and how to get the most out of their strengths.

Differentiation

This unit was designed for SPARK Camp, a week long summer enrichment camp for AIG students in Durham Public Schools. Differentiation is evident in many ways. The topic of a mission to Mars is outside the traditional curriculum. The unit is structured with open-ended, higher-order questions to promote creative thinking and promotes 21st century skills through collaboration, problem-solving, and reflection.

The lessons are designed using research-based gifted methodology that addresses the needs of gifted students. The lessons include Taba Concept Development, Problem-Based Learning, Visual Thinking Skills, and Kohlberg's Moral Dilemma. The personality assessment supports the social and emotional needs of AIG students by providing a forum for exploration of self and others.

Furthermore, students will be challenged to use the lens of survival to learn about what it takes to survive on Mars and how, as a member of a community, their unique strengths can promote survival. They will explore the concepts of community and survival through the lens of a mission to Mars.

The Students

This unit was designed for Durham Public Schools' students who have applied and are attending SPARK Camp, a week long camp for students identified as academically and/or intellectually gifted according to the district criteria. The students attending the camp are rising 4th through 8th graders. In general, the students are curious and have a well-developed sense of justice. They are typical in terms of physical development.

Durham Public Schools racial composition is: African-American 46.7%, Hispanic/Latino 30.1%, White 18.6%, Multiracial 2.8%, Asian 2.3%, American Indian 0.3%, Hawaiian/Pacific Islander 0.1%. The socio-economic status of students in Durham Public Schools is reflected in the 66.16% free and reduced lunch with 10 schools with Community Eligibility Provision where no applications are taken.

Students in DPS are identified as Intellectually Gifted with an age level composite score of 96% or above on a nationally normed aptitude/ability test. Students are identified as Academically Gifted in reading, math, or both reading and math have met the following criteria: a composite or subscore at or above the 90th percentile on a nationally normed achievement test in Reading and/or Math, an EOG/EOC/BOG score at or above the 85% or a minimum of three performance artifacts that support the students advanced ability/achievement.

Goals and Outcomes

Content Goals and Outcomes

Goal 1: To develop an understanding of Mars and a mission to Mars

Students will be able to...

- Research to determine the raw materials available on Mars
- Analyze the environmental conditions on Mars
- Compare survival on Mars to survival on Earth

Process Goals and Outcomes

Goal 2: To develop knowledge of self and others in terms of a mission to Mars

Students will be able to...

- Analyze personality types to determine jobs best suited for specific personality types
- Present a proposal for a crew on a mission to Mars
- Complete an application to become a member of a mission to Mars

Concept Goals and Outcomes

Goal 3: To understand how community impacts survival

Students will be able to...

- Predict jobs and functions necessary for survival on Mars
- Justify how their particular skill set will promote survival on a mission to Mars
- Design a community on Mars that will promote the survival of the crew

Assessment Plan

Students will be assessed using both formative and summative assessment. We will begin with a brief video about weather on Mars during which students will be asked to respond to each of the following questions: What was something you learned? What was something you already knew? What was something that emerged as a question? What information is missing? What was something that was unexpected? Student answers helped me to assess the level of knowledge students had about Mars.

Students will take a personality assessment which will provide both the student and me insight into who they are. They will use this information to determine their strengths and position on the crew as well as create a proposal for a mission to Mars.

Students will complete a daily journal entry answering the question: Based on what we did today, how does community promote survival? I read them daily and provided feedback. This will give me insight into how their thinking about community and survival develop.

Students will complete a performance task for the unit. The application is attached. Each day, students will be able to work on the performance task. I will address any misconceptions and questions each day based on the progress students make.

The following is the performance task for the unit:

Mission to Mars Astronaut Application

You have decided that you want to be an astronaut on one of the upcoming Mars Missions. This team needs astronauts that will promote the survival of the community as they travel to and explore Mars.

Complete an application for a position on the next mission to Mars. Your application will be submitted to the NASA Selection Committee for the next Mission to Mars. Include a cover letter, a short biography, and your answers to the following questions:

- 1. For what job are you applying and what are your qualifications for that job?*
- 2. How do your strengths support your application for this job?*
- 3. What do you know about Mars that makes you want to go?*
- 4. How would your acceptance in the program as a member of the team for the next Mission to Mars promote the survival of the community?*

Lesson Plans

TEACHER NAME		Lesson #
Donna Dodson		1
MODEL	CONTENT AREA	GRADE LEVEL
Taba Concept Development	Science	6 th - 8 th
CONCEPTUAL LENS		LESSON TOPIC
Survival		Mars
LEARNING OBJECTIVES <i>(from State/Local Curriculum)</i>		
6.E.1.2 Explain why Earth sustains life while other planets do not based on their properties (including types of surface, atmosphere and gravitational force) and location to the Sun. 7.L.1 Understand the processes, structures and functions of living organisms that enable them to survive, reproduce and carry out the basic functions of life 8.L.3 Understand how organisms interact with and respond to the biotic and abiotic components of their environment. 8.L.3.1 Explain how factors such as food, water, shelter and space affect populations in an ecosystem. 8.L.2 Understand how biotechnology is used to affect living organisms.		
THE ESSENTIAL UNDERSTANDING <i>(What is the overarching idea students will understand as a result of this lesson?)</i>		THE ESSENTIAL QUESTION <i>(What question will be asked to lead students to "uncover" the Essential Understanding)</i>
Community promotes survival		How does community promote survival?
CONTENT KNOWLEDGE <i>(What factual information will students learn in this lesson?)</i>		PROCESS SKILLS <i>(What will students be able to do as a result of this lesson?)</i>
- Atmosphere of Mars - Climate and weather conditions of Mars - Environmental conditions on Mars - Impact on humans of the environmental conditions on Mars		- Analyze information about Mars in order to draw conclusion about survival on Mars - Compare how survival on Mars is different than survival on Earth
GUIDING QUESTIONS <i>What questions will be asked to support instruction?</i> <i>Include both "lesson plan level" questions as well as questions designed to guide students to the essential understanding</i>		
Pre-Lesson Questions:	During Lesson Questions:	Post Lesson Questions:
Who are your other team members? How did you determine the grouping? What was something you already knew? What was something that you learned? What was something	What are the things that would impact survival on a mission to Mars? Do any of these items belong together? What would you call the groups that you formed? Why did you group them the way you did?	What can you say about all of the things that would impact survival on a mission to Mars? How is survival on Mars different than survival on Earth? Based on what we did today, how can community promote survival?

unexpected? What was something that emerged as a question? What information is missing? So, what does this mean?	Can we put these same items in different groups? Fewer groups? What would you call the new groups you formed? Why did you group them the way you did?	How can you use what you learned today to make progress on your application?	
DIFFERENTIATION <i>(Describe how the planned learning experience has been modified to meet the needs of gifted learners. Note: Modifications may be in one or more of the areas below. Only provide details for the area(s) that have been differentiated for this lesson.</i>			
Content	Process	Product	Learning Environment
Students will learn about Mars which represents novelty of content.	Use of Taba Concept Development lesson plan model.		Student-centered, small group discussions
PLANNED LEARNING EXPERIENCES <i>(What will the teacher input? What will the students be asked to do? For clarity, please provide detailed instructions)</i>			
Engage and Connect - This phase focuses on piquing students' interest and helping them access prior knowledge. This is the introduction to the lesson that motivates or hooks the students. Icebreaker: As students enter the room, each student will be given a card and asked to find other members of their group. After the students have identified their groups, they will be asked to address the questions on the back of each card: Introduce yourself. Who are your other team members? How did you determine the grouping? Teacher: "Today will be about getting to know Mars, where it is, what it's like and what challenges there might be." We will begin class with a weather video or Curiosity Report of Mars. The following questions will be posted on chart paper in the room and students will have sticky notes to record their answers and then post their answers. • What was something you already knew? • What was something that you learned? • What was something unexpected? • What was something that emerged as a question? • What information is missing? These questions will give me an idea about how much experience the students have had with the subject matter. Teacher: "So, what does this mean?" Explore - In this phase, the students have experiences with the concepts and ideas of the lesson. Students are encouraged to work together without direct instruction from the teacher. The teacher acts as a facilitator. Students observe, question, and investigate the concepts to develop fundamental awareness of the nature of the materials and ideas. Step 1: Students will be given How You'll Die on Mars and asked to list all of the things that would impact survival on a mission to and on Mars. Each item will be written on a sticky note which will allow them to reshuffle the groupings. After students have had a few minutes to read the passage, I will facilitate recording the things that impact survival on a mission to Mars. Mission will be the journey to Mars as well as exploration on Mars. Step 2: Students will be assigned to one of four groups. In their groups, they will need to answer the question: Do any of the items belong together? If we identify more than 20-25			

items, students will be instructed to select 20 items. Students will then create groups of items they determine belong together.

After a few minutes of working, I will ask them: What would you call the groups that you formed? Why did you group them the way you did?

Students will create a chart to report out their groupings.

Explain - *Students communicate what they have learned so far and figure out what it means. This phase also provides an opportunity for teachers to directly introduce a concept, process, or skill to guide students toward a deeper understanding.*

Step 3: After the initial report out, I will ask the groups to continue: Can we put these same items in different groups? Fewer groups? What would you call the new groups you formed? Why did you group them the way you did?

Elaborate —*Allow students to use their new knowledge and continue to explore its implications. At this stage students expand on the concepts they have learned, make connections to other related concepts, and apply their understandings to the world around them in new ways*

Step 4: Students will be asked to synthesize. What can you say about all of the things that would impact survival on a mission to Mars?

Then, students will be asked “How is survival on Mars different than survival on Earth?”

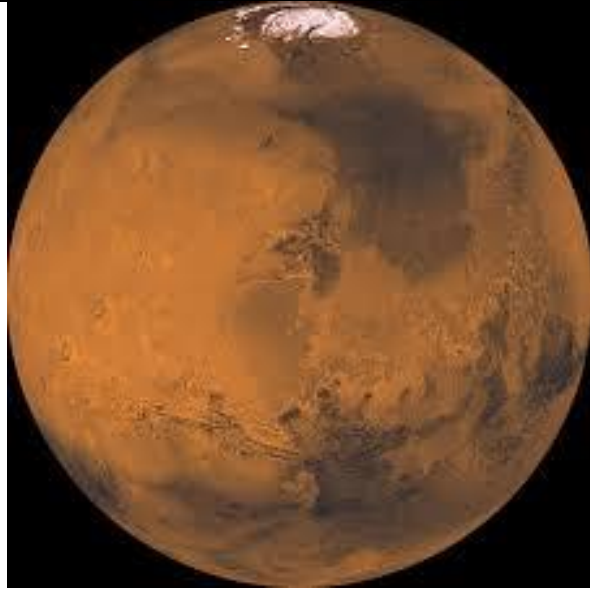
Evaluate: *This phase assesses both learning and teaching and can use a wide variety of informal and formal assessment strategies.*

JOURNAL ENTRY

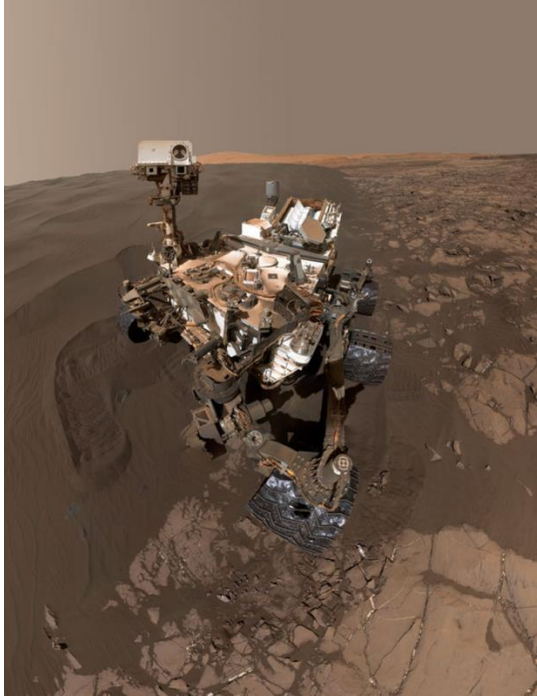
Students will be asked to write a journal entry answering the question: Based on what we did today, how does community promote survival?

WORKSHOP TIME

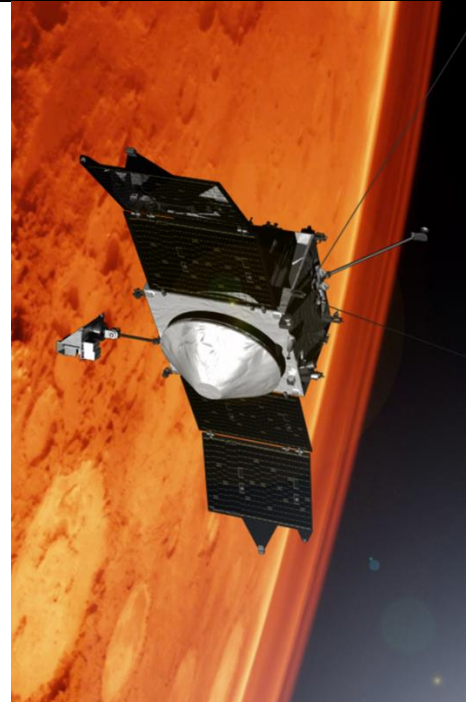
Teacher will introduce the performance task. Students will have workshop time each day to make progress on the performance task and address the question: How can you use what you learned today to make progress on your application?



	• Average diameter 4,212 miles (6,780 kilometers); about half the size of Earth, but twice the size of Earth's moon • Same land area as Earth, reminiscent of a cold, rocky desert • Mass 1/10th of Earth's; gravity only 38 percent as strong as Earth's • Density 3.9 times greater than water (compared with Earth's 5.5 times greater than water) • No planet-wide magnetic field detected; only localized ancient remnant fields in various regions • Highest point is Olympus Mons, a huge shield volcano about 16 miles (26 kilometers) high and 370 miles (600 kilometers) across; has about the same area as Arizona • Canyon system of Valles Marineris is largest and deepest known in solar system; extends more than 2,500 miles (4,000 kilometers) and has 3 to 6 miles (5 to 10 kilometers) relief from floors to tops of surrounding plateaus
• Fourth planet from the sun, the next beyond Earth • About 1.5 times farther from the sun than Earth • Orbit elliptical; distance from sun varies from a minimum of 128.4 million miles (206.7 million kilometers) to a maximum of 154.8 million miles (249.2 million kilometers); average is 141.5 million miles (227.7 million kilometers) • Revolves around sun once every 687 Earth days • Rotation period (length of day): 24 hours, 39 minutes, 35 seconds (1.027 Earth days) • Poles tilted 25 degrees, creating seasons similar to Earth's	• Atmosphere composed chiefly of carbon dioxide (95.3 percent), nitrogen (2.7 percent) and argon (1.6 percent) • Surface atmospheric pressure less than 1/100th that of Earth's average • Surface winds of 0 to about 20 miles per hour (0 to about 9 meters per second), with gusts of about 90 miles per hour (about 40 meters per second) • Local, regional and global dust storms; also whirlwinds called dust devils • Surface temperature averages minus 64 F (minus 53 C); varies from minus 199 F (minus 128 C) during polar night to 80 F (27 C) at equator during midday at closest point in orbit to sun

	Cameras • Mast Camera (Mastcam) • Mars Hand Lens Imager (MAHLI) • Mars Descent Imager (MARDI) Spectrometers • Alpha Particle X-Ray Spectrometer (APXS) • Chemistry & Camera (ChemCam) • Chemistry & Mineralogy X-Ray Diffraction/X-Ray Fluorescence Instrument (CheMin) • Sample Analysis at Mars (SAM) Instrument Suite Radiation Detectors • Radiation Assessment Detector (RAD) • Dynamic Albedo of Neutrons (DAN) Environmental Sensors • Rover Environmental Monitoring Station (REMS) Atmospheric Sensors • Mars Science Laboratory Entry Descent and Landing Instrument (MEDLI)
Mars Science Laboratory mission Part of NASA's Mars Exploration Program Long-term effort of robotic exploration of the red planet Designed to assess whether Mars ever had an environment able to support small life forms called microbes To determine the planet's "habitability" To acquire information about the geology, atmosphere, environmental conditions, and potential biosignatures on Mars To answer the question: Did Mars ever have the right environmental conditions to support small life forms called microbes?	Rover named Curiosity Part of NASA's Mars Science Laboratory mission Launched in November 2011 Landed in August 2012 in the Gale Crater near Mount Sharp Managed for NASA's Science Mission Directorate

	• Mastcam-Z • SuperCam • Planetary Instrument for X-ray Lithochemistry (PIXL) • Scanning Habitable Environments with Raman & Luminescence for Organics and Chemicals (SHERLOC) • The Mars Oxygen ISRU Experiment (MOXIE), • Mars Environmental Dynamics Analyzer (MEDA), The Radar Imager for Mars' Subsurface Exploration (RIMFAX)
Addresses high-priority science goals for Mars exploration, including key questions about the potential for life on Mars Takes the next step by not only seeking signs of habitable conditions on Mars in the ancient past, but also searching for signs of past microbial life itself Introduces a drill that can collect core samples of the most promising rocks and soils and set them aside in a "cache" on the surface of Mars Provides opportunities to gather knowledge and demonstrate technologies that address the challenges of future human expeditions to Mars Part of NASA's Mars Exploration Program	Part of NASA's Mars Science Laboratory mission Projected launch in July/August 2020 Rover named Curiosity Projected landing March/April 2021 Part of NASA's Mars Exploration Program Based on NASA's successful Mars Science Laboratory mission architecture, including its Curiosity rover and proven landing system Managed by NASA's Jet Propulsion Laboratory

	• Neutral Gas and Ion Mass Spectrometer • Imaging Ultraviolet Spectrograph • Magnetometer • Solar Wind Electron Analyzer • SupraThermal And Thermal Ion Composition • Langmuir Probe and Waves antenna • Solar Energetic Particles • Solar Wind Ion Analyzer
Will explore the Red Planet's upper atmosphere, ionosphere and interactions with the sun and solar wind. Data will be used to determine the role that loss of volatiles from the Mars atmosphere to space has played through time, giving insight into the history of Mars' atmosphere and climate, liquid water, and planetary habitability. Will orbit Mars to explore how the sun may have stripped Mars of most of its atmosphere, turning a planet once possibly habitable to microbial life into a cold and barren desert world The first spacecraft mission dedicated to exploring the upper atmosphere of Mars	The Mars Atmosphere and Volatile Evolution (MAVEN) mission, or MAVEN, mission Launched in November 2013 Reached orbit in September 2014 Part of NASA's Mars Scout program Funded by NASA Headquarters

TEACHER NAME		Lesson #
Donna Dodson		2
MODEL	CONTENT AREA	GRADE LEVEL
Problem-Based Learning	Science	6 th - 8 th
CONCEPTUAL LENS		LESSON TOPIC
Survival		Human Capital
LEARNING OBJECTIVES <i>(from State/Local Curriculum)</i>		
7.L.1 Understand the processes, structures and functions of living organisms that enable them to survive, reproduce and carry out the basic functions of life 8.L.3 Understand how organisms interact with and respond to the biotic and abiotic components of their environment. 8.L.3.1 Explain how factors such as food, water, shelter and space affect populations in an ecosystem. 8.L.2 Understand how biotechnology is used to affect living organisms. 8.P.2.2 Explain the implications of the depletion of renewable and nonrenewable energy resources and the importance of conservation.		
THE ESSENTIAL UNDERSTANDING <i>(What is the overarching idea students will understand as a result of this lesson?)</i>		THE ESSENTIAL QUESTION <i>(What question will be asked to lead students to "uncover" the Essential Understanding)</i>
Community promote survival		How does community promote survival?
CONTENT KNOWLEDGE <i>(What factual information will students learn in this lesson?)</i>		PROCESS SKILLS <i>(What will students be able to do as a result of this lesson?)</i>
• Personality type • Jobs necessary for survival on Earth • Jobs/Functions necessary for survival on Mars		• Analyze personality types to determine jobs best suited to personality types • Predict jobs/functions necessary for survival on Mars
GUIDING QUESTIONS <i>What questions will be asked to support instruction?</i> <i>Include both "lesson plan level" questions as well as questions designed to guide students to the essential understanding</i>		
Pre-Lesson Questions:	During Lesson Questions:	Post Lesson Questions:
What was something you already knew about yourself? What was something new that you learned about yourself? Why might knowing your personality type be relevant to being a member of a mission to Mars?	Who am I? What are the jobs on Earth that best fit my personality profile and also support the survival of the Earth community? What is my function within the community of Earth specifically how it relates to survival? How does this change if we are talking about a mission to Mars? What do you already know?	What did you learn? Why is this an important problem to solve? What feelings did you or do you have? How might solving this problem impact (positively or negatively) the future? In what ways do habitable communities promote survival? How can you use what you learned today to make progress on your application?

	What do you need to know? How are you going to proceed with solving this problem? What functions are necessary for a community to survive on Mars? What are the jobs necessary to perform those functions? Who among your group can best represent your proposal to the Board of Directors? What makes you say that? What functions did you determine were necessary for a Mission to Mars? What makes you say that? What are the jobs necessary to perform those functions? What makes you say that?	
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DIFFERENTIATION

(Describe how the planned learning experience has been modified to meet the needs of gifted learners. Note: Modifications may be in one or more of the areas below. Only provide details for the area(s) that have been differentiated for this lesson.)

Content	Process	Product	Learning Environment
Use of personality profile which represents novelty of content	Use of PBL as lesson model.		Student-centered, small group discussions

PLANNED LEARNING EXPERIENCES

(What will the teacher input? What will the students be asked to do? For clarity, please provide detailed instructions)

Engage and Connect - This phase focuses on piquing students' interest and helping them access prior knowledge. This is the introduction to the lesson that motivates or hooks the students.

To begin class, students will complete a [personality profile](#). After completion, students will identify their personality type and record their answers to the following questions in their journal:

- What was something you already knew about yourself?
- What was something new that you learned about yourself?
- Why might knowing your personality type be relevant to being a member of a mission to Mars?

Explore - In this phase, the students have experiences with the concepts and ideas of the lesson. Students are encouraged to work together without direct instruction from the teacher. The teacher acts as a facilitator. Students observe, question, and investigate the concepts to develop fundamental awareness of the nature of the materials and ideas.

Students will be grouped into one of four groups according to personality type. These personality groups will answer the questions:

- Who am I? (Give a brief description of a person that fits this personality type.)
- What are the jobs on Earth that best fit my personality profile and also support the survival of the Earth community? (Identify the jobs on Earth which are best suited for your specific personality profile and determine which of those jobs are relevant for survival on Earth.)
- What is my function within the community of Earth specifically how it relates to survival?

PROBLEM ENGAGEMENT

Teacher: So, how does this change if we are talking about a mission to Mars?

Students will be regrouped such that one member of each of the four personality type groups will become a member of a committee. The committees will be posed the following problem:

Mars Mission Control needs to assemble a team for the first mission to Mars. The members of the team will need to be able to perform all of the necessary functions as well as get along in order for the community to survive. Your committee must submit a proposal for the functions and jobs necessary for a mission to Mars. Proposals will be reviewed by the Board of Directors of Mars Mission Control for final decision.

Inquiry and Investigation

As a whole group, we will answer the following questions:

- What do you already know?
- What do you need to know?
- How are you going to proceed with solving this problem?
- What functions are necessary for a community to survive on Mars?
- What are the jobs necessary to perform those functions?

Problem Definition

The teacher will guide the class in restating the problem in the form of a question that they will need to answer in their assigned groups.

In their assigned groups, students will work collaboratively to determine the jobs and functions necessary for a mission to Mars.

Explain - Students communicate what they have learned so far and figure out what it means. This phase also provides an opportunity for teachers to directly introduce a concept, process, or skill to guide students toward a deeper understanding.

PROBLEM Resolution

Each group will present their designs to the Board of Directors (the class) and address the following questions:

Who among your group can best represent your proposal to the Board of Directors? What makes you say that?

What functions did you determine were necessary for a Mission to Mars? What makes you say that?

What are the jobs necessary to perform those functions? What makes you say that?

The teacher will facilitate a final decision discussion on the jobs necessary.

Elaborate —Allow students to use their new knowledge and continue to explore its implications. At this stage students expand on the concepts they have learned, make connections to other related concepts, and apply their understandings to the world around them in new ways

PROBLEM Debriefing

The teacher will facilitate a whole group discussion addressing the following questions:

What did you learn?

Why is this an important problem to solve?

What feelings did you or do you have?

How might solving this problem impact (positively or negatively) the future?

Evaluate: *This phase assesses both learning and teaching and can use a wide variety of informal and formal assessment strategies.*

JOURNAL ENTRY

Students will be asked to answer the following question as a journal entry:

Based on what we did today, how does community promote survival?

WORKSHOP TIME

Students will have 30-45 minutes to work on their application. How can you use what you learned today to make progress on your application?

TEACHER NAME		Lesson #
Donna Dodson		3
MODEL	CONTENT AREA	GRADE LEVEL
Problem-Based Learning	Science	6 th - 8 th
CONCEPTUAL LENS		LESSON TOPIC
Survival		Community
LEARNING OBJECTIVES <i>(from State/Local Curriculum)</i>		
7.L.1 Understand the processes, structures and functions of living organisms that enable them to survive, reproduce and carry out the basic functions of life 8.L.3 Understand how organisms interact with and respond to the biotic and abiotic components of their environment. 8.L.3.1 Explain how factors such as food, water, shelter and space affect populations in an ecosystem. 8.L.5 Understand the composition of various substances as it relates to their ability to serve as a source of energy and building materials for growth and repair of organisms. 8.L.5.2 Explain the relationship among a healthy diet, exercise, and the general health of the body (emphasis on the relationship between respiration and digestion). 8.L.2 Understand how biotechnology is used to affect living organisms. 8.P.2 Explain the environmental implications associated with the various methods of obtaining, managing and using energy resources. 8.P.2.1 Explain the environmental consequences of the various methods of obtaining, transforming, and distributing energy. 8.P.2.2 Explain the implications of the depletion of renewable and nonrenewable energy resources and the importance of conservation.		
THE ESSENTIAL UNDERSTANDING <i>(What is the overarching idea students will understand as a result of this lesson?)</i>		THE ESSENTIAL QUESTION <i>(What question will be asked to lead students to "uncover" the Essential Understanding)</i>
Community promote survival		How does community promote survival?
CONTENT KNOWLEDGE <i>(What factual information will students learn in this lesson?)</i>	PROCESS SKILLS <i>(What will students be able to do as a result of this lesson?)</i>	
- the raw materials available on Mars for construction - how long it will take to create a community on Mars	- Research to determine the raw materials available on Mars for construction - Design a community on Mars - Justify the need for each structure in the design	

GUIDING QUESTIONS			
What questions will be asked to support instruction? Include both "lesson plan level" questions as well as questions designed to guide students to the essential understanding			
Pre-Lesson Questions:	During Lesson Questions:		Post Lesson Questions:
What do you see in this picture? What makes you say that? What else is happening? When was this picture taken? What makes you say that? Does everyone agree with that? Does anyone see something different?	What do you already know? What do you need to know? How are you going to proceed with solving this problem? What resources are available on Mars for constructing a community? What needs to be transported to Mars? What will the people living on Mars be doing? How long will it take to build a community? How did you decide what structures are needed?		What did you learn? Why is this an important problem to solve? In what ways do habitable communities promote survival? What feelings did you or do you have? How might solving this problem impact (positively or negatively) the future? How do you think survival on Mars is different than on Earth? How do you think a community on Mars is different than a community on Mars?
DIFFERENTIATION			
(Describe how the planned learning experience has been modified to meet the needs of gifted learners. Note: Modifications may be in one or more of the areas below. Only provide details for the area(s) that have been differentiated for this lesson.			
Content	Process	Product	Learning Environment
	Use of VTS and PBL as lesson models.	Students will decide how to present their design (3D model, PowerPoint presentation, report, brochure, etc.) Different groups will design communities for different numbers of people.	Student-centered, small group discussions
PLANNED LEARNING EXPERIENCES			
(What will the teacher input? What will the students be asked to do? For clarity, please provide detailed instructions)			
Engage and Connect - This phase focuses on piquing students' interest and helping them access prior knowledge. This is the introduction to the lesson that motivates or hooks the students.			
We will begin class with the image:			
			

Students will be given a couple of minutes to view the image. Teacher will facilitate discussion of the following questions:

What do you see in this picture?

What makes you say that?

What else is happening?

When was this picture taken?

What makes you say that?

Does everyone agree with that?

Does anyone see something different?

To transition into the lesson, the teacher will ask: Why do you think we need to know what's going on in this picture?

Explore - *In this phase, the students have experiences with the concepts and ideas of the lesson. Students are encouraged to work together without direct instruction from the teacher. The teacher acts as a facilitator. Students observe, question, and investigate the concepts to develop fundamental awareness of the nature of the materials and ideas.*

PROBLEM ENGAGEMENT

The teacher will pose the following problem:

When the first team of astronauts lands on Mars, they will need a sustainable community, a place where they can live while they do the work of the mission. Your team has been tasked with designing a sustainable community and will submit your design proposal to Mars Mission Control.

Inquiry and Investigation

As a whole group, we will answer the following questions:

- What do you already know?
- What do you need to know?
- How are you going to proceed with solving this problem?
- What resources are available on Mars for constructing a community?
- What needs to be transported to Mars?
- What will the people living on Mars be doing?
- How long will it take to build a community?
- How did you decide what structures are needed?

Problem Definition

The teacher will guide the class in restating the problem in the form of a question that they will need to answer in their assigned groups.

In their assigned groups, students will work collaboratively to design the community in which the astronauts will live and work.

Explain - *Students communicate what they have learned so far and figure out what it means. This phase also provides an opportunity for teachers to directly introduce a concept, process, or skill to guide students toward a deeper understanding.*

PROBLEM Resolution

Each group will present their designs to the class and address the following questions:
How many people was your group assigned?
How did the different numbers of people impact your decision-making and design?
How do you think a community on Mars is different than a community on Mars?

Elaborate —Allow students to use their new knowledge and continue to explore its implications. At this stage students expand on the concepts they have learned, make connections to other related concepts, and apply their understandings to the world around them in new ways

PROBLEM Debriefing

The teacher will facilitate a whole group discussion addressing the following questions:
What did you learn?
Why is this an important problem to solve?
What feelings did you or do you have?
How might solving this problem impact (positively or negatively) the future?

Evaluate: This phase assesses both learning and teaching and can use a wide variety of informal and formal assessment strategies.

Journal entry:

Students will be asked to answer the following question as a journal entry:
In what ways do habitable communities promote survival?

WORKSHOP TIME – Students will have 30-45 minutes to work on their application. How can you use what you learned today to make progress on your application?

TEACHER NAME		Lesson #
Donna Dodson		4
MODEL	CONTENT AREA	GRADE LEVEL
Kohlberg Moral Dilemma	Science	6 th - 8 th
CONCEPTUAL LENS		LESSON TOPIC
Survival		Decision-Making
LEARNING OBJECTIVES <i>(from State/Local Curriculum)</i>		
Language Arts – take a position, examine perspectives of others, making inferences, decision making, formulating and justifying position		
THE ESSENTIAL UNDERSTANDING <i>(What is the overarching idea students will understand as a result of this lesson?)</i>		THE ESSENTIAL QUESTION <i>(What question will be asked to lead students to “uncover” the Essential Understanding)</i>
Community promote survival		How does community promote survival?
CONTENT KNOWLEDGE <i>(What factual information will students learn in this lesson?)</i>		PROCESS SKILLS <i>(What will students be able to do as a result of this lesson?)</i>
- A dilemma is a situation in which a difficult choice has to be made between two or more alternatives, especially equally undesirable ones. - That reasoning informs perspective - That perspective informs decision making - Outcomes of dilemmas impact survival regardless of the choice - Resolutions for dilemmas impact community		- Evaluate decisions using a moral lens - Inferring perspectives from context - Analyze perspectives in order to inform a position - Using knowledge to justify a position

GUIDING QUESTIONS			
What questions will be asked to support instruction?			
Include both "lesson plan level" questions as well as questions designed to guide students to the essential understanding			
Pre-Lesson Questions:	During Lesson Questions:		Post Lesson Questions:
Who has a dilemma? What is the dilemma? In general, what is a dilemma? How could their dilemma impact community? How does it impact survival? What is decision-making? What does it mean to take a position? How could your decisions impact community? What is the relationship between dilemma and survival What is the relationship between dilemma and community? How is decision making related to dilemma?	What do you think Jackie should do and why? How are your reasons similar or different from your classmates? What is the strongest reason to support your position? Why do you say that? Who will be impacted by Jackie's decision? Why? How might the mission be impacted based on Jackie's decision? Why? How might Jackie feel based on her decision? What are your reasons for saying that? What do you think Jackie should do? What is the most important reason for this action?		In what ways do communities promote survival? How far would you go to survive? To help the world survive? How can you use what you learned today to make progress on your application? What job did you apply for and how do your strengths and qualifications support your application?
DIFFERENTIATION			
(Describe how the planned learning experience has been modified to meet the needs of gifted learners. Note: Modifications may be in one or more of the areas below. Only provide details for the area(s) that have been differentiated for this lesson.			
Content	Process	Product	Learning Environment
	Use of Kohlberg's Moral Dilemma as lesson models. Use of higher order questions.	Completion of an individual, unique application.	Student-centered, small group discussions
PLANNED LEARNING EXPERIENCES			
(What will the teacher input? What will the students be asked to do? For clarity, please provide detailed instructions)			
Engage and Connect - This phase focuses on piquing students' interest and helping them access prior knowledge. This is the introduction to the lesson that motivates or hooks the students.			
The word <i>DILEMMA</i> ? will be written on the board as the students enter the class. Step 1: We will begin class with a clip from the movie <i>The Martian</i> (2016). While watching the clip, think about the following questions: Who has a dilemma? What is the dilemma? In general, what is a dilemma? How could their dilemma impact community? How does it impact survival? What is decision-making? What does it mean to take a position? How could your decisions impact community? What is the relationship between dilemma and survival			

What is the relationship between dilemma and community?
How is decision making related to dilemma?

Explore - In this phase, the students have experiences with the concepts and ideas of the lesson. Students are encouraged to work together without direct instruction from the teacher. The teacher acts as a facilitator. Students observe, question, and investigate the concepts to develop fundamental awareness of the nature of the materials and ideas.

Step 2: Students will read the following Jackie's Dilemma:

Jackie always wanted to travel to Mars so she became an astronaut. She also studied environmental science and engineering and is top in her field in engineering and creating livable sustainable structures on Mars for long-term exploration. Her two children (ages 11 and 13) love hearing her stories of space flight and seeing the pictures she's taken from her many visits to the International Space Station. A mission to Mars has been in the planning stages for years but has not actualized because scientists haven't figured out a way to return from Mars. Recently, Mars Mission Control set a date of next year for the first mission to Mars. The timeline for the mission to Mars was moved up because of a recent report that said in 50 years Earth will not be able to sustain humanity and according to most experts the most viable solution will be to colonize Mars. Rather than simply exploring Mars, the mission will be exploring and beginning the process of colonizing for future generations to be able to live on Mars. Jackie is the top choice for this mission to Mars. What should she do?

Step 3: Students will summarize the events, identify the characters and describe alternatives.

Step 4: The teacher asks the students to take a tentative position on the action that Jackie should take and the major reason for their choice and record their position on Jackie's Dilemma. After a few minutes, the teacher will ask students to identify their initial position and reason for taking that position.

Step 5: The teacher splits the class into small groups according to their initial position. Students are instructed to share their reasons within their groups and, if needed, select the two best reasons that support their common position.

- How are your reasons similar or different from your classmates?
- What is the strongest reason to support your position? Why do you say that?

Explain - Students communicate what they have learned so far and figure out what it means. This phase also provides an opportunity for teachers to directly introduce a concept, process, or skill to guide students toward a deeper understanding.

Step 6: The teacher brings the class back together for a whole class discussion and poses the following questions:

- Who will be impacted by Jackie's decision? Why?
- How might the mission be impacted based on Jackie's decision? Why?
- How might Jackie feel based on her decision? What are your reasons for saying that?

Elaborate —Allow students to use their new knowledge and continue to explore its implications. At this stage students expand on the concepts they have learned, make connections to other related concepts, and apply their understandings to the world around them in new ways

Step 7: Students are asked to reevaluate their positions individually and answer the following questions:

- What do you think Jackie should do?
- What is the most important reason for this action?

Evaluate: This phase assesses both learning and teaching and can use a wide variety of informal and formal assessment strategies.

JOURNAL ENTRY

Students will be asked to answer the following question as a journal entry:

- Based on what we did today, how does community promote survival?
- How far would you go to survive? To help the world survive?

WORKSHOP TIME

Students will complete their application. How can you use what you learned today to make progress on your application?

SHOWCASE/DEBRIEF TIME

Students will present by answering the following questions: What job did you apply for and how do your strengths and qualifications support your application?

Cover Letter				
Name				
Title	First	Middle	Last	Suffix
Email address				
Postal address				
Number and Street				
Apt #				
City				
State/Province				
Zip/Postal Code				
Country				
Home phone				
Mobile phone				
Student ID number				
Education				
Name and location	Dates Attended: From - To	Describe your area of interest in science.		
List any honors or awards				
List any extracurricular activities				
Applicant Statement				
Please answer the following questions				
1. For what job are you applying and what are your qualifications for that job?				
2. How do your strengths support your application for this job?				
3. What do you know about Mars that makes you want to go?				
4. How would your acceptance in the program as a member of the team for the next Mission to Mars promote the survival of the community?				

Unit Resources

Aldrin, Buzz (2013) *Mission to Mars: My Vision for Space Exploration*. Washington, D. C.: National Geographic Society.

Carney, Elizabeth. (2014). *National Geographic Readers: Mars*. Washington, D. C.: National Geographic Society.

Cross, E. & Parrott, L. (2016). *Local Academically or Intellectually Gifted (AIG) Plan 2016-2019*. Durham, NC: Durham Public Schools. Retrieved from <https://www.dpsnc.net/cms/lib/NC01911152/Centricity/Domain/137/AIG%20Plan.pdf>.

Facts and Figures About Durham Public Schools. Retrieved from <https://www.dpsnc.net/domain/78>.

The Durham Public Schools website that includes the basic demographics about Durham Public School students.

Free Personality Test. Retrieved from <https://www.16personalities.com/>.

This free online personality test was used on Day 2. Students took the test to determine their personality type based on the Myers-Briggs type. In addition, students researched some of the jobs and skills that were strengths of particular personality types.

Grush, Loren (2015). How You'll Die on Mars. *Popular Science*, May 2015. Retrieved from <http://www.popsoci.com/how-youll-die-mars>.

Karnes, F. & Stephens, K. (2008). *Achieving Excellence: Educating the Gifted and Talented*. Upper Saddle River, New Jersey: Pearson.

Lee, Pascal (2013). *Mission: Mars*. Scholastic.

NASA: National Aeronautics and Space Administration. An independent government organization whose vision is to reach new heights and reveal the unknown for the benefit of humankind.

NASA (Producer). (2016). *Curiosity Rover Report: Mars Weather Report*. USA: NASA. Retrieved from <https://mars.nasa.gov/multimedia/videos/?v=296>.

This two-and-a-half minute video was used as the hook activity for Day 1. The video provided a look at the weather on Mars as reported by Curiosity, one of the Mars' rovers. During the report, the narrator included facts about Mars that figured into the weather report.

Scott, Ridley (Director). (2015). *The Martian* [Motion picture]. USA: 20th Century FOX.

We watched the closing scene of the movie as a hook for Day 4 in which we explored the dilemmas that faced the astronaut candidates as well as the main character. This led us into the Kohlberg Moral Dilemma lesson.

SpaceX. A private organization in partnership with NASA whose goal is to revolutionize space technology, with the ultimate goal of enabling people to live on other planets.

Zubrin, Robert (2008). *How To Live On Mars: A Trusty Guidebook to Surviving and Thriving on the Red Planet*. New York: Three Rivers Press.