

# PLAY STATION: ISS

**Jacqueline H. Townsend**

**YOUR NAME**

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**SOLAR SYSTEM VACATION**

**LESSON TITLE**

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**PLAY STATION ISS**

**GRADE LEVELS**

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**Grade 8th**

**TIME ALLOTMENT**

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**Three 50-minute class periods**

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**OVERVIEW:**

All Aboard!

It's a space shuttle ride to the International Space Station (ISS)

Our solar system consists of the sun, nine planets (and their moons), an asteroid belt, many comets, and meteors. The sun is the center of our solar system: the planets, their moons (sixty one), the asteroids, comets, and other rocks, gas, and microscopic dust all orbit the sun.

The sun is a medium-sized star. It is orbited by the following (in order from the Sun): mercury, Venus, Earth, Mars, the asteroid belt, Jupiter, Saturn, Uranus, Neptune, and Pluto. The first four planets (Mercury, Venus, Earth, and Mars) are small, rocky planets. After the orbiting belt of small rocky metallic asteroids are four gas giants (Jupiter, Saturn, Uranus, and Neptune). The ninth planet is Pluto, a small rocky planet. These objects all orbit the sun in roughly circular orbits that lie in the same plane, the ecliptic (Pluto is an exception; it has an elliptical orbit tilted over 17 degrees).

The International Space Station (ISS) is a space station in orbit around the Earth. It is made up of a number of 'modules' which fit together to form an area where astronauts, who live on it generally for periods of 4 to 6 months, can live, exercise and perform tasks and experiments. It is still in its relatively early stages. More modules are being added to it on a timely basis.

The (ISS), a joint project between many different space agencies, is the first truly international major space project in the history of mankind. It is a collaboration between these countries:

- USA (NASA)
- Russia
- Europe (ESA)
- Japan (NASDA)
- Canada (CSA)
- Italy (ASI)
- Brazil

Through the activities presented in this lesson, students will gain a thorough and comprehensive knowledge of the International Space Station with an integration of the solar system components. In this lesson students will learn why the ISS is being built and how it provides first-hand experiences with the space program. Students will receive insight into the different types of research being conducted in the station's microgravity environment. The lesson can be integrated across curriculum using real world applications such as budget constraints, measuring, and calculations for the model ISS in a mathematics and science class. Since other countries contribute to the ISS, a social studies class will employ map skills as well as conduct research on cultural issues. Although the ISS is located orbiting in Earth's atmosphere, this lesson fantasizes each planet will have a space station in its atmosphere. The lesson is presented through cooperative groups as well as whole group instruction.

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## **SUBJECT MATTER**

Mathematics, Social Studies, and Science

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## **LEARNING OBJECTIVES**

Students will be able to...

- Design a model of the space station from a set of materials and parameters
- Analyze and interpret data to determine the best design, based on budget and component placement, for the Space Station.
- Construct a mobile model of the solar system from common every day materials.
- Identify and describe the components of the ISS.
- Role play the planets' position around the sun.
- Use measurement tools and techniques to construct a model of the International Space Station
- Incorporate technology into classroom instruction.

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## **STANDARDS**

Mathematics Grade 8

<http://www.glc.k12.ga.us>

**28 Topic:** Length, Perimeter, Circumference, Area, Volume/Capacity, Weight/Mass, Time, Temperature, Angle Measure

**Standard:** Selects and uses appropriate customary and metric units of measure for length (including perimeter and circumference), area, volume, capacity, weight /mass, time, temperature, and angle measure

**31 Topic:** Exponent, Power, Equivalent Representations

**Standard:** Expresses standard numerals in scientific notation and expresses scientific notation as a standard numeral

Science Grade 8

<http://www.glc.k12.ga.us>

**1.Topic:** Scientific Inquiry Process

**Standard:** Uses process skills of observing, classifying, communicating, measuring, predicting, inferring, identifying, and manipulating variables. Also uses skills of recording, analyzing and operationally defining, formulating models, experimenting, constructing hypotheses and drawing conclusions

**21 Topic:** Astronomy

**Standard:** Describes the components of the solar system.

21.1 Describes features, characteristics and motions of the planets.

Social Studies Grade 8h

<http://www.glc.k12.ga.us>

**60. Topic:** Information Processing

**Standard:** Makes predictions and comparisons based on factual information.

**77. Topic:** Map and Globes

**Standard:** Analyzes and uses a variety of maps and globes for information about an area.

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## MEDIA COMPONENTS

Video

NASA CONNECT! #311 "International Space Station"

Web Sites

Zoom Astronomy is a user support site where numerous resources are attainable.

<http://www.enchantedlearning.com/subjects/astronomy/activities>

NASA's link to space exploration.

<http://connect.larc.nasa.gov>

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## **MATERIALS**

### **Per Group:**

- Solar System Model guide
- Cardboard (round 1ft across)
- Various colors of construction paper
- Scissors
- Tape
- String
- Pencils
- Crayons or markers
- Compass
- Craft sticks
- Straws
- Buttons
- Soft drink cans
- Toilet paper tube
- Foam food trays
- Transparency sheets
- Glider kit
- Paper
- Cereal boxes
- Balances
- Ruler
- Glue
- Aluminum foil
- ISS activity procedure
- Student Worksheets
- Appendix A: Constraints for Space Station
- Student Cue Cards

### **Per Student/Classroom**

- Appendix B: Space Station Diagram
- Data chart: planets' profile
- Graph paper
- Focus questions activity
- Vocabulary sheet
- Lamp
- Distance strips

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## **PREP FOR TEACHERS**

Pre-planning is necessary and important for best facilitation of an effective lesson. Bookmark the Web sites used in the lesson on each computer in your classroom. Download teachers and students guide at <http://connect.larc.nasa.gov> (International Space Station: Up to Us). Download Solar System Model at <http://www.enchantedlearning.com/subjects/astronomy/activities>. Preview video NASA CONNECT! #311 "International Space Station". When using media, provide students with a **FOCUS FOR MEDIA INTERACTION**, a specific task to complete and/or information to identify during or after viewing of video segments, Web sites, or other multimedia elements. Provide students with practice experience in using cooperative grouping and collaborative skills such as, think-pair-share, teambuilding, communication, leadership, etc. Assign group roles (materials collector, recorder, facilitator/problem solver, etc).

Prepare the hands-on elements of the lesson by:

1. Copying the following sheets, one per student: Appendix B: Space Station Diagram, Data chart: Planets' Profile, Graph paper, Student Cue Cards, and Vocabulary Sheet
2. Copying the following sheets, one per group: Various colors of construction paper, Scissors, Tape, String, Pencils, Crayons or Markers, Compass, Craft sticks, Straws, Buttons, Soft Drink, Cans, Toilet Paper Tubes, Transparency Sheets, Glider Kit, Paper, Cereal Boxes, Space Shuttle Glider Kit, Balances, Ruler, Glue, Transparency Sheets, Aluminum Foil, ISS Activity Procedure, Student Worksheets, and Appendix A: Constraints for Space Station. Arrange nine "Space Stations" (learning centers: Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, Neptune, and Pluto). Each "Space Station" is a cooperative group.

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## INTRODUCTORY ACTIVITY

### Step 1

Ask your class to sit in a circle around a lamp. Distribute the Planets' Profile Chart to your students. Ask your students to study and analyze the chart focusing on the planet's arrangement, first to last as well as its distance from the sun. Ask your students to volunteer to give the planets' order from the sun with its distance. As answers are given, ask the student to move closer to or farthest away from the lamp (sun). Ask student to place distance strip and string to illustrate the planets' orbit. Ask your students to observe the human solar system model and visualize a mobile model. Tell your students, "Let's design a mobile model of the solar system".

### Step 2

Tell your students that they are now going to construct a model solar system. Tell your students they will now form cooperative groups. Ask your students to count off by A, B, C. The A's are collectors (gather materials/supplies), The B's are reporters, and C's are facilitators/problem solvers. Distribute the Solar System Model materials and guide to

each group. Download guide at <http://www.enchantedlearning.com/subjects/astronomy/activities>.

Allow time for your students to read the guide, collaborate, and complete the model. Tell your students to hang their model at their "Space Station."

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## LEARNING ACTIVITIES

### Step 1

Distribute the activity sheet of Focus Questions to each student. Provide your students with a **FOCUS FOR MEDIA INTERACTION**, asking them to identify the What, and Why of the ISS. (Guide your students to understand What is the International Space Station and Why it is being built?). **PLAY** the clip when you see a screen with NASA International Space Station and the Norbert icon. **STOP** the clip when you hear the narrator say, "Thanks Guys" and see an unclear picture of the Space Station move across the sky. **PAUSE** and ask your students to answer the following question.

- What is the International Space Station? Can we see it and when?

**CHECK** for comprehension and discuss. (It is a world-class research facility, orbiting the earth's atmosphere. Ask your students to answer the question;

- Why build an ISS?

Play the clip until you hear the narrator say, "It provides first-hand experiences with the space program," and see astronauts floating in the service module. **PAUSE**, and check for comprehension and discuss. (The ISS makes a connection with real world science problems being researched in a limited gravity environment). Distribute Student Cue Cards. Tell students Norbert, NASA CONNECT'S animated co-host, poses questions throughout the video. Ask students to watch for Norbert' Cue Card questions. **PLAY** the clip until the cue card is displayed with each question. **PAUSE** and ask students to read the questions. **PLAY** the clip until the narrators appear and a new question is displayed. The Student Cue Cards contains questions that presents a broader picture of the Space Station's purpose and how it functions.

### Step 2

Distribute the Space Station Diagram and Vocabulary List of parts to each student. Provide your students with a **FOCUS FOR MEDIA INTERACTION**, asking them to analyze and interpret the diagram in order to become familiar with the parts and their function. **FASTFORWARD** to diagram and **PAUSE** while students are being engaged in a discussion of parts with their function. Tell the students to volunteer to give answers to focus questions such where do astronauts live, work and eat? (Service Module) Where is the brain of the Station? (Zayra). Where is the docking port? (Unity). What part allows the Station to receive its energy from the sun? (Photo Thermal Radiators) **PLAY** the video until the narrator, Connie VanPraet-Cremens says, "The Altitude Control Thrusters keep the station in orbit. **STOP**

### Step 3

Distribute the Activity: Functions and Statistics: International Space Station: Up to Us. Ask students to explain which part seems to be the most challenging or most confusing

or least important etc? (Answers will vary). Tell your students we are going to build an alternative Space Station. Provide your students with a **FOCUS FOR MEDIA INTERACTION**, asking them to identify how an alternative Space Station is designed by students in Alice Fong Yu, San Francisco. Ask the students to identify what the best design is based on. (budget restrictions, weight and placement of parts).

**FASTFORWARD** the video to students in classroom at Alice Fong Yu, San Francisco, California. Play the video until the narrators (students) say, "Fixing problems that will arise", **PAUSE** and **REWIND** the video to the listing of what the best design must have. **PAUSE** and check for understanding. Your students will build a model Space Station (cooperative groups) and correlate their parts with the actual Space Station. Download activity at

<http://connect.larc.nasa.gov>

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## CULMINATING ACTIVITY

The closing activity is hands-on that focuses specifically on the objective: Use measurement tools and techniques to construct a model. The cooperative groups will design a space colony for the planet assigned to each "Space Station" (learning center). The colony is to accompany the ISS placed at each planet. Consider the parts needed and the type of engineering required to protect the inhabitants from the lethal conditions of an alien environment. Collaborate in group and use the materials from both models. What additional materials are needed? Decide what data from the planets' profile chart will allow for a possible colony to exist effectively or ineffectively on the particular planet.

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## CROSS-CURRICULAR EXTENSIONS

Cross -curricular activities are relevant to real life applications.

### Mathematics

Students in a mathematics class will work within the constraints of a budget by using consumer math.

Mathematics classes will focus deeply on the measurements (area, diameters, mass, etc) of the station's parts.

### Science

Science classes will focus on different types of research being conducted in the station's unique microgravity environment. Research is conducted on how gravity affects human beings in space such as bone loss, diabetes, emphysema, and immune system disorders. Similar experiments on a smaller scale will be conducted in science classes. ISS observes the Earth to help study large-scale, long-term changes in the environment. Effects of volcanoes, hurricanes, and human interactions are studied.

### Social Studies

Classes in social studies will research the other countries involved with the ISS. These countries are; Russia, Europe (ESA), Japan (NASDA), Canada (CSA), Italy (ASI), and Brazil. Flags of these countries will be diagrammed. Locating these countries on maps and globes will illustrate use of map skills.

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## **COMMUNITY CONNECTIONS**

Interview astronauts to capture their experiences in space and make an oral report to class.

Organize a class career day. Tell students to design invitations and send to people/businesses whose careers have an association with space such as CDC, engineers, teachers, etc.

Invite the media specialists from neighborhood libraries to conduct reading/books on out of space.