Science Grade 07 Unit 05 Exemplar Lesson 02: Manned Space Exploration

This lesson is one approach to teaching the State Standards associated with this unit. Districts are encouraged to customize this lesson by supplementing with district-approved resources, materials, and activities to best meet the needs of learners. The duration for this lesson is only a recommendation, and districts may modify the time frame to meet students’ needs. To better understand how your district may be implementing CSCOPE lessons, please contact your child’s teacher. (For your convenience, please find linked the TEA Commissioner’s List of State Board of Education Approved Instructional Resources and Midcycle State Adopted Instructional Materials.)

Lesson Synopsis
Students will research modifications needed for space travel. Students will become space travel experts working together as a final design team to compile research, build, describe, and present information about the types of accommodations needed for space travel.

TEKS
The Texas Essential Knowledge and Skills (TEKS) listed below are the standards adopted by the State Board of Education, which are required by Texas law. Any standard that has a strike-through (e.g., sample phrase) indicates that portion of the standard is taught in a previous or subsequent unit. The TEKS are available on the Texas Education Agency website at http://www.tea.state.tx.us/index2.aspx?id=6148.

7.9 Earth and space. The student knows components of our solar system. The student is expected to:

7.9B Identify the accommodations, considering the characteristics of our solar system, that enabled manned space exploration.

Scientific Process TEKS

7.3 Scientific investigation and reasoning. The student uses critical thinking, scientific reasoning, and problem solving to make informed decisions and knows the contributions of relevant scientists. The student is expected to:

7.3B Use models to represent aspects of the natural world such as human body systems and plant and animal cells.

7.3C Identify advantages and limitations of models such as size, scale, properties, and materials.

7.4 Scientific investigation and reasoning. The student knows how to use a variety of tools and safety equipment to conduct science inquiry. The student is expected to:

7.4A Use appropriate tools to collect, record, and analyze information, including life science models, hand lens, stereoscopes, microscopes, beakers, Petri dishes, microscope slides, graduated cylinders, test tubes, meter sticks, metric rulers, metric tape measures, timing devices, hot plates, balances, thermometers, calculators, water test kits, computers, temperature and pH probes, collecting nets, insect traps, globes, digital cameras, journals/notebooks, and other equipment as needed to teach the curriculum.

GETTING READY FOR INSTRUCTION

Performance Indicators

Grade 07 Science Unit 05 PI 02
Identify the accommodations that have enabled manned space exploration, and organize information related to the accommodations in a graphic organizer.

Create either a model of protective covering or a space craft that will ensure survival in space. Justify, orally or in writing, the choice of materials and/or design factors in relation to support of life.

Standard(s): 7.3B, 7.3C, 7.9B

ELPS ELPS.c.1C, ELPS.c.1E

Key Understandings

- Scientists use a variety of equipment and transportation methods to study space.
  - Are there advantages to manned space exploration over unmanned exploration?

- Living in space for long periods of time requires precautions against the long-term effects on the human body by zero-G, low...
pressure, and cosmic rays.

— How are the needs of astronauts in space different from their needs on earth?

• Differences in pressure, temperature, atmosphere, and gravity must be accounted for in order for manned space travel to occur.

— What happens to our bodies when we go to outer space?

Vocabulary of Instruction

• mass
• weight
• microgravity
• solar radiation
• slingshot effect
• mass

Materials

• glue or tape (per group)
• paper (construction or colored paper, 3–4 sheets per student)
• scissors (1 pair per student)
• tape (masking, duct or clear, 1 roll per group)
• variety of material for space suit model (such as, but not limited to the following): aluminum foil, plastic wrap, Mylar™—such as inside of chip bags, plastic balloons, or some wrapping paper backing, plastic bottles, plastic containers, rubber gloves, foam
• variety of material for spacecraft model (such as, but not limited to the following): empty cardboard tubes (paper towel or toilet paper), cardboard boxes, milk cartons, egg cartons, balloons, construction paper

Attachments

All attachments associated with this lesson are referenced in the body of the lesson. Due to considerations for grading or student assessment, attachments that are connected with Performance Indicators or serve as answer keys are available in the district site and are not accessible on the public website.

Teacher Resource: PowerPoint: Types of Spacecraft
Handout: Types of Spacecraft (1 per student)
Handout: Research Topics (see Advance Preparation, 1 strip per group)
Teacher Resource: Research Websites KEY
Handout: Accommodations for Space (1 per student)
Teacher Resource: Accommodations for Space KEY
Teacher Resource: Performance Indicator Instructions KEY (1 for projection)

Resources

None Identified

Advance Preparation

1. Prior to Day 2, arrange for access to student computers/Internet for research. Cut the Handout: Research Topics into strips for sections A–G. Each group will receive a strip to research. You will need to determine in advance how you would like to disseminate the district approved websites for student research (see Teacher Resource: Research Websites KEY). You may wish to locate additional district approved sites for student research (see key topics and phrases on the Teacher Resource: Research Websites KEY).

2. Prior to Day 3, set up a designated area for teams to place their materials for the Explain activity. Gather materials that may be in the classroom or storeroom for the model building activity. See Notes for Teacher section for a list of suggested materials. Note: Mylar™ is also known as BoPET (Biaxially-oriented polyethylene terephthalate). “Emergency blankets” are usually made from this.

3. Prepare attachment(s) as necessary.

Background Information

During this lesson, students will identify the accommodations, considering the characteristics of our solar system that enable manned space exploration (TEKS 7.9B).

The type of equipment needed, manner of launch, and accommodations for humans in space are important to human safety. The long-term effects of living in
space have not yet been fully understood.

STAAR Notes:
Although not directly tested, the content in this unit creates a foundation for student understanding of Space Exploration. This lesson provides opportunities for students to identify and research the obstacles we face to travel in space.

### INSTRUCTIONAL PROCEDURES

<table>
<thead>
<tr>
<th>Instructional Procedures</th>
<th>Notes for Teacher</th>
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<tbody>
<tr>
<td><strong>ENGAGE – What Do We Need?</strong></td>
<td><strong>Instructional Notes:</strong></td>
</tr>
<tr>
<td>1. Ask:</td>
<td>This lesson is to be completed in six days. It is important to keep students on task and to maximize instructional time.</td>
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<tr>
<td>- What elements are needed to support life in space? (Note: This is a review from the previous lesson.) Temperature due to proximity to the Sun, presence of water, and usable atmosphere.</td>
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<tr>
<td>2. Instruct students to generate individual lists in their science notebooks of what they think a space traveler may need to survive in space.</td>
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<tr>
<td>3. After about five minutes, randomly select students to share one of their answers with the class. Write their responses on the board. Continue asking for responses until all possible answers have been shared.</td>
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<tr>
<td>4. Write the following statements on the board:</td>
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<tr>
<td>- There is no gravity in space.</td>
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<tr>
<td>- Mass and weight are the same.</td>
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<tr>
<td>- Living in space has no effect on the human body.</td>
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<tr>
<td>5. Say:</td>
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<tr>
<td>- We’re going to take a class poll. Each of the three statements on the board may be a true statement or a false statement. Raise your hand, and vote for either true or false when I ask for a response. You may only vote once for each statement. I will record the class totals on the board.</td>
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<tr>
<td>6. Read the first statement, and ask for a show of hands for how many students think it is a true statement. Count hands, and record the number. Ask how many think it is a false statement. Count hands, and record the number. Be sure that all students participate. Repeat the process for the other two statements.</td>
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<tr>
<td>7. As students look at the results, inform them that all the statements are FALSE. Allow students to process that information. Instruct students to record the three statements into their science notebooks and label them as “Misconceptions.” Say:</td>
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<tr>
<td>- You will be doing some research about what is needed for humans to travel and live in space. We will be conducting research to find out why these three statements are false.</td>
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**EXPLORE/EXPLAIN – Types of Spacecraft**

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<th>Suggested Day 1 (continued)</th>
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<tr>
<td>1. Project the Teacher Resource: PowerPoint: <strong>Types of Spacecraft</strong>. Discuss</td>
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</table>

**Attachments:**
the types of spacecraft and their purposes in space.

2. Distribute Handout: Types of Spacecraft to each student. Allow students time to read about the different types of spacecraft. Ask:
   - Which types of spacecraft are best suited for human exploration? The Shuttle and the Space Station were once considered the best suited spacecraft. However, the traditional Apollo style rockets are being used by NASA’s new Space Launch Systems (SLS) and Space X.

3. Project the following questions and ask students to first discuss the answer with a shoulder partner, then record their answer in their science notebooks:
   - How are the needs of astronauts in space different from their needs on earth? Allow students to brainstorm some ideas.
   - What happens to our bodies when we go to outer space? (Students should allude to weight changing, mass staying the same, and loss of some muscle mass due to lesser gravity in space.)

4. Facilitate a brief discussion in which student volunteers are asked to share their responses to the previously posted questions. Allow students to revise their answers, if necessary.

EXPLORE/EXPLAIN – Needs of Astronauts Research

1. Write or project the following on the board: (See Instructional Notes)
   - Leaving Earth
   - Effects of Microgravity on the Body
   - Space Suits
   - Space Food
   - Waste Management
   - Living and Working in Space
   - Spacecraft

2. Allow a minute for students to look over the list. Say:
   - Today, we are going to divide into groups and each group will have to research the topic and share the information gathered with the rest of the class. Every topic must have a group. I will provide you with some websites to research.
   - Write your name next to a topic. If that topic has reached the number of students allowed, you must pick another topic and write your name beside it.

3. Distribute the A–G strips cut for each group from the Handout: Research Topics (see Advance Preparation).

4. Distribute the Handout: Accommodations for Space to each student. Call student attention to the format of the handout. They are to find their research topic on the handout. The information they find is to be summarized and recorded on the right side of that section. Say:
   - On the left side, titled “Obstacle to Space Travel,” is an area that can be used for notes or diagrams.
   - The right side is titled “Effects on Humans and Accommodations,” and it is divided into two parts.
   - Summarize the effect or problem for humans caused by your topic in the area labeled “Effects.”
   - The word accommodation means an adjustment, or how a need is met. Under Accommodations, summarize how the effect or problem is met, or what adjustment is made.
You will have the rest of this class and half of tomorrow's class period to find the information needed. Beginning at the second half of the period tomorrow, each group will report their findings to the class.

5. Remind students that all group members must conduct the research and record information. Groups should work together to summarize information.

6. Prior to conducting their research, instruct students to affix the handouts in their science notebooks for safe keeping.

7. Monitor and assist groups as they begin their research.

EXPLORE/EXPLAIN – Sharing Information

1. Remind students that they only have half the period to complete their research (Day 3).

2. Instruct each group to present their effects and accommodations for their topic. Require the other students to take notes on each presentation, accurately filling in each topic on their own handouts.

3. Monitor students to ensure accurate information is being recorded during presentations.

4. Facilitate a class discussion in which students reflect on the effects and accommodations that take place while in space. Check off ideas as they are discussed below. Ask students to lead the discussion on each topic. The information below should provide ideas for discussion.

Leaving Earth:
- Living in space is not as easy as it looks in the movies or on TV. Think about what you learned in the last lesson about how different the temperatures and atmospheres were on other celestial bodies. The distance from the Sun affects how much solar radiation arrives at that planet or object. Too much solar radiation can kill humans if they do not have protection from the radiation.

Living and Working in Space:
- Space is huge and the distances between objects are very great. It is generally cold and dark. Human sense to time and speed are not accurate. Living in a small crowded area can lead to depression.

Effects of Microgravity on the body:
- Orbiting in space creates a nearly weightless effect for humans. It is called microgravity. You can experience microgravity by riding roller coasters or jumping on a trampoline or off a diving board. It is the “free fall” period of these activities when the microgravity occurs, and of course only lasts for a short period of time. The shuttle is held in orbit by gravity as it “falls” around the Earth. The force of microgravity in the shuttle is $1 \times 10^{-6}$ gravity, so objects appear to be floating. It is sometimes called zero gravity, but is more accurately named microgravity because it is so slight.
- Since weight is measured by the pull of gravity on a mass and mass is the amount of matter in a substance, astronauts lose weight due to less gravity. They will also lose some muscle mass because they do not use them due to the lesser gravity in space. If muscles are not used, they will wither.

Space Food:
- Microgravity will also cause water to form a ball rather than a water drop shape or any other shape water can take. This can cause problems showering, perspiring, and drinking. Food is prepared differently and may taste different. Astronauts often request hot sauce and spice to improve the flavor of their food.

Spacecraft:
- Sleeping is challenging in microgravity. Sleeping bags are strapped to the walls, and astronauts must secure themselves within them. The rhythmic beating of the heart will cause the head to bob, so the head must be restrained.

Instructional Note:
Optional: While student groups are presenting, the teacher may be writing student findings on the board, or you could allow each group to project their sheet as they present their information.

★ STAAR Notes:
Although not directly tested, the content in this unit creates a foundation for student understanding of Space Exploration. This lesson provides opportunities for students to identify and research the obstacles we face to travel in space.
Pressure, Temperature, and Atmosphere Changes:
- Providing clean air supply, water supply, temperature control, and a way to dispose of waste must also be considered. Living in space is challenging!

Waste Management:
- Waste management in space is rather interesting. Astronauts use flushing toilets that flush with air rather than water. The airflow draws the waste away from the body, and then flushes it into the storage tanks. The liquid eventually evaporates once it’s dumped overboard. Solid waste goes into a container, dries out, and is taken back to earth for disposal.

5. Ask:
- Are there advantages to manned space exploration over unmanned exploration? Answers will vary.

EXPLAIN – Sharing Information (continued)

1. Say:
- You will be building a model of either a piece of the protective covering of a space suit or a portion of a spacecraft that will help humans to survive in space.
- You may also bring in additional materials from home. We will begin building tomorrow, and will present the models in a couple of days.

2. Show what materials you have available for student use.

3. Ask
- What are the advantages of building models in science? Answers may vary.

4. Have students decide which model they will build. Limit the number of models that will be built in each class by dividing the class into groups based upon the materials you have available (see Instructional Notes).

5. Allow groups to work together to create a rough draft of their models. They will need to include materials they plan to use and brainstorm, as a group, for accommodations they will need to make to allow for human space travel.

6. You may wish to have students get approval for their models before bringing in supplies from home. Note: Students will build their models during Part II of the Evaluate phase.

Materials:
- scissors (1 pair per student)
- tape (masking, duct or clear, 1 roll per group)
- variety of material for space suit model (such as, but not limited to the following):
  - aluminum foil
  - plastic wrap
  - Mylar™-such as inside of chip bags, plastic balloons, or some wrapping paper backing
  - plastic bottles
  - plastic containers
  - rubber gloves
  - foam
- variety of material for spacecraft model (such as, but not limited to the following):
  - empty cardboard tubes (paper towel or toilet paper)
  - cardboard boxes
  - milk cartons
  - egg cartons
  - balloons
  - construction paper

Instructional Notes:
Limit the models to two or three per class to reduce the amount of materials to be provided by the teacher. Use a variety of materials from whatever you have on hand. Allow students to think creatively. Remind students that they can look around their homes for materials that could be used for building instead of purchasing new materials.
Part 01

Grade 7 Science Unit 05 PI 02
Identify the accommodations that have enabled manned space exploration, and organize information related to the accommodations in a graphic organizer.
Standard(s): 7.3B, 7.3C, 7.9B
ELPS ELPS.c.1C, ELPS.c.1E

Part 02

Grade 7 Science Unit 05 PI 02
Create either a model of protective covering or a space craft that will ensure survival in space. Justify, orally or in writing, the choice of materials and/or design factors in relation to support of life.
Standard(s): 7.3B, 7.3C, 7.9B
ELPS ELPS.c.1C, ELPS.c.1E

1. Refer to the Teacher Resource: Performance Indicator Instructions KEY for information on administering the assessment.

Materials:
- scissors (1 pair per student)
- paper (construction or colored paper, 3-4 sheets per student)
- variety of material for space suit model (from previous activity, such as, but not limited to the following):
  - aluminum foil
  - plastic wrap
  - Mylar™—such as inside of chip bags, plastic balloons or some wrapping paper backing
  - plastic bottles
  - plastic containers
  - rubber gloves
  - foam
- variety of material for spacecraft model (from previous activity, such as, but not limited to the following):
  - empty cardboard tubes (paper towel or toilet paper)
  - cardboard boxes
  - milk cartons
  - egg cartons
  - balloons
  - construction paper

Attachments:
- Handout: Accommodations for Space (from previous activity)
- Teacher Resource: Performance Indicator Instructions KEY (1 for projection)
Types of Spacecraft

**Space Shuttle**

Space Shuttles

- Enterprise (test flights only; now on display at the Smithsonian)
- Atlantis (last flight 07/2011)
- Discovery (last flight 03/2011)
- Challenger (lost in 1986)
- Columbia (lost in 2003)
- Endeavor (last flight 05/2011)

Space shuttles are reusable spacecrafts that are used to take manned missions to space. Accommodations are made to ensure the safety of human passengers during launch, flight, and landing. Experiments are run in space, and the shuttle can be used to deploy satellites.

**Space Probe**

Probes

- Viking 1 & 2
- Mariner and Pathfinder (exploring Mars)
- Rovers (Spirit and Opportunity to explore Mars’s surface)
- Voyager 1 (visited Jupiter and Saturn to provide detailed images of the moons of these planets)
- Voyager 2 (visited Uranus and Neptune to provide detailed images of the moons of these planets)
- Cassini-Huygens (Saturn’s moon Titan)
- Pioneer 10 (traveled through the asteroid belt)
- Pioneer 11 (explored Saturn and its main rings)
- Hubble Space Telescope (deep space object)

Probes are unmanned vehicles that carry instrumentation. They are designed to explore countless features of the solar system. They may carry instruments to collect photos, temperature, mapping equipment, atmosphere testing, etc.
**Rocket**

Rockets

- Saturn V (1967-1973)
- Ares V (cancelled 10/2010)
- Voyager (launched 1977)
- Apollo Missions (1961-1972)

Rockets are used mainly for delivering satellites into orbits in space; however, they have been known to launch manned spacecraft into orbit. Rockets are not designed to carry equipment to gather information from the solar system.

**Space Station**

International Space Station

- Skylab

The International Space Station is a satellite that serves as a home for the crew while they perform scientific research and experiments. Accommodations for long-term living in space are made. Experiments are carried out in the space station.
Research Topics

A) Leaving Earth
   Overcoming gravity:
   Slingshot effect:
   Orbiting:
   Distances in space:

B) Effects of Microgravity on the Body

C) Pressure, Temperature, and Atmosphere Changes
   Space suits - images and history:
   Space suits - inside spacecraft:
   Space suit construction:

D) Space Food

E) Waste Management

F) Living and Working in Space

G) Spacecraft
   Space shuttle construction:
   International Space Station construction:
Research Websites KEY

Inform students which sites are approved for research. This is a partial list of possible resources and you may deem other sites appropriate at the discretion of your district policy (see Advance Preparation).

Websites are subject to changes and may have associated links that are neither referenced nor approved by CSCOPE. District personnel are encouraged to preview and vet all websites, resources, and references in accordance with district policy.

A) Leaving Earth
Overcoming gravity: http://www.aeronautics.nasa.gov/fap/all_about_flight.html
http://www.nasa.gov/centers/glenn/shuttlestation/station/microgex.html
Slingshot effect:

B) Effects of Microgravity on the Body

C) Pressure, Temperature, and Atmosphere Changes
Space suits - images and history: http://web.mit.edu/16.00/www/aec/spacesuit.html
Space suits - inside spacecraft: http://spaceflight.nasa.gov/living/spacewear/index.html

D) Space Food
http://spaceflight.nasa.gov/living/spacefood/index.html
http://www.nasa.gov/centers/johnson/pdf/167750main_FS_SpaceFood508c.pdf

E) Waste Management

F) Living and Working in Space
http://www.nasa.gov/centers/johnson/pdf/167746main_FS_LivingandWorkinginSpace508c.pdf

G) Spacecraft
Space shuttle construction: http://www.nasa.gov/returntoflight/system/system_Orbiter.html
International Space Station construction:
## Accommodations for Space

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<tr>
<th>Obstacle to Space Travel</th>
<th>Effects on Humans and Accommodations</th>
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<tbody>
<tr>
<td><strong>Group A:</strong> Leaving Earth: <strong>overcoming gravity, slingshot effect, orbiting distances between objects in the solar system, etc.</strong></td>
<td>Effects-</td>
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<td>Accommodations-</td>
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<tr>
<td><strong>Group B:</strong> Effects of Microgravity on the Body: <strong>being weightless, physical effects, long-term effects on muscles and bones, etc.</strong></td>
<td>Effects-</td>
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<td><strong>Group C:</strong>&lt;br&gt;Pressure, Temperature, and Atmosphere Changes: suits that provide air supply, temperature, pressure, and radiation protection, maneuverability, etc.</td>
<td><strong>Effects-</strong>&lt;br&gt;<strong>Accommodations-</strong></td>
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<td><strong>Group D:</strong>&lt;br&gt;Space Food: challenges in preparing and eating, taste, etc.</td>
<td><strong>Effects-</strong>&lt;br&gt;<strong>Accommodations-</strong></td>
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<td><strong>Group F:</strong> Living and Working in Space: sleeping, health, crowded conditions, etc.</td>
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<td><strong>Group G:</strong> Spacecraft: providing living, sleeping, hygiene, working areas, etc.</td>
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| **Group A:** Leaving Earth: overcoming gravity, slingshot effect, orbiting distances between objects in the solar system, etc. | Effects/Accommodations-  
Living in space is not as easy as it looks in the movies or on TV. Think about what you learned in the last lesson about how different the temperatures and atmospheres were on other celestial bodies. The distance from the Sun affects how much solar radiation arrives at that planet or object. Too much solar radiation can kill humans if they do not have protection from the radiation. |

| **Group B:** Effects of Microgravity on the Body: being weightless, physical effects, long-term effects on muscles and bones, etc. | Effects/Accommodations-  
Space travel causes an almost weightless effect on humans called microgravity. You may have experienced microgravity by riding roller coasters, jumping on a trampoline, or diving off a diving board. It is during the "free fall" period when the microgravity occurs and only lasts for a short period of time. It is sometimes called zero gravity, but is more appropriately named microgravity because it is so small. The shuttle is held in orbit by gravity as it is being pulled toward the Earth. Since weight is measured by the pull of gravity on a mass and mass is the amount of matter in a substance, astronauts lose weight due to less gravity. They will also lose some muscle mass because they do not need to use them due to the lesser amount of gravity in space. If muscles are not used, they will lose mass. |
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<td><strong>Group C:</strong> Pressure, Temperature, and Atmosphere Changes: suits that provide air supply, temperature, pressure, and radiation protection, maneuverability, etc.</td>
<td><strong>Effects/Accommodations:</strong> Providing clean air supply, water supply, temperature control, and a way to dispose of waste must also be considered. Living in space is challenging!</td>
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<p>| Group D: Space Food: challenges in preparing and eating, taste, etc. | <strong>Effects/Accommodations:</strong> Microgravity will also cause water to form a ball rather than a water drop shape or any other shape water can take. This can cause problems showering, perspiring, and drinking. Food is prepared differently and may taste different. Astronauts often request hot sauce and spice to improve the flavor of their food. |</p>
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<td><strong>Group E:</strong> Waste Management: toilet, showers, garbage disposal, etc.</td>
<td><strong>Effects/Accommodations:</strong> Human waste management in space is quite fascinating. The toilets flush with air instead of water. The airflow pulls the waste away from the body, and then flushes it into the storage tanks. Liquid waste will eventually evaporate once it’s dumped overboard. Solid waste is deposited into a container, dried out, and then taken back to earth for disposal.</td>
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<td><strong>Group F:</strong> Living and Working in Space: sleeping, health, crowded conditions, etc.</td>
<td><strong>Effects/Accommodations:</strong> Space is huge and the distances between objects are very great. It is generally cold and dark. Human sense to time and speed are not accurate. Living in a small crowded area can lead to depression.</td>
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<td><strong>Spacecraft:</strong> providing living, sleeping, hygiene, working areas, etc.</td>
<td>Sleeping is challenging in microgravity. Sleeping bags are strapped to the walls, and astronauts must secure themselves within them. The rhythmic beating of the heart will cause the head to bob, so the head must be restrained.</td>
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Performance Indicator Instructions KEY

Performance Indicator

Part 01

- Identify the accommodations that have enabled manned space exploration, and organize information related to the accommodations in a graphic organizer. 
  (7.3B, 7.3C; 7.9B)  
  1C, 1E

Materials:
- scissors (1 per student)
- paper (construction or colored paper, 3–4 sheets per student)

Attachments:
- Handout: Accommodations for Space (from previous activity)
- Teacher Resource: Performance Indicator Instructions KEY

Instructional Procedures:
1. Project the Performance Indicator on the board.

2. Share Performance Indicator rubric or your expectations with students prior to students beginning the assessment.

3. Instruct students to use their completed Handout: Accommodations for Space to aid them in constructing a graphic organizer of their choice. The graphic organizer will include the type of spacecraft, the obstacles, and the accommodations for them.

4. Answer any questions students may have regarding the assessment.

5. The graphic organizer should be completed during this class period.

6. Remind students to bring their model materials from home, if needed.

7. Insert the standard statement in lesson:

Instructional Notes:
Note: You may wish to reverse the order of the Performance Indicators, but the creation of the graphic organizers is intended to support students in completing the second part of the assessment.

Performance Indicator

Part 02

- Create either a model of protective covering or a spacecraft that will ensure survival in space. Justify, orally or in writing, the choice of materials and/or design factors in relation to support of life. (7.3B, 7.3C; 7.9B)  
  1C, 1E
Materials:
- scissors (1 pair per student)
- variety of material for space suit model (from previous activity, such as, but not limited to the following):
  - aluminum foil
  - plastic wrap
  - Mylar™-such as inside of chip bags, plastic balloons or some wrapping paper backing
  - plastic bottles
  - plastic containers
  - rubber gloves
  - foam
- variety of material for spacecraft model (from previous activity, such as, but not limited to the following):
  - empty cardboard tubes (paper towel or toilet paper)
  - cardboard boxes
  - milk cartons
  - egg cartons
  - balloons
  - construction paper

Attachments:
- On the lesson, add the new Teacher Resource to the list of attachments (you may need to add a section to do this)
- Delete this section if none listed on lesson

Instructional Procedures:
1. Instruct student groups to complete their model of either a section of the protective covering of a space suit or a section of the space shuttle or space station, as per the previous discussion.

2. Inform students they will be presenting their models to the class on the following day, and will be required to do the following:
   - **Identify some limitations of the model they created.** Limitations may include size, durability, or strength; materials are not authentic, etc.
   - **Justify the choice of materials and/or design factors in relation to support of life.**

3. Answer any questions students may have regarding the assessment.

4. Monitor and assist groups as they complete the models.

5. Allow time on Day 6 for student presentations of the models. Require a discussion of the limitations of the models and use of materials and/or designs.

Instructional Notes:
Assessment of the Performance Indicator should include both the graphic organizer and the model.