



Earth Explorers



Men on the Moon...Reality or Fiction?

Grades 3-5

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07/30/2020

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Introduction

Earth Explorers addresses standards of science content through the Concept of Exploration and Adaptation. Adaptation being the Science field of Ecology. The purpose of this unit is to research the concept of Exploration and humans impact on technology as it relates to our potential adaptability for colonization in space, specifically, the Moon. The developed concept was written using the North Carolina Essential Standards in Science, specifically standards *4.L.1 Understand the effects of environmental changes, adaptations and behaviors that enable animals (including humans) to survive in changing habitats, 4.L.1.2 Explain how animals meet their needs by using behaviors in response to information received from the environment, and 4.L.1.3 Explain how humans adapt their behavior to live in changing habitats.* This unit also supports the Next Generation Science Standard 3-5- ETS 1.1, 1.2, 1.3 - 3-5-ETS1-1. ***Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials.***

Earth Explorers is a unit that uses high order critical thinking and processing skills in the sciences. Students become practitioners of the Science disciplines (NASA, Ecology and Engineering) through exploration and experimentation, students are challenged with questions to ask and answer, provoking high level skills and thought processes. This units'

Essential Understanding is "Exploration induces Adaptation", and looks at humans as explorers. The lessons use historical events, images, videos, field experience and creativity through team collaboration and frequently self-reflection. Independent

And group activities require reflective practices. These lessons teach about human expansion and adaptability based on observations of ecosystems, knowledge of the human body and animal adaptation in its various forms. These lessons use technology and engineering to produce products that actually solve real problems that humans face when in the first stages of setting up colonies and settlements.

Differentiation

Earth Explorers is a unit specifically designed for gifted or advanced learners. It takes the concrete study of Ecological Adaptation of humans and animals and uses the information we've observed on our planet to create a hypothetical ecosystem we are trying to set up in space territories, particularly the moon. The students will transfer knowledge as a field scientist (either Astronaut, Ecologist, Engineer), what we know about our own habitats and adaptability to a new platform (space/ Moon). In lesson one, students may be exposed to the discipline of Space Exploration as a NASA Astronaut for the very first time. Students would answer the question "what does (Space Explorer) Astronauts do?" This is a Bruner lesson challenging learners to use prior knowledge to analyze information, gathered through open ended tasks, and to use the information to infer or make conclusions based on data collected. The students become the "Experts". In lesson two, the Visual Thinking Strategies lesson, students are challenged to look at Visuals. Students observe what they see (view). They proceed to have collaborative discussions. The images students are exploring in this lesson includes examples of the first moon landing, the moon itself and future moon landing prototypes. Students again will make inferences and conclusions about technology, the moon and NASA science in the early stages of Space Exploration. The goal is for students to make connections between the content vocabulary

and what they are viewing in the images. This lesson builds on lesson one by including the footage from the Moon landing as well as footage of NASA's early phase of exploration to current phases of exploration. The third lesson, Kohlberg's Moral Dilemmas, builds on the first two lessons by looking at future settlements through the lens of Ethics and Morality.

The students are challenged to think about their own moral stances and get to become reflective practitioners on their own morals. Students are given passages above grade level where problems are posed for human space expansion. Through a moral dilemma, "partitioning" as NASA engineers make a stance based on scientific information that requires high level processing skills and is hypothetically detrimental to the (future) Moon colonists. Students are discussing and creatively problem solving. This task is open-ended, student driven and directly sets the students up for the final lesson and performance task. All of the tasks in each lesson require high level thinking, processing and problem solving skills by the students with self-reflective practices included. This lesson is where their skill development fosters emotional independence, and group sympathy. The final lesson, CPS (Creative Problem Solving) lesson is a direct connection to Next Generation Science Standards 3-5- ETS 1.1, 1.2, 1.3 - 3-5-ETS1-1. The performance task is included in the final lesson. The lesson is great for gifted learners because they agree on a design and then as Engineers they create models that display how the problems are solved. All tasks challenges include questions and answers with variations. Earth Explorers are asked to think creatively, and challenge their own weaknesses while using individual strengths to benefit the collaborative groups. This lesson fosters and solidifies group sympathy, team reliability and accountability in partnerships to bring the unit to its conclusion.

Content

In this multifaceted Science Explorer unit, students work with content vocabulary that is advanced and complex, yet specific to district guidelines. The concept of Exploration, particularly in space, extends beyond the knowledge required of fourth grade students.

Introducing scientific methods of observation, hypothesis, research, analysis and evaluation enables students to explain how “we as humans” have survived this long, our rapid expansion in technology and how we are adapting and transforming as humans. Students are also introduced to authentic high level text with new text features. They are analyzing concepts of Exploration and human’s impact with familiarity or unfamiliarity to our history, through images, and other resources that are thought provoking and involve high-level of text complexity and content vocabulary. This will push students to question, think, and answer with more “in depth” levels of reasoning.

Process

Throughout this unit, students are provided with reading and reflective journal time with tasks that involve advanced levels of critical thinking and questioning. Students will strengthen inference and connection strategies as they learn to develop problem solving skills at a deep level of understanding with variations of complexity. Students will learn to find solutions to problems which will require challenging their moral stance yet will ensure our future adaptation. The collaborative nature of this unit encourages students and teachers to challenge, question and problem solve as a unified group with a wide range of Higher level thinking and questioning strategies.

Product

The products of each student or group of students will be extraordinary. The students demonstrate their learning through open-ended tasks. Students need to find a

mess, research problems, and then find ideas to creatively redesign/invent something new to represent a hypothetical real-life solution. The performance task, with its complexity, requires students to transfer knowledge from the activities learned throughout the lessons which will solve a “real life problem” in a hypothetical future Moon Settlement.

Learning Environment:

Earth Explorer is a multi-science discipline unit. It is a student centered science unit where students will frequently work independently, or in partnerships and finally in groups or teams to make sense of new information and to learn “Practitioner” skills. Students work individually, partnered or in groups on problems or tasks learning about Exploration and how it induces Adaptation. The tasks the students are performing have numerous outcomes with variations of discoveries, insights and routes to completion to accomplish the final tasks. Students may genuinely struggle with the fact that this practitioner model has multiple possibilities with no real answer. The teacher will act as a facilitator for most of the lessons. The goal is to encourage independence and reflective introspection.

Unit Theme: Earth Explorers

Unit Topic: Earth-Moon Colonization

Unit Concept: Exploration

Essential Understanding: Exploration Induces Adaptation

CONTENT Goal and Objectives:

GOAL: To develop an understanding of animal adaptation

OBJECTIVES: The students will know that...

- **Behavioral adaptations-** allow animals to respond to life needs. (Examples include hibernation, migration, dormancy, instinct, and learned behavior.) **Physical adaptations-** help animals survive in their environment (e.g., camouflage, mimicry). **Instinct-** Some animals are born with natural behaviors that they need in order to survive in their environments (instincts). These behaviors are not learned but are instinctive, such as a beaver building a dam or a spider spinning a web
- **Learned behavior-** Some behaviors need to be taught in order for the animal to survive, such as a bear cub learning to hunt (learned behavior)

Habitat- natural environment of an organism

PROCESS Goal and Objectives:

GOAL: To develop problem solving based on research skills in science.

OBJECTIVES: The students will be able to...

- describe and explain the terms behavioral, instinct, and learned behavior
- explain how an animal's behavioral adaptations help it live in its specific habitat.
(Outer space, specifically the moon)
- distinguish between physical and behavioral adaptations of animals.
- compare the physical characteristics of animals, and explain how the animals are adapted to a certain environment (from Earth to Moon).
- compare and contrast instinct and learned behavior.
- create (model) diorama -related environment of an Earth-Moon Colony,
- design and construct a model of a habitat for Earthlings with a specific adaptation for moon colony survival

CONCEPT Goal and Objectives:

GOAL: To understand the concept of Exploration and Adaptation.

OBJECTIVES: The students will understand that...

- *Exploration induces Adaptation.*

Civilizations create, maintain and adapt via Exploration.

Resources

4.L.1 Understand the effects of environmental changes, adaptations and behaviors that enable animals (including humans) to survive in changing habitats. 4.L.1.2 Explain how animals meet their needs by using behaviors in response to information received from the environment.

4.L.1.3 Explain how humans adapt their behavior to live in changing habitats (e.g., recycling wastes, establishing rain gardens, planting trees and shrubs to prevent flooding and erosion).

Next Generation Science Standard 3-5- ETS 1.1, 1.2, 1.3 - 3-5-ETS1-1.

Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost. 3-5-ETS1-2. Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem. 3-5-ETS1-3. Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved. (The performance expectations above were developed using the following elements from the NRC document A Framework for K-12 Science Education)

Formative Assessments

In the Earth Explorers unit, the overarching Concept is Exploration. The students will be studying the Concept through the Essential Understanding that Exploration Induces Adaptation.

Adaptation is the Life Science of Evolution of animal and plant species. In order to check for understanding and depth of knowledge I have placed formative assessments at the end of each lesson conclusion. These assessments not only target student understanding of the concept, but it will challenge them to reflect on their intent when they begin a lesson and finish it to completion.

The first round of assessments are in the **Bruner lesson** where students learn about Adaptation through Exploration of “practitioner”. The students will work in a group, so there will be a reflective journal entry on rotations, and discussions with other members of the class. The graphic organizer has three main components. The students have three boxes to complete. One

box on each component must be filled out by students as they rotate through-stations. The reflections are noting what was easy or difficult within any or all of the stations. The teacher is checking for student understanding on the essential standard, exploration induces adaptation.

Included in this assessment is also a summary answering post lesson questions that will be recorded in the students’ science journal addressing each question with one to two complete sentences addressing the questions.

In the second lesson (**Visual Thinking Strategies**), the assessments are exit tickets which are independent essays. The students will be responsible to write a rough draft in class at the lesson conclusion. The expectation is for all students to write a final draft in science the day after the lesson, when students are reflecting on the previous day's lesson and prepping for the follow up lessons. In this assessment students are looking at pictures representative of the concept of Exploration. Each group will have a chance to look at all pictures but will have one picture to

focus on as a group. Independently students will reflect in one paragraph on how the images answer the essential question (How does Exploration induce Adaptation?); as shown in the photos. Students will write three more paragraphs, one paragraph addressing each question: (1. *how adaptation induces technology?* 2. *How does technology induce exploration?* 3. *How does exploration induce Adaptation?*) On the exit ticket (post lesson questions).

The third lesson based on Morality will involve index cards with a pre entry ticket and a post exit ticket. The large index cards will be used to allow the student to take a moral stance based on a dilemma based on **Kohlberg's Moral Dilemmas**. At the beginning of the lesson the students will hear the moral dilemma and will respond with a written response on their own moral stance. The students will break into groups and discuss the dilemma and what they group came up with.

With the discussion students will be allowed to analyze their peers versus their own morals stances. After the lesson conclusion students will receive their index cards back and will have time to either keep the same moral stance adding more to why they chose to stick with their stances and/or change their stances. The students will be allowed to either use the same index card and/ or staple a new card to their old card.

The students will then have a reflective journal prompt to answer in their science journals as they had for the first lesson. The students will summarize their own morals compared to their peers followed by a one to two sentence answering post lesson questions.

The **CPS (Creative Problem Solving)** lesson is in itself, most likely, a 10 day lesson. The beginning of the lesson will have a pre assessment based on the 4th grade standards of Earth Moon History. The link to the pre assessment

<https://docs.google.com/document/d/185kSVMEKA8vvQag444YBDPTso3-TXSPH6VsdP9Ptuxk/edit>. In the introduction of this lesson after the pretest the students will be

told about the Performance task that they will have to complete and present at the lesson's conclusion.

The performance task;

The United Nations has announced the establishment of an Earth-Moon colony! You are one of the main NASA scientists on the project. You and a team of other NASA personnel are discussing and testing adaptive models for human survival. You have collected samples and data about the moon atmosphere and habitat. The United Nation has requested that you and a team of scientists create blueprints, a model of a moon colony to set the standard for future colonization of space. NASA has identified three problems that would be fatal to colonists. Your team must research these three problems and present three solutions. Your blue prints will be used to build prototypes based on your solutions. You and your team will be one of three teams on the project. All teams are expected

1. Choose a problem

2. Create a blueprint that addresses the problem

3. Use a blueprint to build a prototype (model) solving problem.

4. Write a 2-3 page summary explaining how prototype (model) addresses the problem

5. Include one paragraph in the summary that addresses the question "How does exploration induce adaptation?" You and your team, along with the other two teams will present your blueprints, prototypes and summaries to NASA and if they are approved NASA will send the recommendations to the UN to begin the Moon project.

Problems:

- Air-oxygen and gravity (isn't any for human survival long term, but is located on Planet Earth)
- Water (beneath moon's surface and on Planet Earth)
- Regolith (moon dust that is the surface of entire moon)

The students will have time to pre journal about their own ideas. The goal is for students to comprehend the essential understanding (exploration induces adaptation). They will specifically

be asked to reflect on their strengths and how they can be useful working on a team or in a group. The students will also have to reflect on their weaknesses and write about how it may be a detriment to the group they are working with. The first series of lessons have articles with excerpts as well as questions. Students will read the articles and excerpts and respond as exit tickets at the end of each mini lesson. The second set of lessons will require journal field notes with guidelines which will count as assessment on management and organization. The lessons will finish up with designs and a final product based on the Performance tasks. Each team will have a design to create together (one assessment). Each team will have a product (product assessment). Each team will have a reflection on their strengths and weaknesses (as they did with the beginning of the lesson launch) where they will do a final summary on their independent and group work and interactions. The groups will be graded by rubrics (they will grade themselves with a rubric (as an additional reflective piece) and I will grade them with the same rubric for their final grade.

Rubric

Building A Structure: Diorama Moon Colony

Teacher Name: **yetta williams**

Student
Name: _____
—

CATEGORY	4	3	2	1
Information Gathering	Accurate information taken from several sources in a systematic manner.	Accurate information taken from a couple of sources in a systematic manner.	Accurate information taken from a couple of sources but not systematically.	Information taken from only one source and/or information not accurate.

Plan	Plan is neat with clear measurements and labeling for all components.	Plan is neat with clear measurements and labeling for most components.	Plan provides clear measurements and labeling for most components.	Plan does not show measurements clearly or is otherwise inadequately labeled.
Construction - Materials	Appropriate materials were selected and creatively modified in ways that made them even better.	Appropriate materials were selected and there was an attempt at creative modification to make them even better.	Appropriate materials were selected.	Inappropriate materials were selected and contributed to a product that performed poorly.
Construction - Care Taken	Great care taken in the construction process so that the structure is neat, attractive and follows plans accurately.	Construction was careful and accurate for the most part, but 1-2 details could have been refined for a more attractive product.	Construction accurately followed the plans, but 3-4 details could have been refined for a more attractive product.	Construction appears careless or haphazard. Many details need refinement for a strong or attractive product.
Journal/Log - Content	Journal provides a complete record of planning, construction, testing, modifications, reasons for modifications, and some reflection about the strategies used and the results.	Journal provides a complete record of planning, construction, testing, modifications, and reasons for modifications.	Journal provides quite a bit of detail about planning, construction, testing, modifications, and reasons for modifications.	Journal provides very little detail about several aspects of the planning, construction, and testing process.
Journal/Log - Appearance	Several entries made and all are dated and neatly.	Several entries are made and most of the entries are dated and neatly entered.	Several entries are made and most of the entries are dated and legible.	Few entries are made AND/OR many entries are not dated or very difficult to read.

TEACHER NAME		Lesson #
Yetta Williams		1
MODEL	CONTENT AREA	GRADE LEVEL
Visual Thinking Strategy	Science	4th
CONCEPTUAL LENS		LESSON TOPIC
Exploration		Moon Landing
LEARNING OBJECTIVES <i>(from State/Local Curriculum)</i>		
4L.1 Understand the effects of environmental changes, adaptations and behaviors that enable animals (including humans) to survive in changing habitats. 4L.3 Explain how humans can adapt their behavior to live in changing habitats (e.g. recycling waste, establishing waste. [4L1.2creating technologies and adaptive skills in response to information received from the environment] , planting trees, establishing rain gardens)		
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>
<i>Exploration Induces Adaptation.</i>		<i>How does Exploration induce Adaptation?</i>
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>

Students will know :

-Interpretation is an attempt to figure out what is being observed.

-Exploration is the action of traveling in or through an unfamiliar area in order to learn about it.

-Analyzation is breaking something into parts to learn what it does and how the parts all relate.

-Problem solving is to define a problem, determine the cause, identify, prioritize and implement an effective solution.

-Understanding is the relation of learning concepts to the theory of the concepts.

-Explanation is the act or process of explaining.

-Adaption is how adaptive skills create technologies in response to information received from the environment.

-Application is the use of existing science knowledge into practical uses like technology and/or inventions

Students will be able to:

- Interpret
- Explore
- Analyze
- Think Critically
- Infer
- Utilize Perspective
- Explain
- Adapt
- Apply

nGUIDING 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 is an environmental change? What is an adaptation? What is a behavior? What is a changing habitat? What does exploration look like? What does adaptation look like? How does adaptation induce technology? How does technology induce exploration? How does exploration induce adaptation? Questions for engage activity: - What do you see? - What outfitting is being used in this activity? - What equipment besides your body are you using? - What does that equipment do? - What were events that led up to this event? - What do you think happened right before this exact event? - Where is this event happening and why?	• What do you see in the image? • What is happening in the image? • What do you see that makes you say that? • What else do you see? • What do you think is happening in this picture? • How do you think the people in the picture feel? • What human behavior (s) can you recognize in this picture? • What are the events that led up to this moment? • What is a technical device that is in this picture? • What other technologies do you see in the pictures? • How is technology represented in these pictures? • How does the technology help humans adapt? • How is exploration represented in these pictures? • Tell me more; what makes you say that? • How does this picture represent adaptation and exploration? • How do the pictures show habitat change? • What technology and behaviors enable the humans in these pictures to adapt to the changing	• What do you see? • What do you see that makes you say that? • What else do you see? • What do you see that means change in environments? • How is exploration depicted in the photos? • How does exploration impact what is happening in the photos? • How could technology result from exploration? • How could exploration inform technology? • How do the examples of adaptation relate to exploration? • What did you see that means adaptation? • How does adaptation induce technology? • How does technology induce exploration? • How does exploration induce adaptation?
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	habitat?	
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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
The photographs used in this lesson may be unfamiliar to some or more students. Content is unique to the curriculum. Concepts in the content are sophisticated.	VTS is an open-ended thinking strategy which allows and encourages students to share their unique perspectives and make inferences.		This is a student led learning activity

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.*

As students enter the room the Moon Landing picture with the USA Flag will be projected on the board or copies will be provided for students if working in a room with no projector.

The teacher will ask the pre-lesson questions:

- What is an environmental change?
- What is an exploration?
- What is a technology?
- What is a changing habitat?
- What does adaption in these pictures look like?
- How does adaptation induce technology?
- How does technology induce exploration?
- How does exploration induce adaptation?

Students will be asked to imagine themselves Launching into Outer Space, Maybe standing on the Moon. Students will be asked to close their eyes and think about the following questions:

What do you see?

- *What do you see in the image?*
- *What is happening in the image?*
- *What do you see that makes you say that?*
- *What else do you see?*

Students will share what they were imagining and share some of their answers to the questions asked elaborating as much as possible.

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.*

The teacher will direct students' attention to the photo where the Astronaut is putting the USA flag on the moon; either displayed on the board or available on student desks. Students are directed to study to picture independently and silently for 2-3 minutes. (Teacher will use an actual face timer). After 2-3 minutes the teacher will go through several rounds of asking several individual students and possibly grouping students who have similar ideas. The teacher will circulate and make/take notes.

- What do you see that makes you say that?
- What else do you see?
- What do you think is happening in this picture?

Every student that volunteers to share will be given the opportunity to answer both of these questions. The teacher may summarize or rephrase student responses. The teacher will not provide opinions nor pass judgements about student responses but may point to the area of the picture to which the student refers.

As the conversation about initial observations continues, the teacher will ask the following questions to get the students to look more closely at the picture:

- What equipment are you using?
- What does that equipment help you do in Space?
- What were the Historical Events that led up to this event?
- What do you think happened right before this exact event?

- Where is this event happening and what makes 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.*

After students are given the chance to observe and study and discuss the photos (Photos 1-8 attached in lesson at the end), the teacher and students look at adaptation, exploration environmental change and technology (in particular) in the photos.

What do you see?

What is going on in the image?

What do you see that makes you say 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*

Students will work in groups of 2-3 for this portion of the lesson. Student groups will be assigned randomly. The teacher will hand out pictures and students will find the people who have the same picture as them to work with.

Students will analyze the pictures using the VTS strategies learned earlier in class. The teacher will circulate and help prompt students to ask:

- How is exploration depicted in the photos?
- How does exploration impact what is happening in the photos?
- How could technology result from exploration?
- How could exploration inform technology?
- How do the examples of adaptation relate to exploration?

Each group will come up with answers to the following questions to share with the class:

- Tell me more; what makes you say that?
- How does this picture represent adaptation and survival?
- How do the pictures show habitat change?
- What adaptation and behaviors enable the humans in these pictures to adapt to....the changing habitat?

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

Student groups will present their photos and their answers to the above questions to the class. After each presentation, other groups can ask clarifying question or build on the information shared by the group presenting.

After all presentations, students will be put into teams that were based on their similarity of answers in the first activity. When they move into break out groups (5; where each group) will discuss and record answer these questions.

- What do you see? (Group 1; must provide evidence from photo)
- What do you see that makes you say that? (Group 2; provide evidence from photo)
- What else do you see? (Group 3; provide evidence from photo)
- What do you see that means Exploration induces adaptation? ? (Group 4; provide evidence

from photo)

- What did you see that means exploration and adaptation of technology? (Group 5; provide evidence from photo)

The Exit ticket for comprehension of lesson will be a writing (essay component) independently.

- How does technology induce exploration?
- How does adaptation induce technology?
- How does the exploration induce adaptation?

Each student will provide their own answer to this question using the knowledge they gained from examining the pictures.

Photo 1



Photo 2



Photo 3

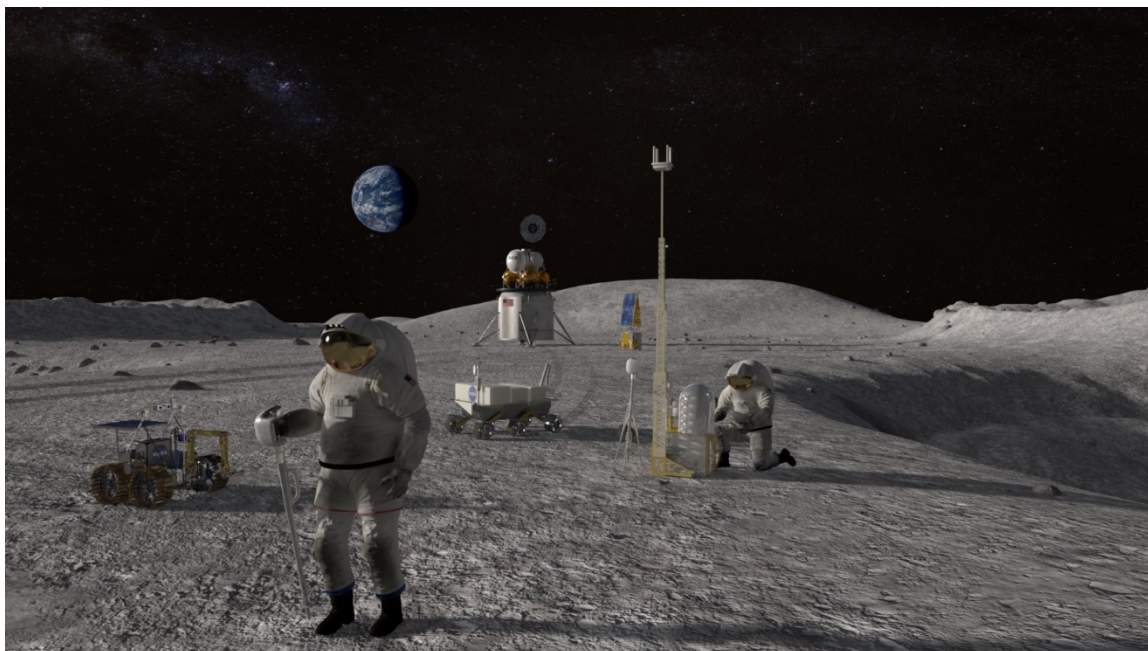


Photo 4

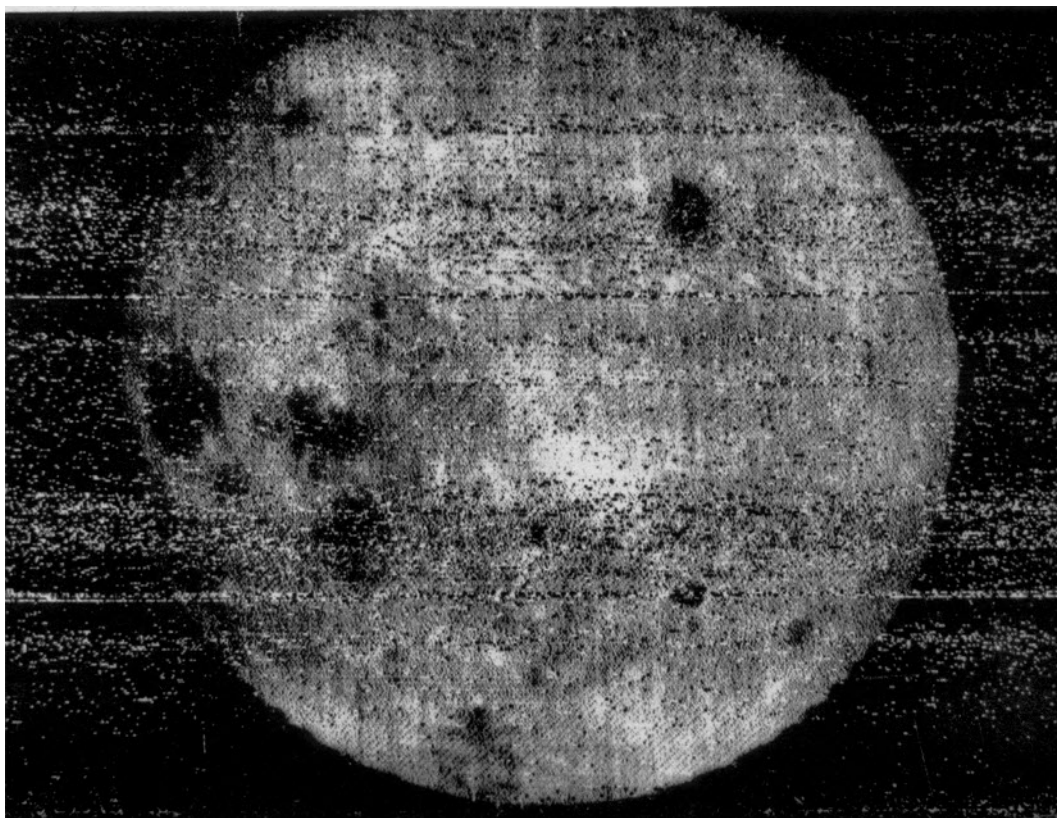


Photo 5



Photo 6



Photos 7 & 8



<https://www.nasa.gov/artemis-moon-program-advances> (all photos provided by NASA)

Additional alternative photos: 9-13





TEACHER NAME		Lesson #
Yetta Williams		2
MODEL	CONTENT AREA	GRADE LEVEL
Bruner	Science	4th
CONCEPTUAL LENS		LESSON TOPIC
Exploration		Earth To Space Adaptations
LEARNING OBJECTIVES <i>(from State/Local Curriculum)</i>		
4.L.1 Understand the effects of environmental changes, adaptations and behaviors that enable animals (including humans) to survive in changing habitats. 4.L.1.2 Explain how animals meet their needs by using behaviors in response to information received from the environment.		

THE ESSENTIAL UNDERSTANDING (What is the overarching idea students will understand as a result of this lesson?)		THE ESSENTIAL QUESTION (What question will be asked to lead students to “uncover” the Essential Understanding)	
Exploration Induces Adaptation		How does exploration induce Adaptation?	
CONTENT KNOWLEDGE (What factual information will students learn in this lesson?)		PROCESS SKILLS (What will students be able to do as a result of this lesson?)	
Students will know that: ● Exploration is the act of searching for the purpose of discovery of information or resources. Exploration occurs in all non-sessile animal species, including humans. (Wikipedia) ● Adaptation is a change or the process of change by which an organism or species becomes better suited to its environment. (Wikipedia) ● Environments are the outside (external) conditions, resources, stimuli etc. with which an organism interacts. (2) The outside (external) surroundings including all of the biotic and abiotic factors that surround and affect the survival and development of an organism or population. (Wikipedia) ● Systems are In general sense, a system pertains to a group of related or interdependent unified components of a whole. ● An explorer is a person who explores an unfamiliar area; an adventurer. ● An Astronaut is a type of explorer ● Astronaut Explorers are scientist. ● Astronaut Explorers do field research and observation. ● Astronaut Explorers use observations to make inferences. ● Inferences enable Astronaut Explorers to make predictions. ● Astronaut Explorers Collect Data. ● Data collection reveals trends. ● In the science of Biology; explorers use problem based solutions to adapt technology.		Students will be able to: ● Apply ● Observe. ● Predict ● Collect, organize and analyze data. ● Infer ● Evaluate ● Problem solve ● Adapt	
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 are the images showing? • What are the people in the pictures doing? • What are the similarities about the people in these images? • How does Exploration and Adaptation affect environmental systems such as habitats? • What does an Explorer do? • Who is an explorer? In what spaces might an Explorer work? • What could we add to our list after watching the video? • What kinds of data might he collect? • What might believe as an Explorer? • What characteristics might an Astronaut Explorer need to possess? • What ethical issues might an Explorer have to think about? • What is adaptation? • How might an explorer use adaptation?	• What did you learn about exploration as you rotated through the stations? • What did you learn from exploration as you participated in the stations? • Why is Exploration important? • What inferences did you make? • What do you believe based on your inferences? • What were some of the predictions you made after observing exploration in practices? • What do you base these predictions on? • How are inferencing and predicting strategies similar? • How are inferencing and predicting strategies different? • How do your observations impact how you inferred? • How do observations impact predictions?	• What did you consider as you read exploration ethics? • Why do you think professionals use ethics? • What are the attributes of ethics? • Why do you think Explorers have strong ethics? • What skills are required to become a space Explorer? • How would you summarize what ethics are in your own language? • How does Adaptation relate to Exploration in space travel? • <i>How does Exploration induce adaptation?</i>
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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
Listing as well as Use Graphic Organizers partners and team members as rotate through Field Experience stations working as professional in the Discipline	Use of Bruner's Structure of the Working as a professional in the discipliner represents high levels of critical thinking and inferencing.		

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 teacher is dressed like an Astronaut like clothes, and oxygen mask, moon boots, protective gear, notebook, recording device, shoe covers. There will be images and artifacts from several space missions and trainings on display as students enter the room (as well as Earth terrestrial land based habitats, aquatic habitats). On the screen will be additional images of space as well as books on space and exploration of space on table at the front of the room. Students are to discuss and make inquiries to pique interest. When students are in place, the teacher will ask pre-lesson questions.

1. What are the images showing?
2. What are the people in the pictures doing?
3. What are the similarities about the people in these images and the way I'm dressed?
4. What useful information might these images, my outfit and these books convey?

The teacher will ask 2 students to summarize the responses.

FAMILIARITY WITH THE DISCIPLINE

The teacher asks:

What are explorers/Who are explorers?

Who are astronauts? How are astronauts explorers?)

The teacher allows students to go with the general question(s) until they begin to run out of answers. The teacher then prompts with:

What do they do?

What tools do they use?

Where might they work?

What might they research?

1. What are some words or phrases that describe Explorers specifically Astronauts in these pictures: What do Explorers do? **What are the necessary skills required to become an Explorer in space?**

The teacher records all responses on the white board or on chart paper. Students can call out words and/or phrases. **When the students begin to repeat ideas or have trouble coming up with ideas, the teacher stimulates thinking by asking.**

2. What are some tools Space explorers might use?

Students call out ideas to be added to the list. When responses repeat or students cannot think of more ideas, the teacher asks:

3. In what spaces might Space explorers train and work?

The teacher records responses on the class list. The teacher then asks students to watch the following video clip about Space Explorers and observe to find other things

<https://www.youtube.com/watch?v=XcNthPiVNgA>

or

<https://www.youtube.com/watch?v=H2Pz-u4W8cQ>

After student have watched the video, the teacher asks:

4. What could we add to our list after watching these NASA explorers in the video?
5. What kinds of data might be collected?
6. What might Astronauts as space explorers believe?
7. What characteristics might a NASA scientist need to possess?
8. What ethical issues might a NASA explorer have to think about?

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.*

2. PRACTICING AND DISCIPLINE

The teacher has set up 4 stations.

- The first station has a picture of a natural Earth terrestrial habitat untouched by development.
- The second station has a picture of a development in the spot of the original habitat. In this particular station there will be images of some compromised animals (dead).
- The third station has development plans for moon Colony.
- The fourth station has Moon habitat of dust, high winds and mountain regions.

In each station the images should represent systems of adaptation and change. Students should be able to use the images to create inferences based on their observations as Explorers about the impact on the lives of species in the habitats as they are altered by Explorers.

The teacher divides the class into groups of four. Students are provided a field guide, their school device camera and pencil. The teacher provides the following expectations for the learning experience. Students (IN THE GROUPINGS) are to:

9. Rotate through four stations (observation Earth terrestrial habitat overtime and Moon Colony plans and habitat [these are photos])
10. Students go to one station each round to observe the species and habitat.
11. Students are not permitted to speak to one another as they observe images during each rotation.
12. Students are not allowed to touch any of the artifacts in each station.
13. Students are to record (in field notes) and/or science journals or with their cameras illustrate what they observe, no inferencing or making predictions at this time.
14. Students finish stations and return to their seats but with their grouping.
15. In their groups students will report what they observed one by one, after documenting observations, one recorder and one reporter. The recorder should document on a chart after each round what the group observed and what the group inferred and predicted. Groups must come to consensus about what is recorded on the chart as this will be shared by the reporter during the whole group debriefing recorded. Share outs will take place.

What inferences did you make?

What were some of the predictions you made after observing?

What do you base these predictions on?

(Groups will remain in each station for 3 minutes with no conversation. Students meet in groups between each rotation to discuss and debrief questions above for 7 minutes. The classroom timer will ding every three minutes and will reset when students all reach their station. The teacher will have already clarified the roles of recorders, time keeper, and reporter prior to this lesson)

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.

3. REFLECTING ON THE DISCIPLINE

Once the groups have completed station rotations and held their debrief conferences, each group will post their findings on the PARKING LOT chart. Students return to whole group for the lesson closing and summarizing.

- How did your observations illustrate Exploration?
- What did you infer about Space exploration from the rotations?
- How did your observations illustrate adaptation?
- How did your observations illustrate Exploration inducing Adaptation?
- **How did your inferencing strategies illustrate Adaptation?**
- **In the exploration of space how do observations impact predictions for future colonies on the moon?**

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

3b. CONTINUED PRACTICE AND REFLECTION

Students are regrouped. In their new small groups of three students, students will look at the code of ethics of NASA Space Explorers. The students will analyze and evaluate how the ethics of NASA Space Explorers are exceptional attributes of the profession. The students will then summarize what a code of ethics is in their own language (exit ticket). The summary should reflect what students have learned about what it means to be a NASA Space Explorer and what they've concluded about acting like a NASA Space Explorer. Students will be asked to consider the following:

- Responsibilities and attributes of an Explorer

- *Professionalism of Space Explorers*
- *Behavior of Space Explorers*

Each student will share out their summaries one by one to the class. Class members complete graphic organizer for each summary.

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

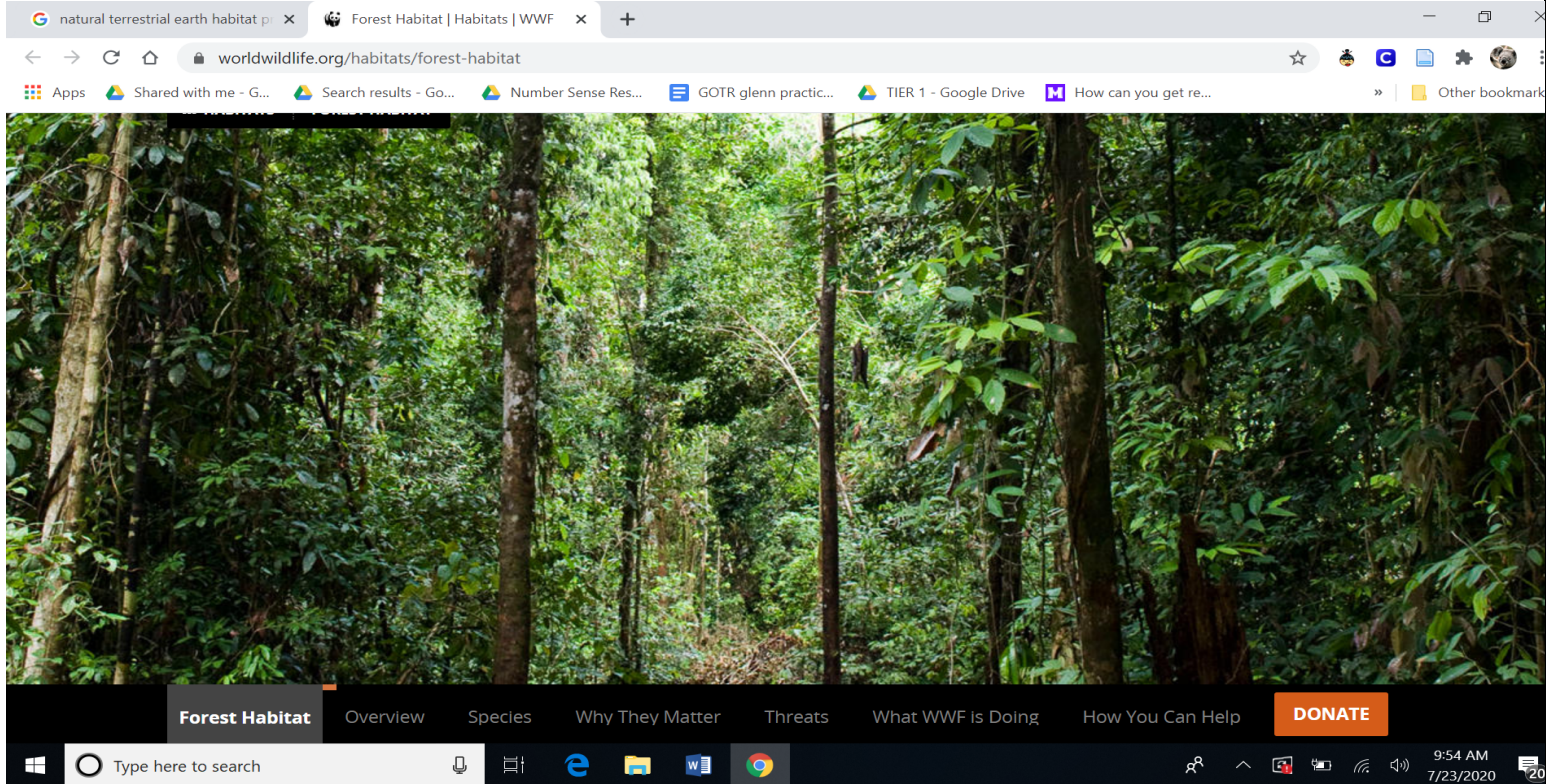
Each student will write a reflective summary based on their graphic organizers used during the rotations and group discussion. After each group presents their summaries the teacher will proceed with post lesson questions. The students will write new answers to the questions that are presented in the post lesson in their science journals.

https://www.nasa.gov/offices/ogc/general_law/ethicsrules.html

- What did you consider as you read the Space Exploration ethics?
- Why do you think professionals use ethics?
- What are the attributes of ethics?
- Why do you think Space Explorers have strong ethics?
- What requirements are needed in the field of science as a Space Explorer?
- How does Adaptation relate to Exploration in space travel?
- How does Exploration induce Adaptation?

All student work will be posted in the hallway with standard attached and images taken during observations during lesson.

Resource photo Station 1. (Natural terrestrial habitat undeveloped)



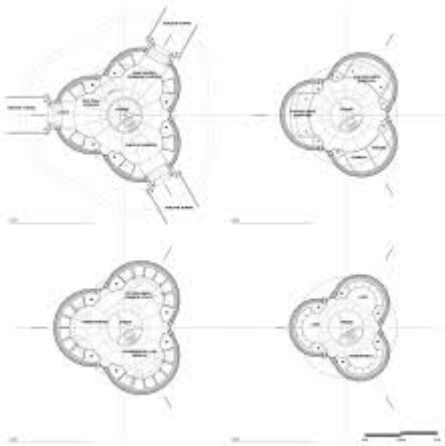
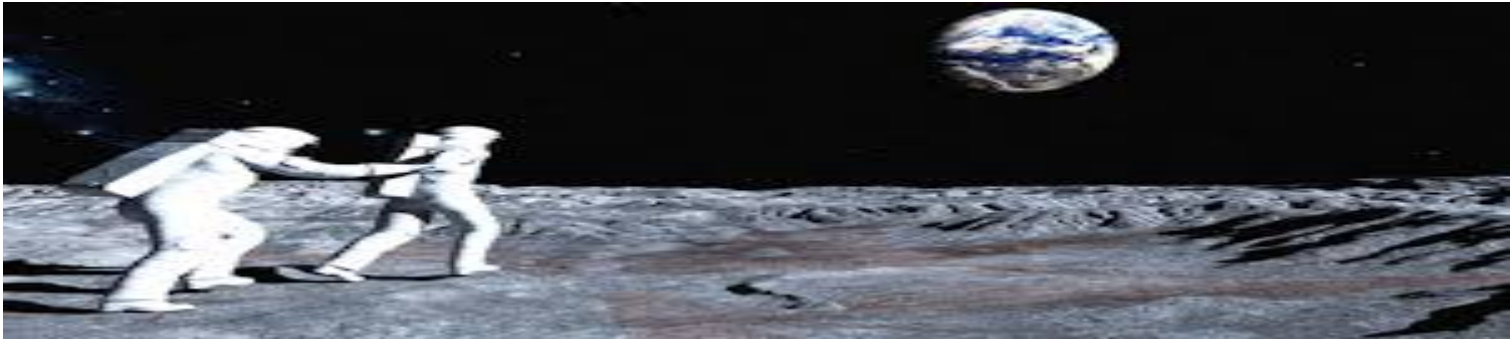


Resource Photo Station 1: Clear Cut Land/ Pre development/ Developed

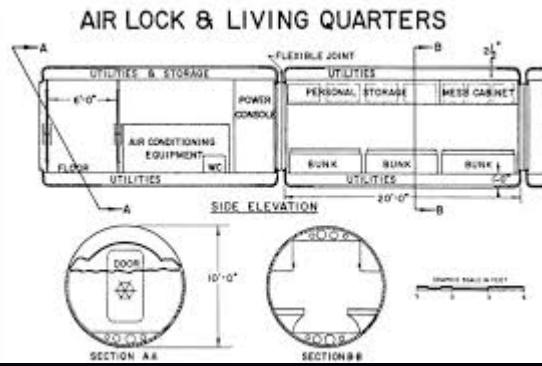
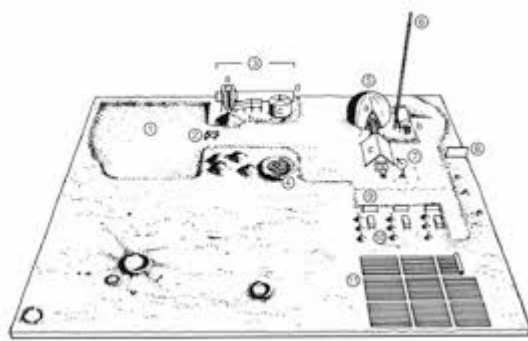




Resource Photo Station III: Moon Photo



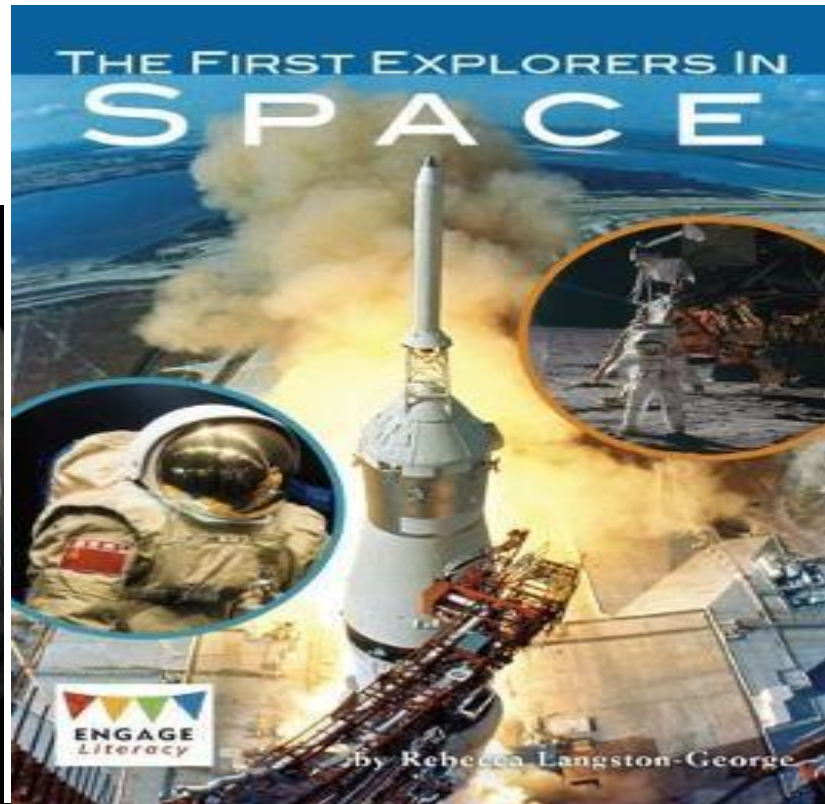
Resource Photo Station IV: Blue Print Moon Colony/ Models:

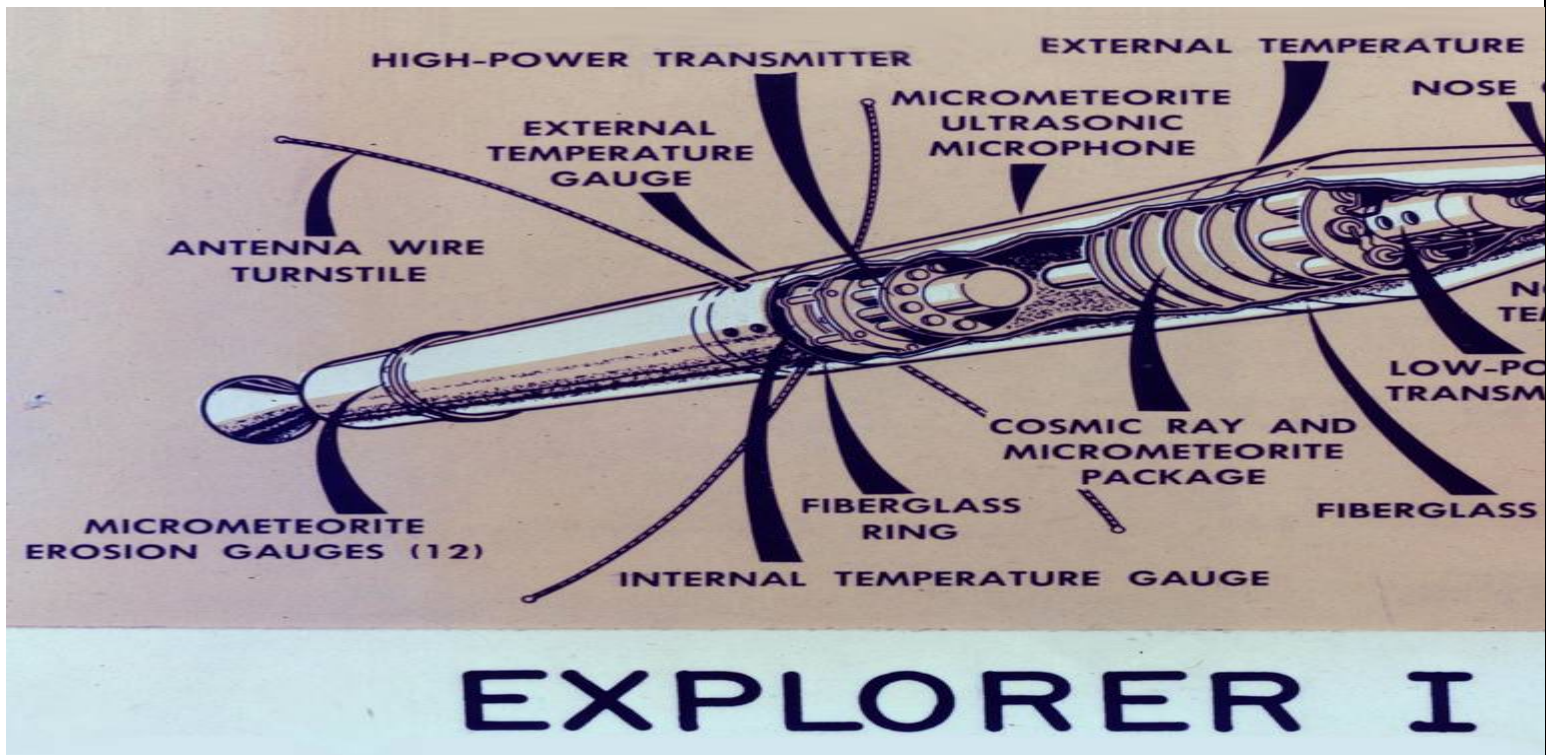






Neil Armstrong





Name: _____
 Date: _____
 Subject: _____

What is the topic?

or other
 name may
 be advised

Paragraphs Answer

Topic: _____
 Start with words right, look at the big picture then go on to details.
 Be detailed.
 Describe generally what you observed.

Paragraphs Answer

Topic: _____
 Be subjective.
 Emphasize feelings and impressions.
 Include emotional aspects.
 Connect emotions and misunderstandings for other people.
 Include insights and speculations.
 Make predictions.

Graphic Organizer for Stations 1-4

TEACHER NAME		Lesson #
Yetta Williams		3
MODEL	CONTENT AREA	GRADE LEVEL
Kohlberg's Moral Development	ELA & Science	4th grade
CONCEPTUAL LENS		LESSON TOPIC
Exploration		Dilemmas
LEARNING OBJECTIVES (from State/Local Curriculum)		
Language Arts: RL & RI 4.5; 4.6 • Explain how an author develops the point of view of the narrator or speaker in a text • Cite textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text. • Write arguments to support claims with clear reasons and relevant evidence Science : 4 L.1, 4 L.2, 4 L.3 • Understand the effects of environmental changes, adaptations and behaviors that enable animals (including humans) to survive in changing habitats. • Explain how animals meet their needs by using behaviors in response to information received from the environment. • Explain how humans adapt behavior to live in changing habitats		
THE ESSENTIAL UNDERSTANDING (What is the overarching idea students will understand as a result of this lesson?)		THE ESSENTIAL QUESTION (What question will be asked to lead students to “uncover” the Essential Understanding)
Exploration induces Adaptation		How does exploration induce adaptation?
CONTENT KNOWLEDGE (What factual information will students learn in this lesson?)		PROCESS SKILLS (What will students be able to do as a result of this lesson?)

• Students will know that Moral development is the process through which children <i>develop</i> proper attitudes and behaviors toward other people in society, based on social and cultural norms, rules, and laws. (Health of children.com) • Students will know that moral development focuses on the emergence, change, and understanding of morality from infancy through adulthood. (Kohlberg). • Students will know that Morality refers to a sense of ethics, integrity, and honor which enables humans to act in accordance with other humans. • Students will know that making a choice depends on how it will alter or effect lifestyles. (psych central.com) • Students will know that exploration and adaptation breaks social norms. • Students will know that exploration and adaptation requires alteration of rules, laws. • Students will know that morality in the sense of exploration and adaptation is a means of survival.	Students will be able to.... • Apply • Analyze • Compare and contrast • Evaluate • Reason • Prioritize • Create • Support • Utilize Perspective • Explain	
GUIDING QUESTIONS <i>What questions will be asked to support instruction?</i> Include both “lesson plan level” questions as well as questions designed to guide students to the essential understanding		
Pre-Lesson Questions: • <i>What do you know about the moon’s atmosphere?</i> • <i>What else do you know about gravity on the moon?</i> • <i>How does the atmosphere and gravity on the moon compare to Earth’s atmosphere and gravity?</i> • <i>When did man first land on the moon?</i> • <i>Why is important to know about the Moon landing?</i> • <i>What obstacles do we need to overcome to live on the moon?</i> • <i>What is colonization?</i> • <i>What would it mean for Earth beings to colonize the moon?</i> • <i>What is a dilemma?</i> • <i>What makes dilemmas of colonizing the moon difficult?</i> • <i>How might you go about solving a dilemma of moon colonization?</i> • <i>What factors in our own colonization of Earth would we use to inform morality?</i> • <i>How would you define</i>	During Lesson Questions: • <i>What is the nature of the dilemma in the excerpt you read?</i> • <i>What happened in your reading?</i> • <i>How would you summarize events in your reading?</i> • <i>What are the dilemmas presented in this reading?</i> • <i>What specific arguments are made in this reading?</i> • <i>What alternatives are open to the Earthlings in your readings?</i> • <i>How might Earthlings use morality in thinking about alternatives as they make decisions about potential colonization of the moon?</i> • <i>What should be considered as with this dilemma about moon settlement?</i> • <i>What is your position?</i> • <i>What are two reasons for choosing these alternatives?</i> • <i>How does exploration and adaptation allow humans to colonize the moon?</i>	Post Lesson Questions: • <i>What was the main dilemma in this lesson?</i> • <i>How did you use morality in considering exploration and adaptation of humans?</i> • <i>What perspectives did you discuss about exploration and adaptation?</i> • <i>Why do you think your decisions were impacted by morality?</i> • <i>How could you use Kohlberg’s stages of Moral Development to make inferences?</i> • <i>How did making these inferences help you analyze your choices when faced with the dilemma?</i> • <i>With the information provided how should Earthlings proceed?</i> • <i>How does Exploration Induce Adaptation?</i>

exploration/adaptation?			
How might morality be used to make a choice about Moon colonization exploration and adaptation?			
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
<i>Utilizing varying perspective of The text is based on the theme of Explaining Author's reasoning and providing text evidence to make choices to lead to a conclusion. Utilizing Science standards on animal and habitat adaptation to solve a moral dilemma on perspective to come to own moral stance with multiple options provided and no easy solution.</i>	<i>Kohlberg's Stages of Moral Development requires students to engage in high level process skills in order to make decisions and establish a position by using reasoning.</i>	Index Cards with reflection on moral stance (after dilemma is presented). Reflection based on peers' moral stance compared to own stance.	Classroom Or Zoom Breakout sessions

PANNED LEARNING EXPERIENCES

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

About 10 Minutes: 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. As students enter the room, the teacher has displayed pictures of Moon Colony blueprints (NASA) and models. The Earth pictures displayed is a basic water cycle picture. This picture is only to show a process the Earth uses that the moon would not have naturally. The teacher will introduce the lesson Theme, Concept, Standards, and Essential Question. After the teacher introduces the lessons through this slide link (imbedded in this slide is a Kahoot <https://create.kahoot.it/kahoots/my-kahoots/folder/3239e5b2-2aa6-44cc-ae12-e892bd08b01a> Game.) The Kahoot Game is set up to distinguish between Laws and Morals. Click this link to Introduce lesson: https://docs.google.com/presentation/d/1-N_9nVGx9x2pmTykY0oby0cEmO3jgc2aAw6PhyK-Gik/edit?pli=1#slide=id.g8684a55ee3_0_13

Debrief: Teacher asks:

- What do you know about the moon's atmosphere?
- What else do you know about gravity on the moon?
- How does the atmosphere and gravity on the moon compare to Earth's atmosphere and gravity?
- When did man first land on the moon?
- Why is important to know about the Moon landing?
- What obstacles do we need to overcome to live on the moon?

Students will have the opportunity to respond to the questions and to share their thoughts. (Answers should include something about trying to make a decision about Earthlings attempt to live on the moon.)

The teacher then asks pre-lesson questions:

- What is colonization?
- What would it mean for Earth beings to colonize the moon?
- What is a dilemma?
- What makes dilemmas of colonizing the moon difficult?
- How might you go about solving a dilemma of moon colonization?
- What factors in our own colonization of Earth would we use to inform morality?
- How would you define exploration and adaptation?
- How might morality be used to make a choice about Moon colonization exploration and adaptation?

About 15 minutes: 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 Introduce and clarify the nature of the dilemma.

The teacher says: Moral dilemmas are present in our lives in the past, present and our future.

The teacher redefines "dilemma" as relevant and provocative situations which exist in everyday life as well as in literature.

Remind students that dilemmas cause us to think critically and reflectively about the reasons we use to make difficult decisions. People often use morality as a basis for decision-making.

The lesson will compose of three sessions where each student has the opportunity to read (session I. Should We Settle the Moon; session II Moon Facts and session III Maura' Dilemma). The groups will read one session per day and have a reflection summary to do on each piece.

The teacher provides students with one of three excerpts over three sessions. Students are instructed to read independently before the gather in their groups. Once all students have read the short except, they are asked to identify the dilemma in the narrative they read. The students will then write on an index card what the dilemma is and some ideas of how they would solve the dilemmas. (This is done independently).

The teacher asks the whole group: What is the nature of the dilemma in the excerpt you read? (The students will write down the perceived dilemma on the card given to them and their solution/ moral stance)

Then the teacher will rotate throughout the room and check in with students before breaking them into groups.

(Writing should only take enough time for the dilemma to be identified and one solution given) Students will then break off into small groups. In groups students will share out what they wrote on their cards and then have 7 minutes to discuss what their solution is. During this process the group will choose one decision they can agree the most on and share back to whole group the decision and why. This procedure will be used for each session 1. Passages will be read independently. 2. On index cards students identify problem. 3. Students write their (decision, choice and/or stance on the problem). 4. In small groups for 10-15 minutes cards are read and followed by a discussion on moral decisions individuals/ groups choose. 5. Share back to group (your group's moral stance and why the group chose it).

STEP 2 Clarify the facts of the situation and identify the issues involved.

The teacher asks for information about what happened relevant to the situation in each reading. The teacher asks students to summarize the events, identify the main ideas and describe the choices that are made.

Three charts (one for each reading) will be posted. Responses to the following questions will be recorded on the appropriate chart.

The teacher asks the whole group:

- What is the nature of the dilemma in the excerpt you read?
- What happened in your reading?
- How would you summarize events in your reading?
- What are the dilemmas presented in this reading?
- What specific arguments are made in this reading?
- What alternatives are open to the Earthlings in your readings?
- How might Earthlings use morality in thinking about alternatives as they make decisions about potential colonization of the moon?
- What is the dilemma of settling the Moon for Earthlings?
- What is your position?
- How does exploration and adaptation allow humans to colonize the moon?
- What are two reasons for choosing these alternatives?

About 15 minutes: 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 Students identify a tentative position on the action the author took and state one or two reasons for that position.

Students work independently. The teacher asks each student to identify exploration and/or adaptation made in the reading.

Then the students will **write their original position and their one to two reasons for their one paragraph and will write them on bright colored large index cards.** (This writing will encourage the students to think for themselves and develop as they make a decision about their position. The teacher can then ask for a show of hands on the various alternatives to get an idea of differences or similarities in preparation for next step.

The teachers take students' index cards and will return them to students during the Evaluation portion of the lesson.

The teacher asks students to individually choose a position for themselves. And jot down one or two reasons for their decision. Responses to the following questions will be added to the appropriate chart based on the reading.

- How does exploration and adaptation open allow humans to colonize the moon?
- What exploration and adaptations were made in these readings in order for humans to be on the moon?
- What are two reasons presented in these reasons that allowed humans to be on the moon?

STEP 4 Divide the class into small groups. In small groups, students share their reasons for the position they have taken. Small group discussions with 4-6 members should take 10-15 minutes. If the class is split unevenly on an issue, students can be grouped with others who share the same position on the issue. They should discuss their reasons and select the best two reasons for the position. If the class splits evenly on an issue, students can be divided into groups with an approximately equal number that agree with each position. In these groups, students discuss both positions and choose the best reasons for each. If the class agrees about one position, the students can be divided into groups based on the similarity of their reasons for supporting a position. Each group can then decide why the reason they prefer is the best one. Students can also be grouped by differences in reasons. These small groups can then discuss their reasons and decide on the best two or three that support their decision.

The teacher instructs students as a small group: (See above for groupings) Students will record their responses on the chart for their reading.

- Share their position and their reasons for taking this position.
- Discuss positions and reasons
- Choose the two BEST reasons for supporting their position.

About 25 minutes 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 5 Reconvene the class for a full class discussion of the dilemma – This part of the lesson should take the majority of the

class time. The class should be seated in a circle to encourage student- to-student interaction. The teacher is crucial in keeping the conversation focused on reasons. Teachers should ask questions that focus on: 1) clarification, 2) student interaction, 3) focus, 4) perspective- taking, and 5) proof of reasoning.

The teacher instructs students to create a circle for a whole class discussion. Students may refer to the charts created for their reading as they answer the following questions.

The teacher asks:

- What was the main dilemma in this lesson?
- How did you use morality in considering exploration and adaptation of humans?
- What perspectives did you discuss about exploration and adaptation?
- Why do you think your decisions were impacted by morality?

Following post-lesson questions during whole group instruction the teacher presents information about Kohlberg's Stages of Moral Development. The teacher tells students that these are stages that progress from infancy to adulthood. The stages simply provide an idea about how humans develop their reasoning as they mature.

The teacher provides students with a handout of Kohlberg's Stages of Moral Development. The stages are briefly discussed, in terms appropriate for the grade level.

Kohlberg's Theory

Level/Stage	Age Range	Description
I: Obedience/Punishment	Infancy	No difference between doing the right thing and avoiding punishment
I: Self-Interest	Pre-school	Interest shifts to rewards rather than punishment – effort is made to secure greatest benefit for oneself
II: Conformity and Interpersonal Accord	School-age	The “good boy/girl” level. Effort is made to secure approval and maintain friendly relations with others
II: Authority and Social Order	School-age	Orientation toward fixed rules. The purpose of morality is maintaining the social order. Interpersonal accord is expanded to include the entire society
III: Social Contract	Teens	Mutual benefit, reciprocity. Morally right and legally right are not always the same. Utilitarian rules that make life better for everyone
III: Universal Principles	Adulthood	Morality is based on principles that transcend mutual benefit.

The Psychology Notes Headquarters - <http://www.PsychologyNotesHQ.com>

Stage One-Avoiding Punishment

Stage Two-Getting a Reward or Benefit

Stage Three-Winning Approval (What others will think of me)

Stage Four-It is the Rule or the Law

Stage Five-It is in line with Social Order; This is the difference between moral and legal

Stage Six-(theory) Universal Principles (Ethics)

The teacher asks:

- How could you use Kohlberg's stages of Moral Development to make inferences?
- How did making these inferences help you analyze your choices when faced with the dilemma?

About 10 minutes -Evaluate: This phase assesses both learning and teaching and can use a wide variety of informal and formal assessment strategies.

Students return to their seats to work independently.

STEP 6 Reevaluate their original positions individually from their cards in the early phase of the lesson step 1. They may have the same positions, if they do they will elaborate on their positions creating a stronger stance for their position or they can change their positions and create new positions on the dilemma of colonizing the moon.

After the large group discussion, the teacher asks students to review the discussion and the charts they created for their reading to answer the following questions on their index cards:

- With the information provided how should Earthlings proceed?
- How does Exploration Induce Adaptation?

The teacher can collect these responses along with the original written position to see if any significant changes occurred. Assessment should focus on the reasoning of the student rather than the stage of moral development.

Resources and articles:

Genre: Persuasive Essay Read

Should We Settle the Moon

1 Whenever people say “Let’s shoot for the Moon!” they mean that Anything is possible. So, when people think of space exploration, a Colony on the Moon seems like the next step. The views from the Moon Would be spectacular, and being a “Moontonian” would be exciting. But Is it feasible?

2 Let’s start with the Moon’s surface, which is not an easy place for life To thrive. There is little atmosphere, so all air would have to be brought From Earth. The lack of atmosphere causes temperatures to vary greatly, From 232°F during the day to –315°F at night. And then there’s the Radiation. Without a thick, Earth-like atmosphere to filter the sun’s rays, Radiation would sicken any colonists.

3 And what about water? True, there is ice below the Moon’s surface. If astronauts can mine that ice, they can melt it and use it to make oxygen And rocket fuel. But if the ice is unreachable, all water would have to be Carted up to the Moon—a cumbersome and unworkable task.

4 But the biggest obstacle to living on the Moon is the regolith. Regolith is a layer of fine stone dust. It covers almost the entire surface And sticks to everything. It can gum up a spacesuit, jam an engine, and Ruin machines. Worst of all, if we couldn’t find a way to keep it out of the colony, it would destroy the lungs of everyone living There.

5 So, will we ever have a Moon colony? Never say never, but Today our technology does not make the idea practical.

What reasons support the Author’s point? Circle three reasons the author gives to support her Point.

2. Moon Fact Statistics

The Solar System Moon Lunar Characteristics • The moon is a quarter the size of Earth, and it is Earth's only satellite in space. • The moon rotates around Earth every 27.3 days, and rotates around itself every 27.3 days as well. • It reflects light from the Sun.

Lunar Surface • The moon has no atmosphere, making it extremely hot during the day, and extremely cold during the night. • The **lunar** surface has no plate tectonics, so its surface features stay mostly the same. It has plenty of **craters**, caused by meteorite collisions. • **Maria** are flat, dark areas that are made of basaltic lava. These were caused when meteorites hit the moon, releasing magma to fill the craters. • **Terrae** are lighter-colored highlands. These are made of silicate materials that came from the ancient magma ocean. • There is no evidence of life, but traces of ice are found in extremely cold craters.

Lunar Interior • The moon has a distinct crust, mantle, and core. Astronauts confirmed this by taking rock samples.

- o The small core is made mostly of sulfur and nickel.
- o The mantle is composed of olivine and orthopyroxene. There may also be iron and titanium.
- o The crust is composed of oxygen, silicon, magnesium, and aluminum.

Concept Check • What is special about the moon's orbit? • What is the temperature like on the moon? What causes this? • What are Maria and terrae?

Earth Science Study Guide Study Tip Since the moon's orbit around itself and around the Earth is the same, we always see the same side of the moon when we look up at the night sky.

3. Moral Dilemma:

Earth's First Moon Colony is up and running. Its success is based solely on the fact that water, wheat and freeze dried fruits and vegetables is the main contribution to their diet and can be launched from the International Space Station twice a month. These freeze dried fruits and vegetables are used temporarily until vegetation regions are fully developed on the Moon, which may take another 3 years or more, as experiments and research to support vegetation on the Moon, have been met with little success. The shipments arrive without any glitches or delays. **The United States** is the most proud because Farmers have had a boost in their production; especially those living in the "America's Breadbasket" regions. Maura, a NASA Scientist, is one of the main researchers and supporters of the Moon Colony making sure communication and supplies are provided before they run out. She's been very proud of NASA and her own successes. Last week, however, news shifted when Maura was told in a briefing that in the excitement of their great success with the Colony, USA farmers over plowed their regions leading to a second dust bowl. Food shortages would affect both Earthlings and

Earth-Montanans. Maura realizes these shortages will result in the loss of life in both places but the losses on the Moon will be more detrimental. Both groups need the food. Shipping can goods, would not be economically feasible. All recommendations have to be made in 3 days. With no easy way to resolve this Maura realizes that without the launch to the Moon Colony many lives in the new settlement will be lost and bouncing back from these losses may mean the collapse of the Moon settlement. What should Maura do?



Life is all about making
choices. Always do your
best to make the right
ones, & always do your
best to learn from the
wrong ones.



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(Google Slide Presentation)

https://docs.google.com/presentation/d/1-N_9nVGx9x2pmTykY0oby0cEmO3jgc2aAw6PhyK-Gik/edit?pli=1#slide=id.g8684a55ee3_5_13

Teacher: Yetta Williams		
MODEL	Content Area	GRADE LEVEL
Creative Problem Solving	Science	4th
CONCEPTUAL LENS		LESSON TOPIC
Exploration		Habitats and Adaptations
LEARNING OBJECTIVES <i>(from State/Local Curriculum)</i>		
4. L.1 Understand the effects of environmental changes, adaptations and behaviors that enable animals (including humans) to survive in changing habitats. 4.L.1.2 Explain how animals meet their needs by using behaviors in response to information received from the environment. 4.L.1.3 Explain how humans adapt their behavior to live in changing habitats (e.g., recycling wastes, establishing rain gardens, planting trees and shrubs to prevent flooding and erosion).		
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>
<i>Exploration Induces Adaptation</i>		<i>How does exploration induce adaptation?</i>
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>

Students will know...

- **Behavioral adaptations**- allow animals to respond to life needs. (Examples include hibernation, migration, dormancy, instinct, and learned behavior [**allow an individual organism to adapt to changes in the environment**].) **Physical adaptations**- help animals survive in their environment (e.g., camouflage- *is the use of any combination of materials, coloration, or illumination for concealment, either by making animals or objects hard to see (crypsis- is the ability of an animal to avoid observation or detection by other animals), or by disguising them as something else (mimesis- **representation or imitation**)*, *mimicry- the action or art of imitating someone or something*,). **Instinct**- Some animals are born with natural behaviors that they need in order to survive in their environments (instincts). These behaviors are not learned but are instinctive, such as a beaver building a dam or a spider spinning a web
- **Dormancy**- is a state of reduced metabolic activity adopted by many organisms (both plants and animals) under conditions of environmental stress or, when such stressful conditions are likely to appear, as in winter. **Learned behavior**- Some behaviors need to be taught in order for the animal to survive, such as a bear cub learning to hunt (learned behavior)
- **Habitat**- natural environment of an organism

Students will be able to...

- Explain
- Distinguish
- Compare
- Contrast
- Collaborate
- Create
- Design
- Synthesize
- Apply
- Analyze

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

• What is Exploration? • What is a model prototype? • What is Adaptation? • What is a model? • Are Exploration and Adaptation related? • What is worn in these pictures? • What is adaptive about the clothing? • What is innovation? • Who might use the clothing worn in these photos? • What is atmosphere like on the moon? • How is clothing important for survival? • Why would a prototype be created? • What technology or knowledge might be needed to create a prototype for space travel and survival? • How do you take a problem and find an effective solution?	• How is exploration represented in the Photos? • How is adaptation represented in the photos? • What are the three main problems with settling the moon? • What adaptations will humans need to survive on the moon long term? • Why did your group decide on these items for your moon diorama? • How do the items you chose to design your moon diorama resemble the items on the prototypes we viewed in the photos? • What innovations will you use as you work on designing and building your diorama? • What other items might you select? • What needs do you intend to meet by using the items you selected for your diorama? • What problems have you encountered as you are designing and building this model diorama? • What were the problems presented to you to use the materials chosen? • How are your designs the solution to the problems stated?	• What were the three problems presented with settling the Moon? • What solutions did you discuss before you gathered materials? • What challenges did you encounter when building your diorama? • How did you use exploration in your designs and models? • How did you use adaptation in your designs and models? • Why did you have to keep referring back to the problems presented? • How did you overcome the challenges of building? • How would you change the design to make it better? • If you could have access beyond the materials provided, what would you have requested? • What designs did you see from other teams that you thought worked well? • How did creativity influence your innovation? • How does exploration induce adaptation?
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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
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All Students will reread Should We Settle the Moon and Moon Fact Sheet - Should We Settle the Moon? Content is above grade level - Content includes advanced vocabulary and/or concepts - Content is taught at a higher grade level - Content is unique to the curriculum; not generally part of the curriculum.	Students will be using creative problem solving as an instructional model. This model encourages both divergent and convergent thinking.	Student products will vary based on the creativity and innovation visible in which problem they're solving from article. The open-endedness of the product makes it well-suited for gifted learners	Students will work in homogenous groupings for this lesson. Please see the Content Guidelines for materials differentiation and break out groups.
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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. Students enter the room to find pictures of past and present Space equipment including suits and travel. Some of the images are just prototypes of space technology and have yet to be tested for space travel. The teacher has lab coat and has junkyard and recyclable items on a table in the middle of the room. The teacher allows the students to ask about the displays but remains silent; keeping them guessing. There is also a table in the rear of the room covered with a sheet with the words, "no peeking" written on top of it. Students are handed a sticky note pad and are asked to take a gallery walk around the room to each poster (pairs or small groups) allowing 3 minutes at each poster. While at each poster, students will be asked to answer a question posted above each poster. Answers are written on sticky notes and posted beside the corresponding poster. (Sample Questions: What is Exploration? What is Adaptation? How are Exploration/ Adaptation Represented in these photos? Sample Questions for posters:

- What is Exploration?
- What is Adaptation?
- What is a model?
- Who creates a model?
- Why would a model be created?
- What technology or knowledge might be needed to create a model?
- What technology or knowledge might be needed to create a model for space travel and survival?
- How do you take a problem and find an effective solution?

Students return to their desks for whole class discussion about their gallery walk. Include the questions above and the following as pre-lesson questions to be discussed prior to moving to the Explore Phase of the lesson.

- What is worn in these pictures?
- What is adaptive about the clothing
- What is adaptation?
- Who might use the clothing worn in these photos?
- What is atmosphere like on the moon?
- How is clothing important for survival?

Following the discussion the students will be given a card with the Performance Task challenge on it. They are to read the card and then make notes or questions on sticky notes or in journals for the discussion.

The Performance Task:

The United Nations has announced the establishment of an Earth-Moon colony! You are one of the main NASA scientists on the project. You and a team of other NASA personnel are discussing and testing adaptive models for human survival. You have collected samples and data about the moon atmosphere and habitat. The United Nation has requested that you and a team of scientists create blueprints, a model of a moon colony to set the standard for future colonization of space. NASA has identified three problems that would be fatal to colonists. Your team must research these three problems and present three solutions. Your blue prints will be used to build prototypes based on your solutions. You and your team will be one of three teams on the project. All teams are expected

1. *Choose a problem*
2. *Create a blueprint that addresses the problem*
3. *Use a blueprint to build a prototype (model) solving problem.*
4. *Write a 2-3 page summary explaining how prototype (model) addresses the problem*
5. *Include one paragraph in the summary that addresses the question “How does exploration induce adaptation?” You and your team, along with the other two teams will present your blueprints, prototypes and summaries to NASA and if they are approved NASA will send the recommendations to the UN to begin the Moon project.*

Problems:

- Air-oxygen and gravity (isn't any for human survival long term, but is located on Planet Earth)
- Water (beneath moon's surface and on Planet Earth)
- Regolith (moon dust that is the surface of entire moon)

Following discussion, teacher goes to the back of the room and unveils the contents of the table. (See photo of junk, which will be brought into the room)

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.

Mess Finding: Mess finding will take 3 full days (Day 1 will last 10 minutes to read articles specified to group. The AIG group will only read the first day and begin computer research. The other groups will read Two articles The Solar System Moon Lunar Characteristics, Should We Settle the Moon and compare and contrast them. Groupings of Mid-level will do online Encyclopedia research on Day 2 and will incorporate other online research provided for them. The final groups will read have a small group discuss with an expert on the second day and on the day 3 the entire class will research online materials. This will include research of the full class with computers on the day 3.

The teacher provides students with the following challenge: Students are to collaborate in a group discussion about what is learned from looking at pictures, answering the guided questions and what they have discovered from the articles chosen for this model over 3 days and view and discuss materials and uses on days 4 and 5 (**Fact Finding**), tracking and recording information gathered in a timely manner. **On days 6-7 Students will state the problem and determine the different ways their designs for their models solves their particular problem. In the consecutive days;** Students will discuss and sketch design three solutions to three problems presented in an article and will end the lesson unit by creating actual dioramas of their ideas with explanations to why their solution solves the problem. Journal entries on what worked well, didn't work well, what was learned and the ultimate question answered. **HOW DOES EXPLORATION INDUCE ADAPTATION?**

Fact Finding:

1. https://youtu.be/bYGiEg-nkIA?list=PLTiv_XWHnOZr1hhl3LTwma-ChrntY5iOF

2. <https://youtu.be/AI3CdnNsVFI>

Day 1-3: STUDENTS ARE GIVEN THE PERFORMANCE TASK TO Reread;

Students are given instructions on the rules of engagement (list of rules attached to the lesson plan)

Rules of Engagement:

1. Be Excited
2. Be Engaged
3. Be Kind
4. Be an Active Team contributor
5. Give all ideas a chance (especially the Innovative)

.) Teacher goes over rules and procedures with students as well as their roles in their groups

Roles of Students as Science Researchers:

1. Time Keeper
2. Information Tracker
3. Material Collector
4. Recorder

. Students will read Should We Settle the Moon, The Solar System Moon Lunar Characteristics and The Strangeness of Curiosity. Students will be broken into 6 groups (ideally). Two groups per 1 problem to ensure 2 solutions to each problem. **Day 4-5:** Students will view the items that will be used as building materials, but cannot touch them at this time. They will begin to gather the necessary data and facts that are needed to solve the problem presented. Students and teacher review the rules of engagement (list of rules attached to the lesson plan.) Teacher goes over rules and procedures with students again. It is the expectation that students work well in groups and that everyone participates.

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 Finding:

Day 6-7: Students will begin to determine the different ways for designing dioramas that solves the problem of atmosphere/ air, water and Regolith stone dust; working as a team, they will determine their objective and what they aim to accomplish.

Idea Finding:

Day 8: Teams are given 20 minutes to sketch their designs; designs only (construction does not begin until Explain phase of the lesson) based on innovation, creativity and materials provided. **Prior to going to materials table, students are to have a design completed and a materials list prepared. Each team will determine the best techniques to use. Students will begin by brainstorming all possibilities (deferring judgment). The teacher circulates, acting as a facilitator.**

- <https://www.nasa.gov/nasa-explorers-apollo>
- <https://youtu.be/WT39gTs9X7k>
- <https://www.nasa.gov/feature/explorer-1-the-beginning-of-american-space-science>

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

Solution Finding:

Students use convergent thinking to narrow down and decide on the best approach for building their diorama. All ideas are evaluated and the best idea is selected for building the model.

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

Acceptance Finding:

Students develop a work plan for putting their idea into action – assigning responsibilities to each team member toward completing the task. Students are given 30 minutes to build their model (time to be adjusted if necessary). One student, the materials manager, is allowed to go to the materials table for supplies. The teacher should constantly circulate noting participation by all students. (See assessment rubric)

During lesson questions are posed at this time:

- What did you notice in the photos that was exploration?
- What did you notice in the photos that was adaptation?
- What are the three main problems with settling the moon?
- What adaptations will humans need to survive on the moon long term?
- Why did your group decide on these items for your moon diorama?
- How do the items you chose to design your moon diorama resemble the items on the prototypes we viewed in the photos?
- What innovations will you use as you work on designing and building your diorama?
- What other items might you select?
- What needs do you intend to meet by using the items you selected for your diorama?
- What problems have you encountered as you are designing and building this model diorama?
- What were the problems presented to you to use the materials chosen?
- How are your designs the solution to the problems stated?

Day 9-10: This is the PERFORMANCE TASK SECTION: PERFORMANCE TASK TO BE COMPLETED

(PERFORMANCE TASK PRESENTED , Please see above in this lesson plan and below in the lesson plan)

Students will review what they have discovered in their research over the 8 days. After discussion and last minutes theories students will be give 30 minutes to build their designs. After 30 minutes of building time, assess for time needed to complete the task. When time is called, students remain in their teams. Students will come up with a plan of what the challenges are and will discuss and come

up with a plan to tackle the challenge on day 10 to complete model and present to class. Day 10: The teacher asks each group to display their model and describe the innovations they used in creating their model design. Students will also be asked to describe their experience creating the diorama model and why they chose materials as they did.

Students will then be asked to put their model on display and explain why the model is the best solution.

After display and explanation phase, students return to their seats and are allowed to discuss what they have discovered so far. This is time for reflection using the following questions. A recorder should note responses of group members. Student responses are provided on the assessment rubric teacher passes to students. (See attached)

- What were the three problems presented with settling the Moon?
- What solutions did you discuss before you gathered materials?
- What challenges did you encounter when building your diorama?
- How did you use exploration in your designs and models?
- How did you use adaptation in your designs and models?
- Why did you have to keep referring back to the problems presented?
- How did you overcome the challenges of building?
- How would you change the design to make it better?
- If you could have access beyond the materials provided, what would you have requested?
- What designs did you see from other teams that you thought worked well?
- How did creativity influence your innovation?
- How does exploration induce adaptation?

These are photos of Resources and the Performance Task

The United Nations has announced the establishment of an Earth-Moon colony! You are one of the main NASA scientists on the project. You and a team of other NASA personnel are discussing and testing adaptive models for human survival. You have collected samples and data about the moon atmosphere and habitat. The United Nation has requested that you and a team of scientists create blueprints, a model of a moon colony to set the standard for future colonization of space. NASA has identified three problems that would be fatal to colonists. Your team must research these three problems and present three solutions. Your blue prints will be used to build prototypes based on your solutions. You and your team will be one of three teams on the project. All teams are expected

1. Choose a problem

2. Create a blueprint that addresses the problem

3. Use a blueprint to build a prototype (model) solving problem.

4. Write a 2-3 page summary explaining how prototype (model) addresses the problem

5. *Include one paragraph in the summary that addresses the question “How does exploration induce adaptation?” You and your team, along with the other two teams will present your blueprints, prototypes and summaries to NASA and if they are approved NASA will send the recommendations to the UN to begin the Moon project.*

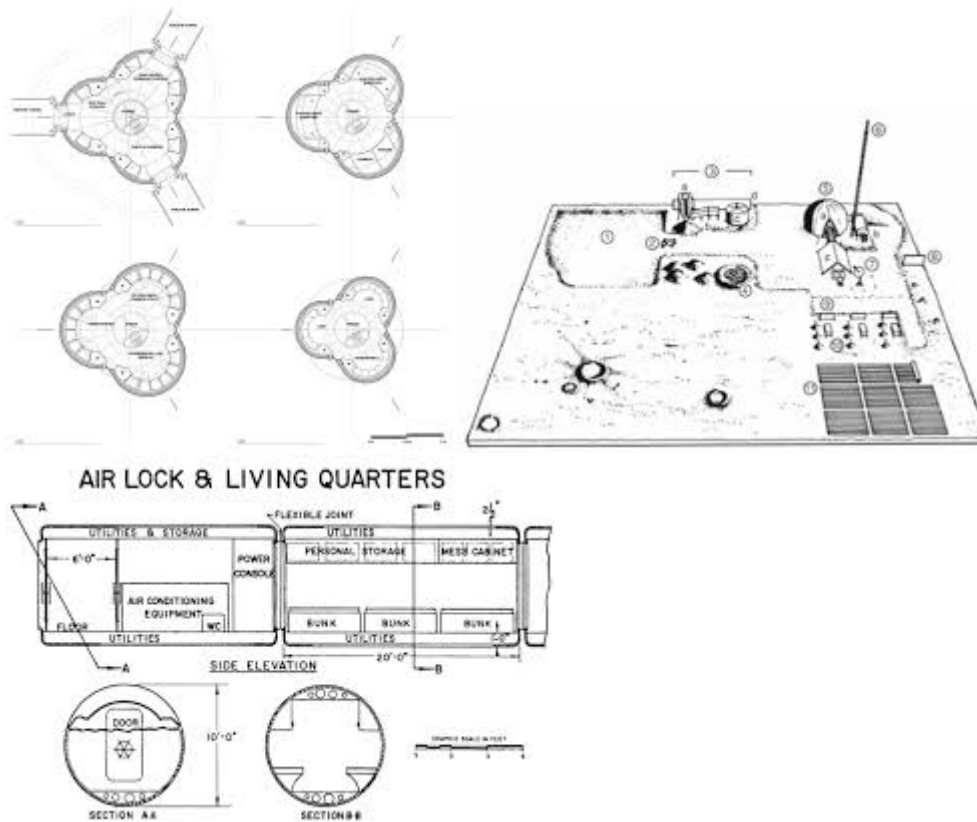
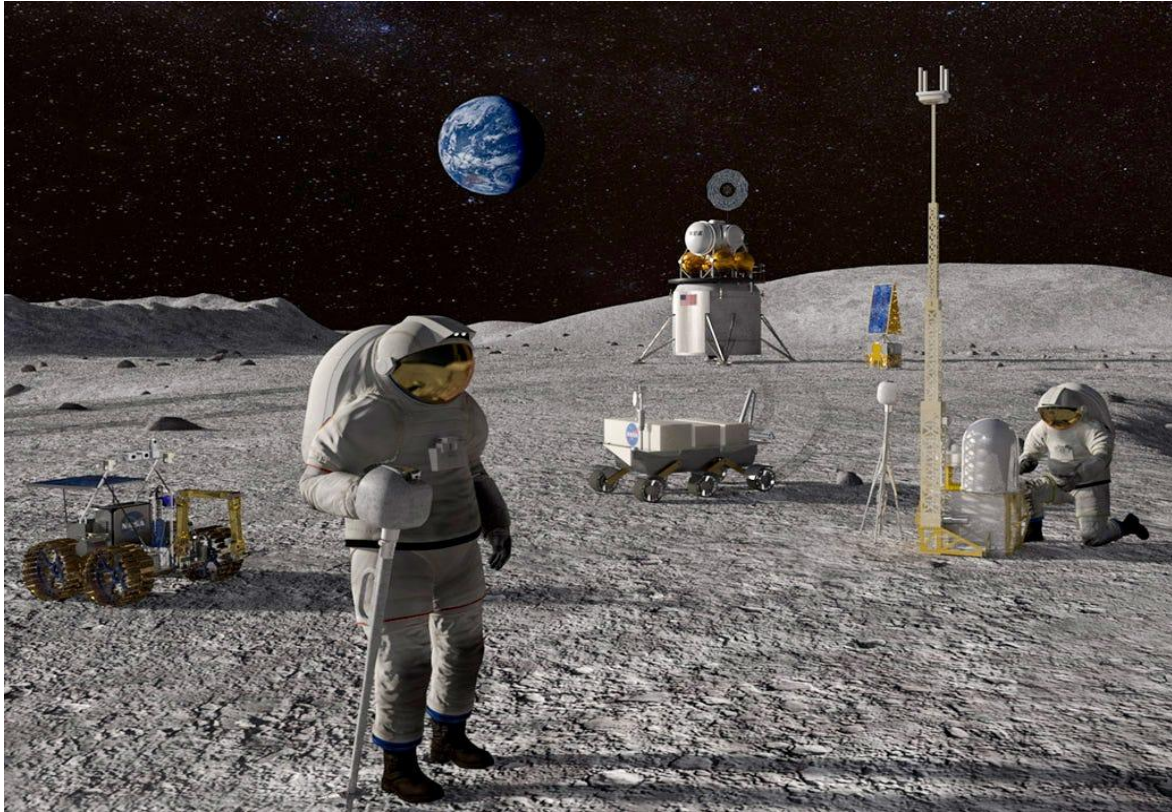




Photo 2: Astronauts in proposed future missions to the moon field testing



Prototype Model courtesy of NASA: Moon Colony living quarters



Photo 3 Proposed moon colony Solar panels



Rules of Engagement:

6. Be Excited
7. Be Engaged
8. Be Kind
9. Be an Active Team contributor
10. Give all ideas a chance (especially the Innovative)

Roles of Students as Science Researchers:

5. Time Keeper
6. Information Tracker
7. Material Collector
8. Recorder

Photo 4: Space Explorers and modes of travel

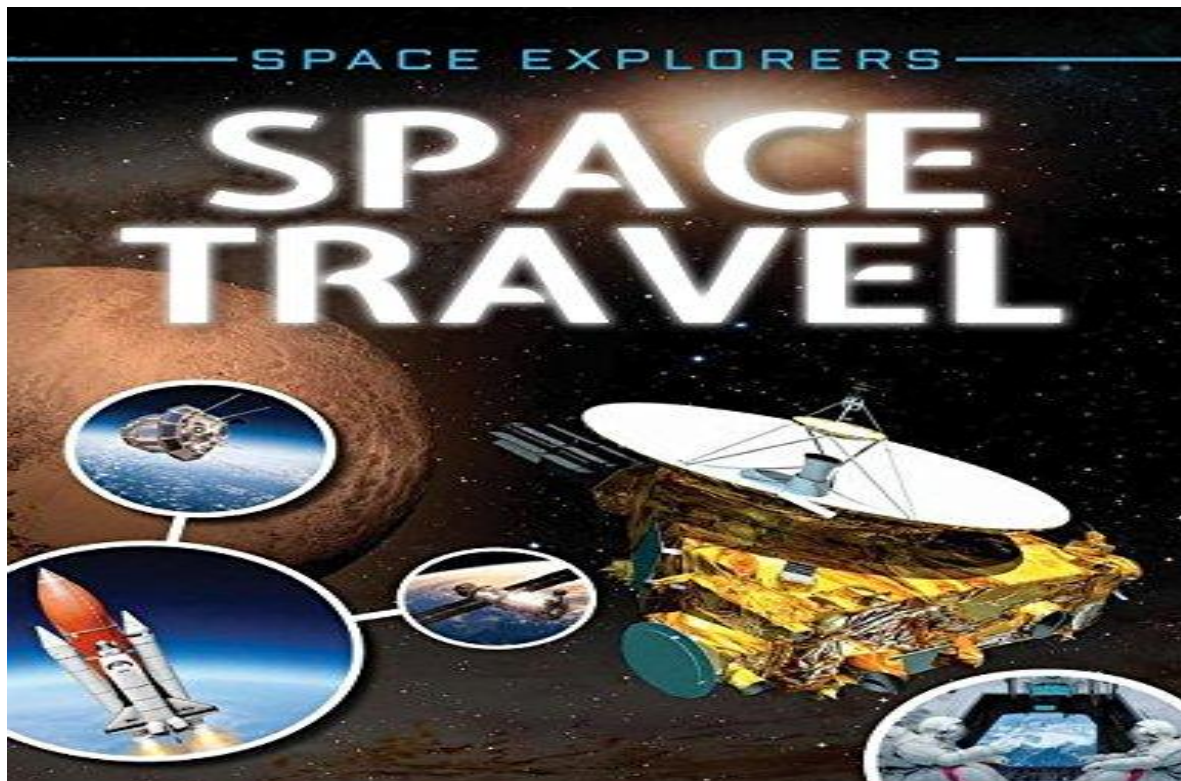


Photo 5: Early Space Expeditions



Photo 6: Prototype model of Space object

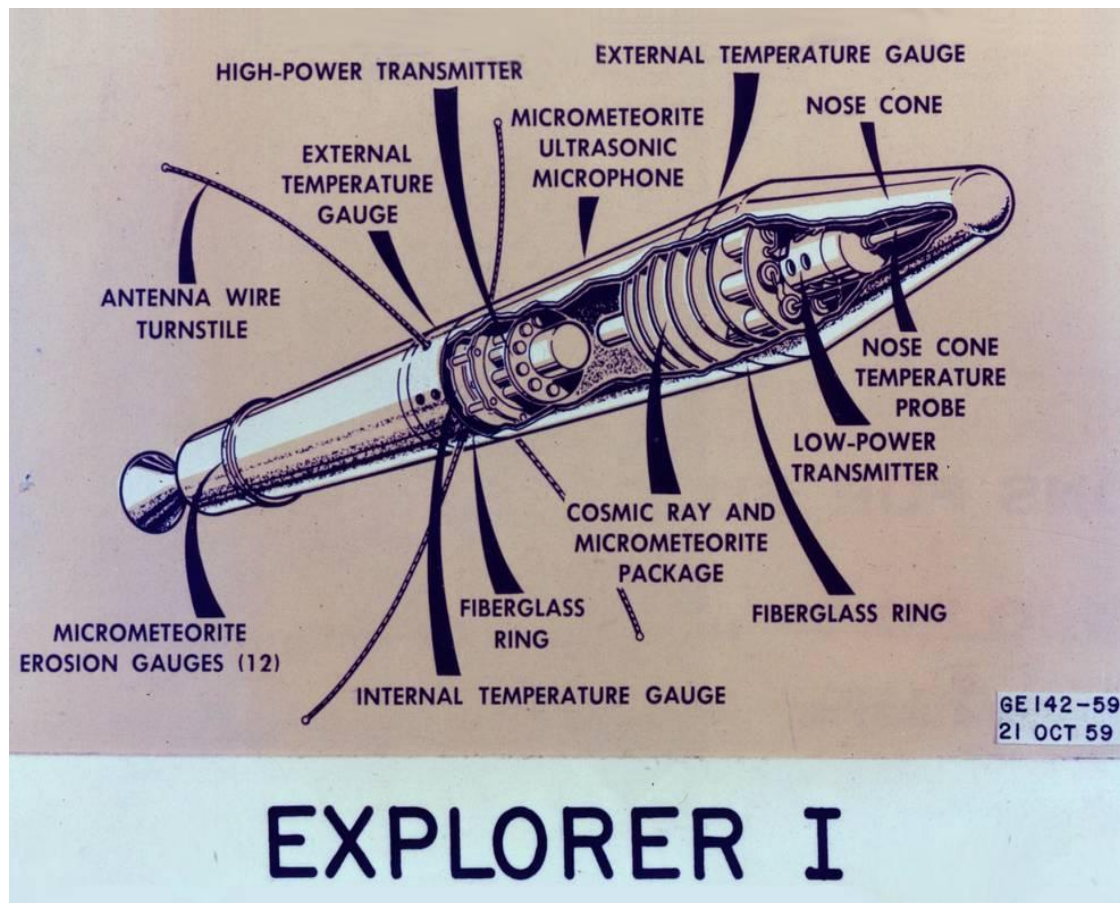


Photo 7: First moon Landing NASA

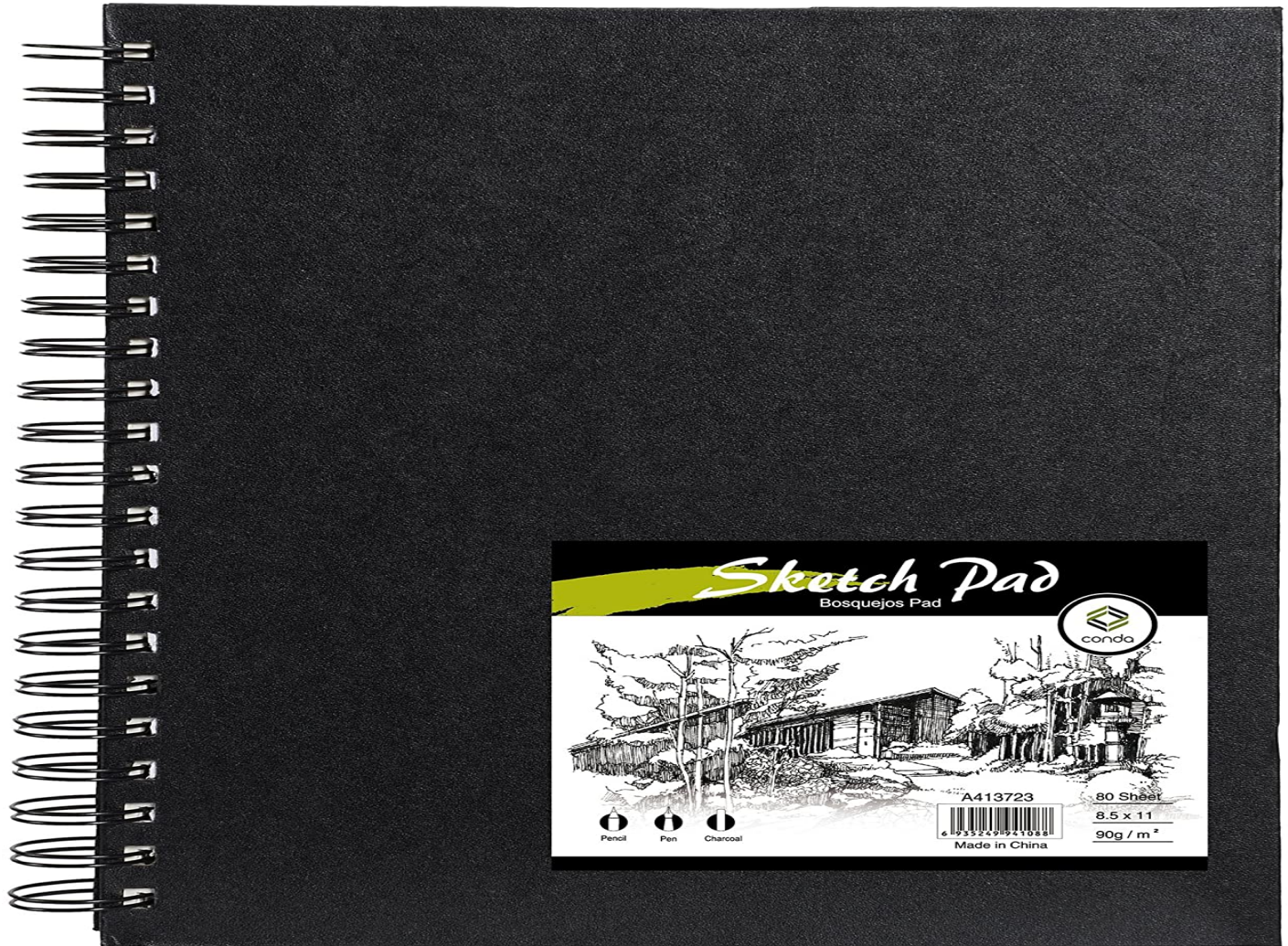


Photo 8-9: Astronauts Field Testing at International Space Station

Photo 10: Moon landing, Field testing on the moon



Sketch Book: Below is used for drawing a diagram of prototype in as many variations of whatever solution the team of young scientist has chosen.



Should We Settle the Moon?

1 Whenever people say “Let’s shoot for the Moon!” they mean that anything is possible. So, when people think of space exploration, a colony on the Moon seems like the next step. The views from the Moon would be spectacular, and being a “Moontonian” would be exciting. But is it feasible?

2 Let’s start with the Moon’s surface, which is not an easy place for life to thrive. There is little atmosphere, so all air would have to be brought from Earth. The lack of atmosphere causes temperatures to vary greatly, from 232°F during the day to –315°F at night. And then there’s the radiation. Without a thick, Earth-like atmosphere to filter the sun’s rays, radiation would sicken any colonists.

3 And what about water? True, there is ice below the Moon’s surface. If astronauts can mine that ice, they can melt it and use it to make oxygen and rocket fuel. But if the ice is unreachable, all water would have to be carted up to the Moon—a cumbersome and unworkable task.

4 But the biggest obstacle to living on the Moon is the regolith.

Regolith is a layer of fine stone dust. It covers almost the entire surface and sticks to everything. It can gum up a spacesuit, jam an engine, and ruin machines. Worst of all, if we couldn’t find a way to keep it out of the colony, it would destroy the lungs of everyone living there.

5 So, will we ever have a Moon colony? Never say never, but today our technology does not make the idea practical.

The Strangeness of Curiosity

Far away, on the rocky surface of the planet Mars, a small but powerful robot called a rover moves dutifully along. Back and forth and up and down the robot roams. It scans the planet. It also sends valuable information back to scientists on Earth at the National Aeronautics and Space Administration (NASA). The scientists have big goals for this rover, which they have named Curiosity. They hope it will tell them whether life has existed on Mars, what the planet’s environment is like, and whether humans will ever be able to explore it. But the missions to Mars come at a high price—Curiosity alone cost 2.5 billion dollars to build and send. Some people question whether that money might be better spent here on Earth. Should the exploration of Mars continue, despite the staggering cost?

ALL IN FAVOR

2 Scientists and others who support space exploration believe that the rovers may one day tell us if life ever existed on Mars. This would be the first evidence of life elsewhere in our universe. Second, the rovers can study the climate and geology of Mars. They relay information about how it has changed over time. This kind of information would help us learn whether any of the planet’s resources can help us here on Earth. It may also help scientists understand features of our own planet. Third, scientists want to learn about the planet’s environment. They hope to prepare for human exploration.

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THE PARTS OF A MARS ROVER

laser for studying
rocks and soil

cameras

robotic arm

tool for cutting
through rock

wheels This artist's rendering
of a Mars rover shows the
parts that help it do its job.

Explaining an Author's Reasons and Evidence Lesson 23

The Solar System Moon Lunar Characteristics • The moon is a quarter the size of Earth, and it is Earth's only satellite in space. • The moon rotates around Earth every 27.3 days, and rotates around itself every 27.3 days as well. • It reflects light from the Sun.

Lunar Surface • The moon has no atmosphere, making it extremely hot during the day, and extremely cold during the night. • The **lunar** surface has no plate tectonics, so its surface features stay mostly the same. It has plenty of **craters**, caused by meteorite collisions. • **Maria** are flat, dark areas that are made of basaltic lava. These were caused when meteorites hit the moon, releasing magma to fill the craters. • **Terrae** are lighter-colored highlands. These are made of silicate materials that came from the ancient magma ocean. • There is no evidence of life, but traces of ice are found in extremely cold craters.

Lunar Interior • The moon has a distinct crust, mantle, and core. Astronauts confirmed this by taking rock samples.

- The small core is made mostly of sulfur and nickel.
- The mantle is composed of olivine and orthopyroxene. There may also be iron and titanium.
- The crust is composed of oxygen, silicon, magnesium, and aluminum.

Concept Check • What is special about the moon's orbit? • What is the temperature like on the moon? What causes this? • What are Maria and terrae?

Earth Science Study Guide Study Tip Since the moon's orbit around itself and around the Earth is the same, we always see the same side of the moon when we look up at the night sky.

Final Unit Resources & References

- **Visual Thinking Strategies Lesson** (All photos are credited to the National Aeronautical Space Administration, aka NASA website)

Photos 1, 5, 7, 8, 11-13: These photos provide information on the first mission to the moon, the space walk and the USA flag placed on the moon.

Photos 2, 10: The photos provide information on the Astronauts that took the first steps on the moon.

Photos 3, 6, 9: These photos show proposed future missions to the moon. Provides students physical images about future missions.

Photo 4: This is a photo of the moon taken from NASA space station. Provides an image of the moon from close up.

Artemis Moon Program Advances. (2019, May 31st). Updated October 7, 2019, from <https://www.nasa.gov/artemis-moon-program-advances>.

- **Bruner Lesson** (All photos are credited to the National Aeronautical Space Administration, aka NASA website and the World Wildlife.org)

Video: *How to Get a Job in Space:* <https://www.youtube.com/watch?v=XcNthPiVNgA>
This video provides information to students about how to get a job in space.

Video: *NASA looks to return astronauts to the moon:*

<https://www.youtube.com/watch?v=H2Pz-u4W8cQ>

This video provides information on NASA's plans to send astronauts back to the moon. It also includes USA Government policies and procedures.

Ethics Rules/NASA. (1978). Updated August 3, 2017, from https://www.nasa.gov/offices/ogc/general_law/ethicsrules.html

This webpage provides information on NASA's ethics policies created in the late 1970s. It provides updates and policy changes as well.

Photos 1-4: Provide visual information on how human exploration and expansion on Earth has impacted our own habitats and wildlife.

Photos 5-10, 12-17: Provides students with visual information on NASA's images of earth viewed from the moon, plans for Moon colonies, prototypes/ models of equipment, first moon landing Astronaut, and technological advances of NASA's space program.

The last photo: This is the resource handout that will be used during the rotation of the stations. This was one of the resources provided in class for the Bruner model lesson.

- **Kohlberg Lesson:** (All photos are credited to the National Aeronautical Space Administration, aka NASA website)

Kohlberg's Stages of Moral Development image provides information for the students on what the developmental stages are in morality according to Kohlberg. This diagram is provided by <https://www.psychologynoteshq.com/kohlbergstheory/>

The following two articles are provided so that students understand the ideas, planning and policies around space exploration. These two reference human expansion in regard to technology
Newbold, Jo. (2020). *Should We Settle the Moon*. Author's Purpose. I-Ready Textbook. <https://www.teacher-toolbox.com/toolbox/R.4/classroom-resources.html>

Walker, Deion. (2020). *The Strangeness of Curiosity*. Author's Purpose. I-Ready Textbook. <https://www.teacher-toolbox.com/toolbox/R.4/classroom-resources.html>

The following article is a fact sheet on the moon in relation to Earth as a solar body. This is to provide the students with "real" information on the moon.

The Solar System Moon Lunar Characteristics.

file:///C:/Users/yetta_williams/Downloads/StudyGuide_Moon.pdf

Photos: provides students with visual information on the proposed moon colony blueprints, and future settlement living quarters. https://docs.google.com/presentation/d/1-N_9nVGx9x2pmTykY0oby0cEmO3jqc2aAw6PhyK-Gik/edit#slide=id.g8684a55ee3_0_13

- ***Creative Problem Solving Lesson***

History Rediscovered Found Tapes (October 27, 2016)

This video provides information on the very early stages and phases of the NASA mission preparations.

https://youtu.be/bYGiEg-nkIA?list=PLTiv_XWHnOZr1hhI3LTwma-ChrntY5iOF

Data and Music: What 50 Years of Exploring Our Moon Sounds Like

This video provides information of what our natural satellite the Moon sounds like in space <https://youtu.be/Al3CdnNsVFI>

These videos are of NASA through the early, and current phases of space exploration. The Apollo mission. The first Satellite mission is also included in video two. The last video being the beginning of American Space Science.

- ***<https://www.nasa.gov/nasa-explorers-apollo>***

- ***<https://youtu.be/WT39gTs9X7k>***

- ***<https://www.nasa.gov/feature/explorer-1-the-beginning-of-american-space-science>***

Photos 1-8 are scientists testing in a lab and also of the moon living quarters blueprints for the proposed Moon colony. Included in these photos are astronauts doing field experience on the moon and pictures of explorers and exploring space.

Junk Photos 1-3 are pictures of various junk drawers. These are examples of junk that can be collected from students and teachers to use to build prototypes and models.

Newbold, Jo. (2020). *Should We Settle the Moon*. Author's Purpose. I-Ready Textbook. <https://www.teacher-toolbox.com/toolbox/R.4/classroom-resources.html>

The Solar System Moon Lunar Characteristics. This is included for statistics of the moon including size, shape, rotation cycle and how the moon and Earth relate to one another as solar bodies.

https://docs.google.com/document/d/1V7rLfI9HkN05_8zjdTDaeR5eEih5FipICg6md3gzJo/edit

