Kimberly Stedner-Clayton - Space Mission

Teacher: Kimberly Stedner-Clayton	**Grade Level: 9 - Science**

Teacher Preparation

NC Essential Standard and Clarifying Objectives:
EEn.1.1 Explain the Earth's role as a body in space.

EEn.1.1.1 Explain the Earth's motion through space, including precession, nutation, the barycenter, and its path about the galaxy.
EEn.1.1.2 Explain how the Earth's rotation and revolution about the Sun affect its shape and is related to seasons and tides.
EEn.1.1.3 Explain how the sun produces energy which is transferred to the Earth by radiation.
EEn.1.1.4 Explain how incoming solar energy makes life possible on Earth.

HS.TT.1.1 Use appropriate technology tools and other resources to access information
HS.TT.2.1 Use appropriate technology tools and other resources to organize information

These standards will be looked at from the ISS work.

Materials: *Provide a comprehensive list.*

For the class:

- Computers with Internet access (optional but very helpful)
- Additional reference materials on the ISS

Each group of three or four students will need the following:

- Large sheets of paper
- Construction paper
- Colored markers

Each student will need the following:

- Pencils
- Paper
- Classroom Activity Sheet: How Do Astronauts Live in Space? (see printable version)
- Take-Home Sheet: A Week in Space (see printable version)

Lesson Objective: *What do you want the students to understand and to be able to do?*

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Students will understand the following:

1. An environment with almost no gravity challenges humans living in space. Humans must adjust their diets, sanitation, and sleep patterns; wear space suits; and conduct specially designed experiments.
2. ISS inhabitants perform the daily functions of life in space using special products and procedures.

Misconceptions: *What misconceptions did you identify through your research and your interviews with students?*

There are no changes to living on Earth versus traveling in space, to our bodies.

Learning Experiences

ENGAGE *How will you elicit prior knowledge? How will you "hook" students?*

Begin the lesson by asking students what they already know about the IS Station (ISS). As they brainstorm facts, write them on the board. Next, review basic facts about the ISS:

- The ISS will orbit the Earth, allowing humans to live and work in space for long periods of time.
- Scientists will be able to study the long-term effects of microgravity (the weightless environment of the ISS) on humans, as well as chemical, physical, and biological processes. These studies should lead to advances in medicine, technology, industrial materials, and in other practical areas.
- The ISS also serves as a stepping-stone to the solar system because to undertake such missions, we must first understand how humans can survive in space for such long journeys.
- Sixteen countries are working together to build the ISS: the United States, Russia, Canada, Japan, Brazil, and the nations of the European Space Agency (Belgium, Britain, Denmark, France, Germany, Italy, the Netherlands, Norway, Spain, Sweden, and Switzerland).
- The ISS is being assembled piece by piece in space. Enormous and heavy, it can only be built in microgravity.
- The first component of the ISS was Zarya, the control module built by Russia. It was launched into orbit in November 1999 and was followed a few weeks later by the U.S. module Unity. The two modules were connected in space—beginning an assembly that will include over 70 more components and take at least six more years to complete.

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EXPLORE *What "hands-on" activities will you include that require students to be involved in* ***scientific practices****? Specify the science practices they will engage in. What "minds-on" activities will you include that require students to* ***think critically****? How will students demonstrate evidence of their learning through their explorations?*

Have students locate the 16 nations that are working together to build the ISS on a world map. If students have other questions about the ISS, have them find answers in the following Web site http://www.shuttlepresskit.com/ISS_OVR/.

Next, ask students what they think it is like to live in space. Begin with a brief discussion of microgravity, the weightless environment of the ISS. Have them consider everyday activities, like eating, taking a shower, and using the bathroom. What might be some challenges of living on the ISS? Tell the class that they will be working in groups and using the Internet or other resource materials to answer questions about living in space.

EXPLAIN *What data will students share prior to your explanations? How will you help them draw connections and use their data to explain the science concepts? What specific questions will you ask them that will require higher order thinking skills? What specific science content (tied to standard) do you want students to understand? Include a detailed explanation of the science concepts you desire students to understand.*

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Divide the class into five groups and give each group a set of questions outlined below. Each group will use the Web resources provided to answer questions. All the questions relate to the daily life of astronauts and cosmonauts in space. Students should record their findings on the Classroom Activity Sheet: How Do Astronauts Live in Space?

Group 1: Food

- How has the food that astronauts eat changed over the last 50 years?
- What kinds of foods do astronauts eat in space today?
- What methods are used to prevent food from spoiling?
- If you lived in space for a month, what foods do you think you would miss the most? Why?

Web Resources
Top 5 Foods Astronauts Request
Eating in Space

Group 2: Space Suits

- What are the main parts of a space suit? How do they work?
- Do astronauts have to wear the space suits all the time? Why or why not?
- What are some safety measures that are built into space suits?
- Do you think space suits are comfortable? Why or why not?

Web Resources Space Suit: How it Works
Space Suits
The Space Suit (history)

Group 3: Extraterrestrial Experiments

- What are some examples of experiments that are conducted on the ISS?
- What do scientists hope to learn about life in space?
- How do scientists conduct controlled experiments in space?
- Name two findings that have emerged from experiments done in space.

Web Resources
Home in the Sky: International Space Station
NASA Watch

Group 4: Sanitation in Space

- How do astronauts shower and use the bathroom in space?
- Do they have to wash dishes or laundry?
- How do they keep their living quarters clean?
- What special sanitation issues do astronauts face that those of us on Earth don't worry about?

Web Resources
Sanitation

Group 5: Sleep and Relaxation

- Do astronauts require more or less sleep than normal when they are in space?
- How many hours of sleep do astronauts usually get each night?
- How do astronauts relax in space?
- Do astronauts sleep in a bed? If they do not, how do they sleep?

Web Resources
Recreation and Sleeping

ELABORATE *How will your Elaborate phase have students apply these science concepts to new situations? How will they make connections between these concepts and other disciplines (literacy, math, etc ?*

After completing the research and filling out the classroom sheet, have each group present its findings to the class. Students should use their Classroom Activity Sheet to take notes. As a follow-up homework assignment, assign the Take-Home Activity Sheet: A Week in Space. Students should use what they learned from the presentations to complete their essays.

Books about the ISS

The International Space Station
Franklyn Mansfield Branley. HarperCollins, 2000.

The International Space Station
Wolfgang Englehardt. Tessloff Publishers, 1998.

Space Station Science Marianne J. Dyson. Scholastic Inc., 1999.

Web Sites on the ISS

If students need additional resources, they may be interested in visiting the following Web sites:

NASA International Space Station
Our Base in Space
Earth from Space: An Astronauts View of the Planet
NASA Spacelink: An Aeronautics & Space Resource for Education
Lesson Plan on the Space Shuttle
100th Space Shuttle Mission a Success

Forty years ago, during the space race between the United States and the Soviet Union, no one could imagine that in the 1990s Russians and Americans would be collaborating on a space station. Have high school students research the history of the space age, focusing on the relationship between the United States and the Soviet Union. Make sure students discuss the role of competition between the two countries. In what ways did this competition improve space technology? How did the competition interfere with progress? Students can write a research paper on their findings or make a presentation to the class.

EVALUATE *How will student learning be assessed? By what criteria will student work be judged? Include a detailed rubric.*

1. What are some of the challenges astronauts face living in a microgravity environment?
2. Why must the ISS be constructed in space rather than on the surface of a planet?
3. What was the space race? What factors led to the United States and Russia collaborating on the ISS?
4. Who first suggested the idea of creating the ISS? Has it always been called the "International Space Station?" If not, what was its former name?
5. If astronauts traveled to Mars, they would be away from Earth for more than a year. What problems do you think being in space for a year would cause? For example, would the astronauts face health problems, and would the equipment be able to remain in space for so long without maintenance? What could be done to address these and other problems?
6. The cost of completing the ISS will exceed $60 billion. Do you think that the benefits of this project justify this astronomical cost? If not, how would you recommend this money be spent?

Students should be able to work cooperatively in groups; research their questions thoroughly and accurately; make an interesting presentation to the class; and write accurate, lively essays about a week in space. Use the following three-point rubric to evaluate students' work during this lesson:

- **Three points:** Students worked effectively in their groups, researched all their questions thoroughly and accurately; presented their findings to the class in an interesting and creative way; and wrote convincing, accurate essays about a week in space.
- **Two points:** Students worked somewhat effectively in their groups, researched most of their questions thoroughly and accurately, presented their findings to the class in a satisfactory way, and wrote a satisfactory essay about a week in space.
- **One point:** Students did not work very effectively in their groups, researched one question thoroughly and accurately, presented some information to the class, and wrote a few sentences about a week in space.

Adapted from: **Jordan D. Brown, a freelance author in New York City, enjoys writing books, magazines, and Web sites for kids and teachers.**
http://www.discoveryeducation.com/teachers/free-lesson-plans/life-in-space-international-space-station.cfm

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