**BACKGROUND INFORMATION**

**Concepts**
Health is an important factor in a successful Space Shuttle mission. To stay in the best possible condition, astronauts need to

- exercise regularly to counteract the effects of living in a weightless environment
- have their own lockers containing personal items and changes of clothing
- sponge bathe to keep clean

**Personal Hygiene**
Astronauts do not take showers on the Shuttle. Earlier showering attempts aboard Skylab failed because of weightlessness. The water floated about the cabin, and two astronauts had to spend time vacuuming up escaping water. Now astronauts on the Shuttle take sponge baths. A curtain is drawn from the bathroom door to the side of the galley where the washbasin is recessed. There is a mirror and a light above the basin and strips of tape on the wall to hold washcloths, towels, and other personal items.

Because water and soapsuds stick to the skin in the weightless environment, crew members use one washcloth for washing and a second for rinsing. Excess water is pulled into the waste water tank under the floor. The used washcloths and towels are put into a bag that hangs on the bathroom door. The bathroom on the Shuttle has a light to read by and a hatch window for an outside view.

**Exercise**
On Earth, some people like to exercise more than others. Aboard the Space Shuttle, astronauts have little choice. On earlier missions, scientists discovered that astronauts suffered some bone and muscle deterioration because their bodies were not getting the resistance they were used to in gravity. Today, astronauts participate in a planned exercise program to counteract the effects of a weightless environment. As a form of resistance exercise, astronauts walk a treadmill on the Shuttle. Flight doctors recommend fifteen minutes daily on seven-to-fourteen-day missions and thirty minutes daily on thirty-day missions. Exercising also helps people readjust more quickly to Earth's gravity when they return home.

The treadmill is a Teflon-coated aluminum sheet on a roller, with a bottom that locks into holes in the floor. Straps from the base of the treadmill tie around the waist. Astronauts exercise their arms by pushing upward on the bar while walking. Moving air from a nearby duct is used to dry off the perspiration produced from exercising. Otherwise, the sweat would stick to the skin and grow thicker and thicker.

While astronauts exercise, they can listen to music or look out the hatch window at the view.

**Personal Storage Lockers**
In the forward mid-deck cabin area, astronauts have their own storage lockers containing changes of clothing and personal hygiene kits. Kits include a toothbrush, toothpaste, dental floss, nail clippers, soap, comb and brush, lip balm, stick deodorant, and skin lotion. Shaving cream and a razor are added for the men. Although nail clippers are included, nails grow so slowly in space that they only need trimming once a month.

**Medical Care**
Aboard the Space Shuttle, a mission specialist provides medical care. The mission specialist may be an astronaut with paramedic training or a doctor. When there is no doctor on board, if a problem arises that is too serious for the mission specialist, there is always a doctor available for consultation at Mission Control in Houston.

A Shuttle Orbiter Medical System (SOMS), a special medical kit, is stowed in the mid-deck cabin area. This three-part system has diagnostic equipment such as a blood pressure cuff and a stethoscope, first-aid materials that include ointments, bandages, and medication, and other medical instruments, including a respirator and a defibrillator.
OBJECTIVES

Students will understand the following:
- Astronauts have their own personal storage lockers.
- The lockers contain clothes and personal items, such as toothbrush, toothpaste, dental floss, comb and brush.
- Astronauts use washcloths so that drops of water do not float around the spacecraft cabin.

MOTIVATION

1. How often do you wash?
(Accept any reasonable answer — in the morning, before bedtime, after sports, when I'm dirty.)
2. Why do we need to wash?
(Accept any reasonable answer — to stay clean, to wash away germs, to help us stay healthy.)
3. Pretend you are on a camping trip. There is no shower. How will you keep clean?
(Try to elicit ideas, such as using a pan with water, using wash-and-wipes, taking a sponge-type bath.)

VOCABULARY

Have the students use these words as part of your motivating discussion and in the follow-up Space Lab and Space Countdown activities.
- gravity (an inward pull or force that attracts bodies to the center of other bodies, such as Earth)
- cabin (a compartment aboard the Space Shuttle where the living quarters are located)
- locker (a place to keep belongings)
- kit (a collection of personal items)
- astronaut • cloth • spacecraft

ACTIVITY DESCRIPTION

The Student Liftoff page for this lesson contains two activities: Space Lab and Space Countdown.

The Space Lab is a hands-on experiment that helps students understand that on Earth, water drops are pulled downward by the force of gravity. The students are asked: How do drops of water move? A student, with a friend, explores the movement of water drops downward. This activity may be done at school or at home.

The Space Countdown, a math activity, requires that the students determine how many towels and washcloths an astronaut would use for a six-day mission. This involves counting by ones, counting by twos, adding, and problem solving.

ADDITIONAL ACTIVITIES FOR SCHOOL OR HOME

- Have students design their own personal kit to take with them on a space mission. They might want to include items from the following categories: health, personal care, appearance, recreation.
- Create a health chart to mimeograph and distribute to the students. A sample follows:

<table>
<thead>
<tr>
<th>Student's Name's Health Chart</th>
<th>Mon.</th>
<th>Tues.</th>
</tr>
</thead>
<tbody>
<tr>
<td>hours of sleep</td>
<td></td>
<td></td>
</tr>
<tr>
<td>time spent exercising</td>
<td></td>
<td></td>
</tr>
<tr>
<td>time spent washing</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Have students fill in their own chart for up to one week.
What would you do if water floated around you?
In space, drops of water will float around a spacecraft cabin.
On Earth, a force called gravity pulls everything down.
There is not enough gravity in space to keep the water from floating.
Astronauts must use washcloths to hold the water.
They keep the washcloths in a kit.
The kit also holds a toothbrush and toothpaste, soap, and a comb and brush.

Space Lab

How do drops of water move?
You need: a raincoat or a plastic apron, some water, a friend.

Step 1. Put on the raincoat or the plastic apron.
Wash your face standing at a sink.
In what direction do the drops of water go?

Step 2. Lie down on the floor. Have your friend help you wash your face.
In what direction do the drops of water go?

Step 3. Lie on your side. Have your friend help you wash your face.
In what direction do the drops of water go?

What makes the water go in the same direction each time?
How do you think water drops would move inside a spacecraft? Why?

Space Countdown

Astronaut Sheila went on a six-day Shuttle mission.
She used one washcloth each day.
She used one towel every two days.

1. How many washcloths did she use for the 6 days?
2. How many towels did she use for the 6 days?
3. How many washcloths and towels did she use altogether?
Objectives
Students will understand the following:
- Astronauts do not take showers in space because weightlessness would make the water droplets float around the cabin.
- Astronauts take sponge baths instead, and use washcloths for washing and rinsing.

Motivation
1. Ask students how many of them take showers? Baths?
   How often? Why?
   (Accept all reasonable answers, including to get clean, to wash away dirt, when I'm getting dressed up, when I come inside after playing outside.)
2. Suppose you were sick and could not take a bath or a shower.
   What could you do to freshen up?
   (Use a damp towel, use a wash-and-wipe.)
3. What is a sponge bath?
   (A bath where you use a sponge or cloth or towel to wash yourself when there is no bath or shower available.)
4. In what situations might you take a sponge bath?
   (If you are visiting a friend, taking a long car trip, camping out.)

Vocabulary
Have the students use these words as part of your motivating discussion and in the follow-up Space Lab and Space Countdown activities.
- gravity (an inward pull or force that attracts bodies to the center of other bodies)
- locker (a place where an astronaut keeps changes of clothes and a kit containing personal items)
- astronauts
- washbasin
- sponge bath
- sealed
- kit

Activity Description
The Student Liftoff page for this lesson contain two activities: Space Lab and Space Countdown.

The Space Lab is a hands-on experiment that gives the students an opportunity to make and use an in-flight exerciser. The students are asked: How can astronauts exercise in flight to stay healthy? Working with the help of an adult, they make an in-flight exerciser out of a broom handle and an old bicycle inner tube. They also learn to take their own pulses. This activity may be done at school or at home.

The Space Countdown, a math activity, helps teach students to recognize different parts of a bar graph (such as titles and headings) to find facts shown by the graph, and to compare amounts of time.

Additional Activities for School or Home
- Everyone is thinking more about exercise these days. Have the students speak to children and adults they know and find out how to do at least two different kinds of exercise. Some exercises strengthen muscles such as the heart; others are for stretching and flexibility. Plan a special Exercising for Health day. Students take turns teaching their exercises and leading the class. The class might vote for favorites. You might start a daily ten-minute workout period.
- Have a brainstorming session, sharing the different ways to wash without actually taking a bath or shower. List ideas on the board. Remember, all ideas are acceptable and no judgment is made during brainstorming. Discuss how the ideas might work. Have the students create imaginative pictures illustrating the ideas. Use a Bathless Bath bulletin board display.
On the Space Shuttle, astronauts use a bathroom that can be closed off with a curtain. There is a washbasin, warm water, and soap. Strips of tape hold a towel and a washcloth to the wall.

Astronauts take sponge baths. They use one cloth with soap to wash and another cloth to rinse. Used towels go into a bag and are sealed in plastic.

Space Lab

You will need an adult to help you with this experiment. How can astronauts exercise in flight to stay healthy?

You need: a broom handle, an old bicycle inner tube.

Step 1. With an adult, make an in-flight exerciser. Use an inner tube to make a loop hitch around a broom handle. Tighten.

Step 2. Count your pulse beats for ten seconds by placing your fingers at your wrist. (The adult can help you.)

Step 3. Place one foot in the open end of the exerciser loop. Hold the broom handle with both hands. Pull the broom handle against your foot. Release. Do this for thirty seconds. Take your pulse again.

How have the beats changed? How do your muscles feel? How can an exerciser help an astronaut?

Space Countdown

The graph shows how long it took some astronauts to take a sponge bath.

Use the graph to answer the questions.

1. Who took the least amount of time?
2. Who took the most amount of time?
3. How long did it take for Bonnie to sponge bathe?
Objectives
Students will understand the following:

- Astronauts must exercise every day to counteract the effects of weightlessness in space.
- Astronauts use a form of resistance exercise, walking a treadmill for fifteen to thirty minutes daily.
- While exercising, crew members can view Earth through a hatch or listen to their favorite music.

Motivation
1. Why do people exercise?
   (To keep our bodies healthy; to strengthen our muscles; to feel good.)

2. Discuss what kinds of exercise are popular now.
   (Jogging, walking, swimming, tennis, racquetball, golf, baseball, soccer, any reasonable answer.)

3. Ask students what kind of exercise they do.
   (Physical education in school, sports teams, skating, bike riding, swimming.)

Vocabulary
Have the students use these words as part of your motivating discussion and in the follow-up Space Lab and Space Countdown activities.

- gravity (an inward pull or force that attracts bodies to the center of other bodies)
- weightless (having little or no weight because the force of gravity has been balanced by the force of forward speed)
- treadmill (a machine moved by walking motion)
- duct/perspire

Activity Description
The Student Liftoff page for this lesson contains two activities: Space Lab and Space Countdown.

The Space Lab is a hands-on experiment using exercises devised by NASA (National Aeronautics and Space Administration) for space travelers. The students are asked: What special exercises must space travelers do to stay fit? The exercises used are isometric. They strengthen muscles through the use of immovable resistance. This activity may be done at school or at home.

The Space Countdown, a math activity, has students read an exercise chart to answer questions. Students learn to identify different parts of a chart, such as headings and titles, and to locate and compare the information presented.

Additional Activities for School or Home
- Suggest that children turn part of the classroom into a Space Shuttle using chairs, tables, large empty boxes. Have children simulate exercising in space in a weightless environment. Act out walking the treadmill, jogging, stretching, doing jumping jacks, and touching toes.
- Ask students to make believe they are weightless for a day. How would their lives be different? Eating? Sleeping? Dressing? Washing? Playing? Have them share their ideas by writing stories or letters to friends, by drawing pictures, making tape recordings, or pretending they are being interviewed on TV. Have them describe how they became weightless, what things they can no longer do, what new things they are able to do, any problems they have, and how they will return to normal.
Why must astronauts exercise every day aboard the Space Shuttle?
In the weightlessness of space, there is no pull against an astronaut's body.
Bones and muscles get weak when there is not enough gravity.
Astronauts walk a treadmill for fifteen to thirty minutes each day to keep their bones and muscles healthy. Straps attached to the treadmill make their arm and leg muscles work harder. This exercise makes sweat, which sticks to their skin. Moving air from a nearby duct dries off the sweat.

Space Lab
What special exercises must space travelers do to stay fit?
You need: a clock with a second hand.
Step 1. Grasp your right hand with your left hand, palms facing. Pull in opposite directions for five seconds. Release.
Step 2. Repeat this exercise for ten seconds; for twenty seconds.
Step 3. Place hands against a wall or stationary object and practice running in place while pushing for five minutes.
How is this exercise like running on a treadmill?

Space Countdown
Juan, Rika, and Lori tried one of the special space traveler exercises. Their teacher made a chart to show how their pulse beats changed.

Use the chart to answer the questions.
1. Who had the lowest pulse rate before exercising?
2. Who had the lowest pulse rate after exercising?
3. Who had the highest pulse rate after exercising?
4. Whose pulse rate changed the most?

<table>
<thead>
<tr>
<th>EXERCISE CHART</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pulse Beats Before</td>
</tr>
<tr>
<td>-------------------</td>
</tr>
<tr>
<td>Juan</td>
</tr>
<tr>
<td>Rika</td>
</tr>
<tr>
<td>Lori</td>
</tr>
</tbody>
</table>