



Sample Lesson: “Biological & Physical Needs of a Space Station”

Objective

Discuss designs for a lunar settlement including the various matters that must be taken into account such as the use of solar cells, the installation of infrared/visible light astronomical equipment, the creation of a space habitat, access to zero gravity, etc.

National Standards Met

NCSS 3—People, Places and Environments

NSES 2—Physical Science

NSES 4—Earth and Space Science

The Biological and Physical Needs of a Space Station

Objectives

- Students will be able to use the internet to conduct research
- Students will be able to use their imagination and acquired knowledge to design a space station/aircraft that can overcome the psychological and physical limitations of space
- Students will be able to formulate a report from their information gathered
- Students will be able to participate in a team environment and perform a specific task

Grade level

9-12

Subject Areas

Earth/Space science, Biology, Physical Science, Anatomy/Physiology

Timeline

Four 85-minute block periods

Background

Prior to the lesson, students should have a general introduction to space flight and the problems associated with living in space. The students should understand what are gravitational forces and how the concept of microgravity in space affects living organisms and their processes. Students should understand that it costs approximately \$10,000 a pound to get an object into space therefore, weight is a logical concern. This background information is essential for the students to comprehend the problems associated with developing a space station / aircraft that is adequate, yet cost effective.

Materials

Video: " Rocket Men"

Computer with internet access

Pen/pencil

Paper

Lesson

Day one

1. Video- start the lesson by showing the video titled "Rocket Men", this will give a brief history of how individuals got into space and the problems they had in reaching space. This video will create interest and ideas into the student's minds.
2. Short discussion: after the video have a brief discussion making sure to bring up the topic of space travel and the problems associated with it.

Day two and three:

Computer Research

1. Introduce the assignment to the students.
2. Explain to the students that they are going to be in groups of two.
3. Their goal is to create and design a future space station/aircraft that can resolve the following problems associated with long-term space travel.
4. The following problems must be addressed in the design and construction of the space station aircraft:
 - How would you supply your crew with a renewable food source? What food would you grow and why?
 - How would you supply and replenish your water supply?
 - What would you do with your plant, animal and fecal wastes and why? (Note: conserving nutrients is the key to long-term survival)
 - What would you use as a power source, explain why you would use this type of energy instead of other alternatives.
 - How would you combat the problems of astronaut boredom and psychological stress?
 - What would you do to insure the safety and defense of your aircraft?
 - How would you communicate with Earth over vast distances, is the technology available today?
 - Is the reproduction of humans and other animals possible in space? Could these children born in space ever return to Earth's gravity? Justify your response.

Day four:

1. The Power Point presentation:
2. After the students have conducted their research, they must develop and present their findings in a power point presentation. The presentation should answer all the questions above and be clearly and logically explained in their discussion.

Extensions

Have the students construct a 3-D model of their space station using everyday materials.

Have the students draw and label their space station and explain their reasoning for that particular design.

Have each individual student write a report based upon their research and findings and answering the question: Will humans ever colonize another planet and establish permanent civilizations?

Evaluation

- Students will demonstrate their ability to use the internet to conduct research.
- Students designed a space station/aircraft that can overcome the psychological and physical limitations of space.
- Students formulate a report from their information gathered.
- Students appropriately conducted themselves in a team environment and performed a specific task.
- Students successfully completed a group presentation with all questions clearly and logically answered.

- Presentation is organized, clear, and realistic in today's world.
- Actively participated and contributed to group presentation.

Resources

The following materials are found in the Space Foundation Course: Biological and Physical Research.

A 3 page summary titled: Immunology: Past, Present, and Future.

VHS Video Recording: The Rocket Men. Robert Goddard. Thousand Oaks, CA
Godhill Video, 1994