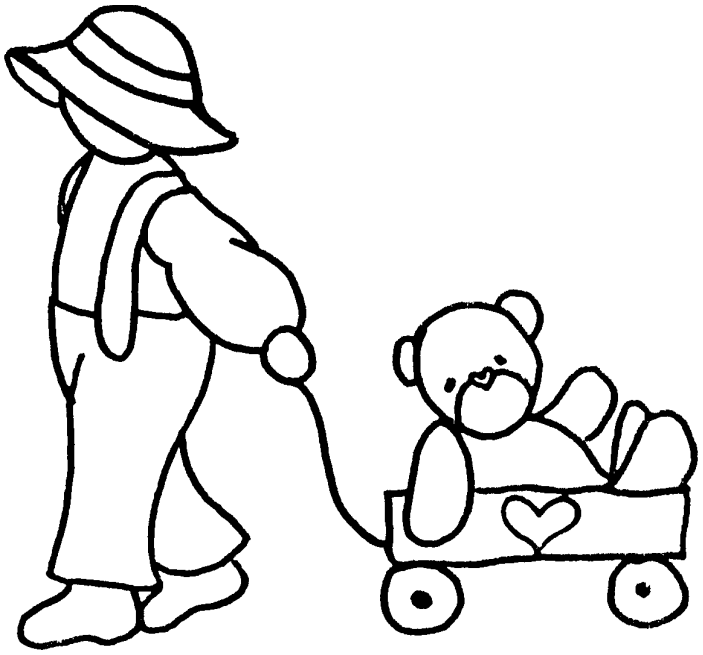
Applied Science

Our Technological World

SIXTH GRADE

BUILT ENVIRONMENT



3 WEEKS
LESSON PLANS AND
ACTIVITIES

APPLIED SCIENCE
OVERVIEW OF SIXTH GRADE

SCIENCE AND MATH

WEEK 1.
PRE: *Investigating critical thinking.*
LAB: *Exploring topology of a closed surface.*
POST: *Exploring how math and science are related.*
WEEK 2.
PRE: *Exploring how mathematical sequences are found in nature.*
LAB: *Exploring design.*
POST: *Designing an experiment.*
WEEK 3.
PRE: *Discussing how fibers become fibers.*
LAB: *Comparing and contrasting different fibers.*
POST: *Investigating fibers present in your home.*

PHYSICS

WEEK 4.
PRE: *Investigating matter and its interactions.*
LAB: *Exploring the nature of motion.*
POST: *Exploring the different laws of motion.*
WEEK 5.
PRE: *Exploring the motion of fluids.*
LAB: *Observing and recording motion of fluids.*
POST: *Investigating fluids in motion.*

TECHNOLOGY

WEEK 6.
PRE: *Investigating Bernoulli's principle.*
LAB: *Experimenting with different types of gliders.*
POST: *Exploring forces that affect gliders.*
WEEK 7.
PRE: *Exploring how design can overcome friction.*
LAB: *Investigating aerodynamic design.*
POST: *Comparing rockets and airplanes.*

BUILT ENVIRONMENT

WEEK 8.
PRE: *Exploring living requirements in space.*
LAB: *Observing toys in space.*
POST: *Designing a space station.*

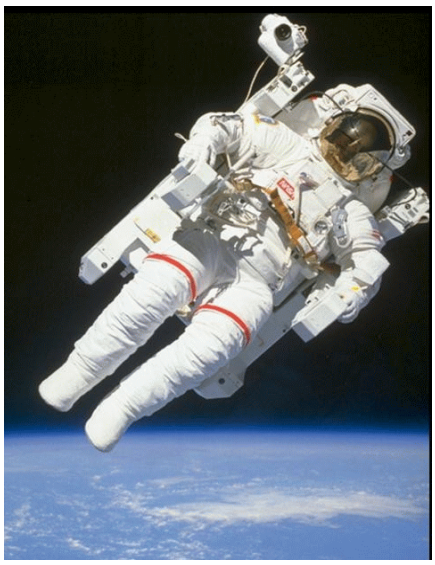
APPLIED SCIENCE - BUILT ENVIRONMENT (6)

PRE LAB

Students view a video on toys in space.

OBJECTIVE:

1. Exploring living requirements of space.
2. Investigating the advantages of space exploration.



VOCABULARY:

astronaut
weightless

MATERIALS:

video tape or clips of Toys in Space
or Applied Science - Built Environment (6)
Internet

BACKGROUND:

Astronauts are people who go into space. They have many different professions on Earth. For example, an astronaut can be a medical doctor studying the effects of microgravity on the human body. Astronauts living in space do most of the same things they would do on Earth. They eat, sleep, and attend to personal hygiene just as we do on Earth. However, the requirements in space are different from Earth. It is easy for us to eat and sleep, but a "job" out in space. Eating and sleeping in space is different because of "weightlessness." The astronauts have to be careful with their food, or it can float away. They have to strap themselves in a place while sleeping or they could float away.

Astronauts brush their teeth, take sponge baths, and go to the bathroom in space. Because of the weightlessness, they have to be very careful about containing wastes so they can bring it back to Earth for proper disposal.

PROCEDURE:

1. View the video on "Eating and Sleeping in Space" provided on the video tape in APPLIED SCIENCE - BUILT ENVIRONMENT (6) or purchased through resources below. This also will help students prepare for lab which asks students to predict what certain toys in space will do.

http://core.nasa.gov

You can purchase videos and other educational material from NASA or related agencies.

http://quest.nasa.gov/space/photos/videos

You can download video free from this site. Not only Toys in Space but other video that may be useful.

2. After the tape, you may want to ask students if it seems like fun or very confining to be in space? Don't be surprised if many students prefer to stay on Earth. It seems fun for a while, but when you really think about it, an astronauts' job is hard work.

3. You may ask students why are we exploring space? First, we need to know what resources may be available for humans in the centuries to come. However, scientists are investigating the possibility of products that can be built in space that might help humans. The ultra vacuum of space is used to student new microelectronic advances including compound semiconductors, synthesizing metallic waters, and high temperature superconductors. Medical research is trying to understand protein crystals in space that might lead to understanding viral diseases. The production of zeolites in space produces a better crystal for use in kidney dialysis machines, solar energy panel, and other medical and industrial uses.

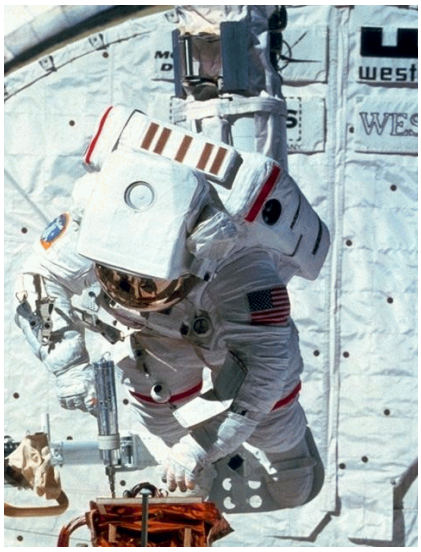
APPLIED SCIENCE - BUILT ENVIRONMENT (6)

LAB

Students predict how toys would react in space.

OBJECTIVE:

1. Predicting how certain toys react in space.
2. Observing toys in space.



VOCABULARY:

gravity
microgravity
zero gravity

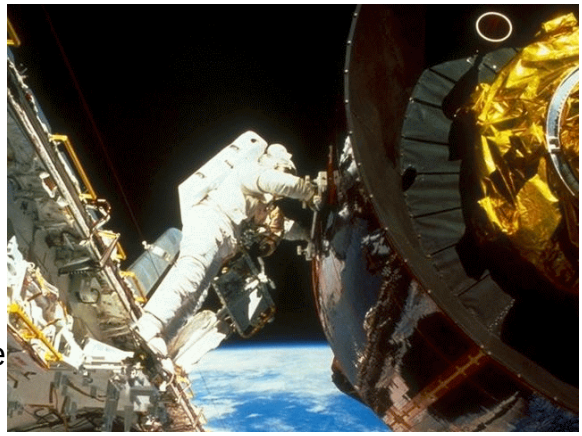
MATERIALS:

Applied Science - Built Environment (6)
or toys listed on lab sheet

BACKGROUND:

The universal law of gravitation states that every object in the universe is attracted to every other object in the universe. Everything pulls on everything else, and in a beautifully simple way that involves only mass and distance. Newton stated that every body attracts every other body with a force which for any two bodies is proportional to the mass of each body which decreases proportionately to the mass of each body which decreases proportionately as the square of the distance between them.

PROCEDURE:



1. In this lab the students will look at different toys. First they will explain how they work or describe their motion by going to the different stations. Then they will predict what would happen in an environment that has no gravity. They will record their answer on the lab sheet.

2. After they fill in their lab sheet have them observe how toys react in space. On the tape there are several toys that are not included in the module. You can skip those

portions, or if you have the toy you might want to add it. The entire tape is 61 minutes, so fast forward to see how the toys will react.

3. Below are highlights of the video tape.
   A. glider - does not fall down, however cannot fly backwards, bounces back;
   B. paddleboard -easier to use;
   C. slinky - cannot "walk", doesn't sag in middle when extended, still has spring motion;
   D. jacks - bounced ball continues, jacks go all over the place;
   E. juggling - doesn't work;
   F. magnetic marble - can see the force of magnetism give motion, marbles swing around;
   G. wind up toy - needs to have base to flip, then continues;
   H. gyroscope - keeps its stability of spin, entire gyroscope spins;
   I. top - difficult to spin, but similar to gyroscope;
   J. space wheel - must use centripetal force to start motion;
   K. yo-yo - cannot sleep;
   L. car (wind up) -can only move if put on a track, stops motion when energy ends.

APPLIED SCIENCE - BUILT ENVIRONMENT (6)

PROBLEM: Can you predict how certain toys act in space?
PREDICTION:_____
PROCEDURE:
Go to the appropriate stations around the lab and experiment with the toys. Record how you think it works or describe the motion of that toy. Predict how it would react in space. After you view a video on Toys in Space, see if your predictions were correct.

	PREDICTION	DESCRIBE MOTION IN SPACE
1. glider		
2. paddleball		
3. slinky		
4. jacks		
5. juggling		
6. magnetic marbles		
7. wind up toys		
8. gyroscope		
9. top		
10. space wheel		
11. yo-yo		
12. car (wind up)		

CONCLUSIONS:
_____

APPLIED SCIENCE - BUILT ENVIRONMENT (6)

POST LAB

Students design a space station.

OBJECTIVES:

1. Investigating living in space.
2. Designing a space station.

VOCABULARY:

space
weightless

MATERIALS:

worksheet

BACKGROUND:

In the not to distant future, men and women will be living in space to carry out numerous experiments and activities. Rather than being confined to shuttles or orbiters, our space pioneers will live in space stations, built largely in space. These orbiting multipurpose systems will have to provide for all the astronauts' needs, including atmosphere, food, water, shelter, and health.

These space stations will also have to create their own living space. For instance, an atmosphere cannot be brought with them. They will have to maintain the atmosphere by using certain plants or other methods. Waste materials will have to be stored, reused, or transported. Gravity will have to be maintained, because human bone will deteriorate without gravity. Emphasize to students that the human body was made to live on Earth, with an atmosphere, water, and gravity. Without these parameters humans cannot survive for very long.

PROCEDURE:

1. A space vehicle will be the ultimate "built environment" because humans will have to have designed every aspect of living. You may want to compare living on today's Space Shuttle with living on the *Enterprise* on Star Trek. Below is an example of some of the items to discuss. Students may want to discuss others. After you go over the list students will see that the *Enterprise* is definitely in the world of our descendants.

EARTH	SPACE SHUTTLE	ENTERPRISE
FOOD	BRING FROM EARTH	PRODUCED BY MACHINES THAT SYNTHESIZE MOLECULES
CLOTHING	BRING FROM EARTH	PRODUCED FROM EARTH
ATMOSPHERE	BRING FROM EARTH	PRODUCED ON BOARD
WASTE RECYCLED	BRING BACK TO EARTH	RECYCLED, DEPOSITED ON DIFFERENT STATIONS
WALKING	WEIGHTLESSNESS	CREATE THEIR OWN GRAVITY

2. On the worksheet have students create their own space station or space city of the future. The words are to remind them to include specific areas. Remember all needs must be provided to survive in space.

APPLIED SCIENCE - BUILT ENVIRONMENT (6)

SPACE STATION OR CITY

ATMOSPHERE	**RECREATION**	**BATHROOM**
ENGINE ROOM	**FOOD**	**PRIVATE ROOM**
WORK AREAS	**SEWAGE**	**WATER**
TRANSPORT ROOM	**GRAVITY GENERATOR**	**SCHOOL**
HOSPITAL	**FUEL**	