NASA Simulations

NASA SUMMER OF INNOVATION

UNIT
Engineering—Exploration

GRADE LEVELS
4 – 6

CONNECTION TO CURRICULUM
Science and Technology

TEACHER PREPARATION TIME
15 – 30 minutes

LESSON TIME NEEDED
1 hour *Level: Basic*

DESCRIPTION
Students will use NASA Web-based simulators to follow sequenced directions and complete ordered tasks while learning how the shuttle is made ready for flight, how the shuttle docks with the International Space Station, how the shuttle lands, and how NASA retrieves the solid rocket boosters.

OBJECTIVES
Students will

- Follow given directions throughout the simulation media to complete the proper sequences
- Incorporate the use of technology when presented with various simulated situations

NATIONAL STANDARDS

National Science Education Standards (NSTA)
Science in Personal and Social Perspectives
- Risks and benefits
- Science and technology in society

History and Nature of Science Standards
- Science as a human endeavor
- Nature of science
- History of science

ISTE NETS and Performance Indicators for Students
Creativity and Innovation
- Use models and simulations to explore complex systems and issues

Critical Thinking, Problem Solving, and Decision Making
- Collect and analyze data to identify solutions and/or make informed decisions

MANAGEMENT
Practice the simulations at the resource Web site to familiarize yourself with each simulator activity. You will need a computer with Internet access for each pair of students and each computer will need to have the latest version of Macromedia plug-ins.

CONTENT RESEARCH

Multimedia: Combined use of several media such as sound and full-motion video in computer applications.

Simulation: Representation of the behavior or characteristics of one system through the use of another system, especially a computer program designed for the purpose. In the mission simulator section, students will be able to launch or land a space shuttle and dock with the International Space Station.
Space Shuttle: The Space Transportation System consists of the orbiter, two solid rocket boosters, and an external tank. The surviving space shuttles include Atlantis, Discovery, and Endeavour. The shuttles will be retired in 2011 upon completing the assembly of the International Space Station.

Space Shuttle Processing Facility (SSPF): Houses bays for horizontal processing of components for the International Space Station and other space shuttle payloads. Prelaunch activities taking place in the SSPF include receipt, handling, and assembly of space station hardware, testing of experiments for proper configuration, and verification of critical systems and system interfaces. The SSPF is a three-story structure containing 42,455 square meters (457,000 square feet) of offices, laboratories, and processing areas. In a virtual tour, students can see how payloads are put together.

Vehicle Assembly Building (VAB): One of the largest buildings in the world. It was originally built for assembly of Apollo/Saturn vehicles and was later modified to support space shuttle operations. High Bays 1 and 3 are used for integration and stacking of the complete space shuttle vehicle. High Bay 2 is used for external tank (ET) checkout and storage and as a contingency storage area for orbiters. High Bay 4 is also used for ET checkout and storage, as well as for payload canister operations and solid rocket booster (SRB) contingency handling. The Low Bay area contains space shuttle main engine maintenance and overhaul shops and serves as a holding area for SRB forward assemblies and aft skirts.

In this virtual tour students can see how a shuttle is made ready for a flight.

Resource Web Site:
http://imedia.ksc.nasa.gov/index1.html

RELATED RESOURCES

Check out NASA's Exploration Mission Directorate at http://www.nasa.gov/exploration/home/index.html.

LESSON ACTIVITIES

- Introduce students to the interactive media resource provided by Information Technology and Communications Services at NASA Kennedy Space Center.
- Students should begin with the first simulation and continue.
- Discuss what happened: Instruct the students to share their simulation experiences and talk about how they solved any problems that came up.
- Evaluation: Observe and record students' successes in the use of technology and the simulation interface to complete each mission.

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DISCUSSION QUESTIONS

- Were you able to complete each simulation mission successfully? *Answers will vary.*
- What were the most challenging parts of the simulations you completed? *Answers will vary.*
- How important was it to follow the instructions in the proper order? *Following directions is a requirement to successfully complete a simulation.*

MATERIALS

- *Computers with Internet access*

- How would a failure to follow the instructions affect the astronauts and the spacecraft they are using? *Answers will vary.*

ASSESSMENT ACTIVITIES
Observe and record students' successes in the use of technology and the simulation interface to complete each mission. Journaling is a valuable tool for explorers as they simulate and perform complex actions in the course of exploration. Students should record their simulation sessions in a journal, noting their successes, failures, and the methods by which they overcame failure. Any science, math, engineering, or technology content that is connected to their work or that they used to meet the challenge should also be included in the journal. The journal should be used as a formative and summative assessment tool.

ENRICHMENT
Ask students to use various other NASA simulators to experience flight and space-based operations.

Wright Brothers simulations in flight: http://wright.nasa.gov/
The Mars Airplane simulator: http://marsairplane.larc.nasa.gov/multimedia.html

www.nasa.gov