



Revised 6/00

Lesson #24
Toys in Space
Grade Level: 3-4

Teachers, this is a basic lesson plan that you may modify at your discretion.

Modifications to video: There have been several changes to the lesson plan since the video was made. This lesson plan reflects the latest changes made as a result of suggestions from teachers who have presented the lesson during the daytime program. Please continue to send us your ideas!

IMPORTANT! : The teacher training video you review from your principal will have some different toys than what are in your kits. The instruction to the students is the same, just substitute the new toys for the old toys. This lesson plan includes the new toys. Also, the video in your blue box **does have** the new toys shown.

Overall educational objective: Students will explain how gravity affects the operation of toys and simple machines.

Associated Standard and CORE objective:

3030-04 Students will use simple machines.

Materials list:

1 - Toys in Space classroom video: **This video stays in the blue box at the end of the day.**

(This video contains a brief introduction to the toys in space project and to microgravity.

Following the introduction there are short segments demonstrating how each toy works both on earth and in space. The order of the toys shown on the video is as follows: Spring Jumper, Horse Shoes, Basketball, Magnetic Rings, Raquetball and Pool Ball, Ball and Cup.)

15 - Storage boxes with assorted toys

2 - Spring Jumpers

1 - Horse Shoes Set

1 - Basketball & hoop

2 - Sets of magnetic rings

1 - Raquetball and Poolball

2 - Ball and Cup Sets

Lesson activities:

1. Have students watch the video sequence on micro-gravity. Gravity is the force that pulls on us and keeps us on the earth. A place that experiences micro-gravity has less gravity than earth. Discuss the differences between the way gravity affects us on earth and how micro-gravity affects astronauts

in space. (On earth: keeps us on the earth, makes things fall, etc. In space: things float, everyday tasks must be done differently (drink with a straw, using the restroom, sleeping). For example, if (on earth) you fell off a roof 15 feet above the ground, it would take you one second to reach the ground. If you fell the same distance in a micro-gravity environment, it would take 10 seconds for you to reach the ground.)

2. Distribute a set of toys to each pair of students.
3. Show the Toys in space class video introduction to the students. Give the students about 3 minutes to try the first toy. Then ask the students to predict how the toy will act in space where there is very little gravity. Now show the astronauts playing with that toy. Ask the students to describe how the toy acted. Did it act differently in space? Or did it act the same as it did on earth? Repeat this process with all of the toys.

CAUTION:

- The basket-ball hoops break easily. Have one student hold the basketball hoop while another shoots the basket, or attach 5-6 hoops very carefully to the wall and organize groups to take turns shooting the basket.

4. End with the students coming up with reasons about why the toys acted differently in the micro-gravity condition in space.

Facts: The STS-54 shuttle crew took different toys with them to demonstrate how mechanical objects perform differently in a micro-gravity condition. The students will see six demonstrated. They will discover that gravity forces are critical for the operation of some devices, yet the laws of motion still apply in space:

1. An object at rest or in motion will remain at rest or in motion unless acted on by a force.
2. An object will change what it's doing just as much as it is pushed or pulled, and it will change in the direction of the push or pull.
3. When an object gets pushed, it pushes back just as hard.

Safety precautions: Students should be warned not to overwind or drop the toys. The gravitrons should be played with on the floor as they break easily when dropped. Toys with moving parts should be kept away from the faces of the operators and their neighbors. Seating may need to be adjusted to provide adequate spacing.

Teacher tips:

- Have the children keep all the toys in the box. Only have them remove one toy at a time.

Extensions: Students could make drawings or 3-D models of the space shuttle. Have students develop their own toys and decide how they would act if they were in space.

References:

National Geographic World v243, Nov '95, p.27-31 "What's Got Pull? Gravity"
This article discusses the history and progression of the study of gravity.

Recommended readings and activities: There are numerous books, articles, videos, and websites on space exploration. The Children's First Library of Learning has an excellent book entitled, *How Things Work*. It describes many of the toys and how they work.

Please make your students aware that this lesson relates to the following:

Career Field: SCIENCE, TECHNICAL

Occupations: Astronaut: Working with the National Aeronautics & Space Administration (NASA), astronauts man the various space projects. NASA primarily seeks candidates with a military background, jet aircraft flight experience, and engineering training.



Several Requirements:

1. Have at least a bachelor's degree from an accredited institution in engineering, biological science, physical science, or mathematics.
2. Have three years of related professional experience following the degree.
3. An advanced degree is recommended but could be substituted with additional years of work.
4. Must be between 5'4" and 6'4".
5. Have at least 1000 hours pilot-in-command time in a jet aircraft.
6. Be able to pass a NASA Class I Space physical or an equivalent exam.

Electrical Engineer: Design, develop, test, and supervise the manufacture of electrical and electronic equipment. Electronic equipment includes power generating and transmission equipment used by electric utilities, electric motors, machinery controls, and lighting and wiring in buildings, automobiles, and aircraft. Electronic equipment includes radar, computer hardware, and communications and video equipment.

Education: Bachelor's Degree

Mechanical Engineer: Plan and design tools, engines, machines, and other mechanical equipment. They design and develop power-producing machines such as internal combustion engines, steam and gas turbines, and jet and rocket engines. They also design and develop power-using machines such as refrigeration and air-conditioning equipment, robots, machine tools, materials handling systems, and industrial production equipment. Some also design toys.

Education: Bachelor's Degree

Physicist: Explore and identify basic principles governing the structure and behavior of matter, the generation and transfer of energy, and the interaction of matter and energy. Some use these principles in theoretical areas, such as the nature of time and the origin of the universe; others apply their physics knowledge to practical areas such as the development of advanced materials, electronic and optical devices, and medical equipment. They design and perform experiments with lasers, cyclotrons, telescopes, mass spectrometers, and other equipment. They attempt to discover laws that describe the forces of nature, such as gravity, electromagnetism, and nuclear interactions. They also find ways to apply physical laws and theories to problems in nuclear energy, electronics, optics, materials, communications, aerospace technology, navigation equipment, and medical instrumentation.

Education: Doctor of Philosophy

Review Questions:

1. Do the laws of motion still apply in space?
 2. How did micro-gravity affect the toys?
 3. What would spilt milk look like in space?
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