Name the International Space Station Node 2 Challenge

Grade Levels: K-12

Focus Question: Can you construct an ISS Node 2 model to scale in your school hallway or classroom and create a name that uniquely describes its objective?

Instructional Objectives:

1. Students will understand principles of living and working in space.
2. Students will research the International Space Station.
3. Students will understand how to track the ISS in the sky.
4. Students will apply proportional ratio equations to construct a Node 2 model to scale.
5. Students will provide a written summary describing the chosen name for the Node 2.

National Standards

Science:

- Abilities necessary to do scientific inquiry
- Understanding about scientific inquiry
- Objects in the sky
- Understanding about science and technology
- Abilities of technological design
- Science as a human endeavor

Mathematics:

- Students understand measurable attributes of objects and the units, systems and processes of measurement.
- Students apply appropriate techniques, tools and formulas to determine measurements.
- Students understand relationships among units and convert from one unit to another within the same system.
- Students make decisions about units and scales that are appropriate for problem situations involving measurement.

Technology:
(from International Society for Technology in Education):

- Students use productivity tools to collaborate in constructing technology-enhanced models, prepare publications and produce other creative works.
- Students use telecommunications to collaborate, publish, and interact with peers, experts, and other audiences.
- Students develop positive attitudes toward technology uses that support lifelong learning, collaboration, personal pursuits and productivity.

Technology
(from International Technology Educators Association)

- Attributes of design (e.g. Design is a creative process; Designs need to be refined)
- Engineering design (e.g. Models; Influence of personal characteristics)
- Information and communications technologies.

Visual Arts:

- Students understand and apply media, techniques and processes in the creation and production of works of art.
- Students use knowledge of structures and functions.
- Students reflect upon and assess by analyzing and critiquing the characteristics and merits of their work and the work of others.
- Students make connections between visual arts, other content areas and the artist's role in society.

Language Arts:

- Students adjust their use of spoken, written, and visual language to communicate effectively with a variety of audiences and for different purposes.
- Students employ a wide range of strategies as they write and use different writing process elements appropriately to communicate with different audiences for a variety of purposes.
- Students use a variety of technological and information resources to gather and synthesize information and to create and communicate knowledge.
- Students use spoken, written, and visual language to accomplish their own purposes.

INTRODUCTION

ISS astronauts get more elbow room…

NASA's Node 2 is the next U.S pressurized module to be installed on the International Space Station (ISS). When installed, this "utility hub" will increase the living and working space inside the ISS to approximately 18,000 cubic feet. Just imagine moving from a three-bedroom house to a five-bedroom house! The Node 2 will allow additional science labs to be attached to the ISS as well as accommodate space vehicles and a robotic arm.

The node is like a large aluminum can with ports. It is 23.6 feet long and 14.5 feet in diameter. Its pressurized volume is 2472 cubic feet. Its weight is equal to that of two African elephants, about 30,000 pounds! This connector may not be much more than the size of your classroom, but it is a very important piece to the soon-to-be completed ISS.

http://www.nasa.gov/mission_pages/station/structure/elements/node2.html

What is in a name?

The Node 2 currently resides at NASA's Kennedy Space Center. It is waiting to be launched on the Space Shuttle in 2007 for delivery to the ISS. But before it can be launched, it needs a name! NASA's Space Operations Mission Directorate and Exploring Space Challenges welcome your class or school to participate in ***Name the ISS Node 2 Challenge***.

The Challenge is to create a Node 2 model using your classroom or school hallway. Open to grades K-12, one class or an entire school can be part of the Challenge. Build your model, name it, write a brief description explaining the chosen name, take some digital pictures and send them in. Remember, it is all about living and working in space, so keep that in mind when you build your model. The model won't be judged, but rather be your ticket to enter a name for the Node 2. All the name submissions will then be reviewed by a panel of NASA scientists, engineers and educators. A winning name will be selected in early 2007.

Want to get your school or class started? A teacher or administrator must register a school or class by sending an email to NASA-ESC@nasa.gov. Please include the school's name and contact information, the approximate number of participating students and their grade level. Registration will be accepted until November 17, 2006. **Deadline to submit your model's images and name for the Node 2 is December 1, 2006.**

CHALLENGE REQUIREMENTS

Pre-Challenge Requirements

1. **Online teacher registration.** A teacher or administrator must register their class or school online by emailing nasa-esc@nasa.gov.
2. **Track the ISS.** The International Space Station is one of the most visible objects in the sky. It appears in the western horizon and disappears over the eastern horizon in a matter of a few minutes. NASA SkyWatch is a tool to help you learn when and where to look for the station in the night sky. All you need is a computer connected to the internet with an updated browser and Java Runtime Environment, and a cloud-free night to observe. Go to the following site to do this activity with your students: http://spaceflight.nasa.gov/realdata/sightings/index.html

Objective One

- **Build a scale model of the ISS Node 2.** Use your classroom or school hallway to "construct" a version of the utility hub.
    i. Using the dimensions of the actual Node, scale your model to a size that fits the classroom or hallway. Use any source of art media available to you: craft paper, newspaper, pipe cleaners, cardboard, watercolors, or whatever your teacher can supply to you. Construct similar characteristics of the Node 2 in your model. For example, how many connector ports does the Node 2 have?
    ii. Use your imagination. Be creative with the interior. For example, what operations could occur inside your model? Do you need a console to operate the robotic arm or to dock a spacecraft? Does the model need moveable parts?
    iii. Design your model with care. Quality work requires time, patience and teamwork.

Objective Two

- **Create an electronic photo album.** Use slide presentation software (i.e. Power Point), other digital media software or create a website to produce a "photo album" of your model.
    i. Must include a maximum of 6 digital images of your model.
    ii. Each image must be accompanied by a brief caption, in English, describing the image.
    iii. Must include your model's dimensions in one image caption.
    iv. First slide/page must list school/class name, school address, participating grade levels and registered teacher/administrator name.

Objective Three

- **Choose a name for the ISS Node 2.** Once the model has been constructed, name it with pride.
    i. Make sure the name is not copyrighted, nor has been used in previous NASA missions, spacecraft or robotics. A little worried as to where to look for already used names? Here's a place to start: http://science.hq.nasa.gov/missions/complete.html#S [1]
    ii. Write a short essay, 500 words or less, describing the significance of your chosen name for the Node 2.

[1]*Note this list is not all inclusive.*

Post-Challenge Requirements

1. **Online submission of documents.** Registered teachers must submit their class or school's electronic scrapbook and essay to NASA-ESC@nasa.gov. Essay submissions should be incorporated into the electronic scrapbook and not sent as a separate document.
2. **National Challenge.** All entries will be evaluated for meeting the criteria to enter a name for the Node 2. Qualifying entries will then have their names reviewed by a team of NASA scientists and engineers.
3. **Certificate of participation.** Each school/class to successfully complete all requirements of the Name the ISS Node 2 Challenge will receive a certificate of participation.

CHALLENGE TIMELINE

Date	Event	Notes
August 21, 2006	Registration open	Teachers register by sending an email to nasa-esc@nasa.gov
November 17, 2006	Registration closed	
December 1, 2006	Submissions due	Teachers may send submissions by email or on CD to NASA ESC.
December 2006	Submissions sorted and evaluated.	Submissions reviewed by a panel of NASA scientists and engineers.
February 2007	Winning entry to be announced.	

GENERAL RULES AND REGULATIONS FOR NASA-ESC

1. All participants must successfully register online.

2. Participation is restricted to students and teachers attending U.S. Schools (this includes U.S. possessions and schools operated by the U.S. for the children of American personnel overseas).

3. Teachers or administrators must register his/her students[a] by emailing NASA-ESC@nasa.gov. Include teacher name, school name, school address, number of students participating, grade level, and email address.

4. There is no limit to the number of student participants from each school.

5. Only students whose names have been submitted through his/her teacher's registration will be allowed to submit entries to the NASA-ESC Challenges.

6. All students must have access to the internet in order to participate in a NASA-ESC Challenge.

7. All entries are evaluated according to the published rubrics and requirements for each respective challenge. Judges' decisions are final.

8. Each registered student/class/school must submit separate entries for their respective challenge.

9. Each document submitted to the NASA-ESC project office must include the student last name, or the school's name, and the challenge abbreviation in the title of the document. Please see the following examples:

Challenge:	**Example:**
Name the ISS Node 2	Name_N2.ppt
Moon Math	Name_MM.doc
Fuel Your Imagination!	Name_FYI.doc
Design a Lunar Base	Name_DLB.ppt
Teacher Challenge	Name_TC.pdf

10. All work submitted to the NASA-ESC challenge's must be original and free from copyright.

11. NASA maintains the right to accept or reject any submitted work. All entries become the property of NASA and the Exploring Space Challenges.

12. Final documents for each respective challenge must be electronically submitted by their deadlines, as follows:

Challenge:	Deadline:	Documents:
Name the ISS Node 2	December 1st, 2006	Slide Presentation & Essay
Moon Math	December 15th, 2006	Slide Presentation & Report
Fuel Your Imagination!	January 31st, 2007	Story
Design a Lunar Outpost	February 16th, 2007	Slide presentation or video
Teacher Challenge	March 3rd, 2007	Instructional guide and proposal

If you encounter any difficulties, or have any questions please direct them to the NASA-ESC project office at NASA-ESC@nasa.gov.

[a] The NASA-ESC Project Office understands that some students may drop out during the course of their Challenge. If such an event occurs please notify the NASA-ESC Project Office. If this event leaves a team with only one student, the student remaining in the Challenge will not be penalized and may have the choice to continue with their project of his/her own or join another team. It is the teacher's responsibility to contact the NASA-ESC Project Office if any changes occur in a teams' participation status.

RULES AND REGULATIONS FOR NAME THE ISS NODE 2:

1. Only students in grades K-12 may participate.

2. Multiple entries from one school will be permitted if more than one class or teacher participates in this activity, but there is a maximum of two entries per grade category as long as each entry is from a different class or teacher.

3. Node 2 models must demonstrate the students' knowledge of working and living in space by incorporating real science, math or engineering facts. Models with fictional components (i.e. gravity simulation on the ISS) will not be considered for this Challenge.

4. Each entry must contain a maximum of 6 digital images with captions of their Node 2 model built in the classroom or school hallway. These images must be compiled in an electronic slide presentation or other electronic format (i.e. web page) and emailed to NASA-ESC@nasa.gov by December 1st, 2006.

5. It is preferred that submitted images do not have students present. If so, then please complete a NASA Talent Release Form for each appearing student.

6. Each entry must include a brief explanation of why the name for that entry was chosen. Each essay should contain a maximum of 500 words. This essay should be submitted at a Word document. Submit this essay as a separate document, or as a text embedded in an email, to NASA-ESC@nasa.gov.

INTERNET RESOURCES:

- Visit the ISS website at
  - http://www.nasa.gov/mission_pages/station/main/index.html

- Track the ISS at
  - http://spaceflight.nasa.gov/realdata/tracking/.

- Check out The Classroom of the Future's activities about living is space at
  - http://iss.cet.edu/lifescience/default.xml

- Create a full-scale model of the ISS! See directions at
  - http://iss.cet.edu/technology/fullscale/fsl_s1.xml.

- View educator guides related to the ISS and living/traveling in space at
  - http://www.nasa.gov/audience/foreducators/topnav/materials/listbytype/3-2-1.Liftoff.html

  - http://www.nasa.gov/audience/foreducators/topnav/materials/listbytype/Space_Food_and_Nutrition_Educator_Guide.html.

- Check out this electrical power "fact sheet" at NASA's Glenn Research Center:
  - http://www.nasa.gov/centers/glenn/about/fs06grc.html.

- Want to learn about living is space? Visit Thursdays Classroom at
  - http://www.thursdaysclassroom.com/index_04jan01.html.

Name the Node 2 Judging Rubric for Model

CATEGORY	4	3	2	1
Knowledge of ISS/Node 2 Characteristics	Image captions indicate a clear and accurate understanding of ISS/Node 2 characteristics underlying the construction and modifications.	Image captions indicate a mostly accurate understanding of ISS/Node 2 characteristics underlying the construction and modifications.	Image captions indicate somewhat accurate understanding of ISS/Node 2 characteristics underlying the construction and modifications.	Image captions do not illustrate much understanding of ISS/Node 2 characteristics underlying the construction and modifications.
Creative Solutions	Clear evidence of troubleshooting, testing, and refinements based on data or scientific principles.	Some evidence of troubleshooting, testing and refinements.	Little evidence of troubleshooting, testing and refinements.	No evidence of troubleshooting, testing or refinement.
Understanding of Living and Working in Space	mage captions indicate a clear and accurate understanding of scientific principles underlying the construction and modifications.	Image captions indicate a mostly accurate understanding of scientific principles underlying the construction and modifications.	Image captions indicate somewhat accurate understanding of scientific principles underlying the construction and modifications.	Image captions of the group do not illustrate much understanding of scientific principles underlying the construction and modifications.
Proportion	School/class model is an accurate scale model of the Node 2 and dimensions are reported correctly an image caption.	School/class model is a somewhat accurate scale model of the Node 2 and dimensions are provided in an image caption.	School/class model is an accurate or somewhat accurate scale model of the Node 2, but dimensions are not provided in an image caption or are incorrect.	School/class model is a not an accurate scale model of the Node 2 and dimensions are not provided in an image caption.
Overall Design	Great care was taken in the construction process so that the structure is neat, attractive and follows plans accurately.	Construction was careful and accurate for the most part, but 1-2 details could have been refined for a more attractive product.	Construction accurately followed the plans, but 3-4 details could have been refined for a more attractive product.	Construction appears careless or haphazard. Many details need refinement for a strong or attractive product.