

Teacher Instructions

From the Mouths of Space Scientists: An Introduction to Space Weather -- TEACHER INSTRUCTIONS

Title: From the Mouths of Space Scientists: An Introduction to Space Weather

Grade Focus: 4, 5, 6, 7, 8, 9

Subject: Science

Integration Activity: Discovering the Internet, PowerPoint Presentations, Video Productions

Recommended Time to Completion: Three to four weeks (three to five hours per week)

INTRODUCTION

Students will analyze a primary source interview from scientists and participants attending the Greenland Space Science Symposium 2007. Based upon this interview, students will share what they've learned about the Sun and space weather's impact on Earth using either a PowerPoint presentation or by producing a video. Students will use Internet resources, including the Space Weather Action Center and NASA Goddard Space Flight Center's Sun-Earth Connection.

PREREQUISITE EXPERIENCE:

Students should be able to conduct research online and use a word processor.

Experience with image editing software (i.e. Photoshop or Paint) and the ability to capture images from the computer will also be helpful.

Prior PowerPoint or other presentation software tool experience is needed. Students may choose to create a video in place of developing a PowerPoint presentation.

TEACHER PREP TIME: 1 - 2 hours

Review the identified Web resources in *Explore and Explain* and these training videos from **Nortel LearniT**

- **Discovering the Internet**, http://nortellearnit.org/technology/Discovering_the_Internet/
- **Imaging**, <http://nortellearnit.org/technology/Imaging/>
- **PowerPoint**, <http://www.nortellearnit.org/DiscoveriT.aspx>.
- **Video Production**, http://www.nortellearnit.org/technology/Video_Productions/

PROJECT:

Students will use the Web to conduct their research. They will use PowerPoint (or another presentation software) or video to present findings and demonstrate their applied understanding through the creation of a PowerPoint presentation or solar video infomercial.

They will add images to their final project to help visualize the Sun-Earth connection.

ASSESSMENT / GRADING:

Using a presentation rubric, the student PowerPoint presentations or videos will be evaluated on their content, their application of analytical skills, and their demonstration of tools to convey their applied understanding.

TIME MANAGEMENT TIP:

Students should complete some research individually as a homework assignment.

Limit the number of slides or length of the video for their final projects.

It's best for students to work in pairs for this lesson.

Lesson plans have been developed for grades K-5, 6-8, 9-12 by educators at the NASA Goddard Space Flight Center's Sun-Earth Connection. You can find these lesson plans and more educator resources at <http://sunearthday.nasa.gov/2007/educators/index.php>

This lesson incorporates many of the educator resources developed by the Sun-Earth Connection educators from NASA Goddard Space Flight Center.

Complete instructions on how to set up your own "Space Weather Action Center" know can be found at this Web site, <http://sunearthday.nasa.gov/swac/>

An instructional guide, http://sunearthday.nasa.gov/swac/instructional_guide.pdf, and set-up guide, http://sunearthday.nasa.gov/swac/setup_guide.pdf, are available to get the "Space Weather Action Center" up and running in no time at all.



Photo credits: NASA/GSFC

“Living in the Atmosphere of the Sun?” What do you think it means to “live in the atmosphere of the Sun?” How does the Sun’s atmosphere, or heliosphere, affect life here on Earth?



Photo credits: NASA/GSFC

What is pictured here? This is a solar prominence, up close.

How does this solar prominence affect YOUR life?

What do you know about the Sun, solar prominences, and how Earth is protected from solar particles spewed into space? In other words, what do you know about space weather?

With a partner, you are going to learn more about the Sun and space weather. You’ll hear from scientists and graduate students who study space weather, trying to understand what happens to Earth as we “live in the Sun’s atmosphere.” And then, you’ll share this information in a PowerPoint or a solar video infomercial to help others learn more about the power of the Sun and space weather. You may even become space weather forecasters, creating your own space weather reports.

Discover why an umbrella and boots won’t protect you from a stormy space weather forecast!

Explore



Photo credits: National Institute of Aerospace (NIA)

1. For this part of the project, you'll need a computer with Internet access.
2. Before you begin, you may want to review this **Nortel LearniT** training video:
 - **Discovering the Internet**,
<http://www31.nortel.com/webcast.cgi?id=3181>
3. Recently, some scientists from all over the world met in Greenland to share their findings and space science research. In particular, they were discussing the importance of studying space science in polar regions, focusing on how Earth's magnetosphere protects us from most space weather. In video interviews, the scientists responded to questions asked by elementary and middle school students. In addition to science questions, the scientists also discussed some of their personal experiences as space scientists. This was also a chance to find out more about life in Greenland.
4. Go to the Greenland Space Science Symposium 2007 web site, http://www.nortellearnit.org/Greenland_Symposium, and choose one of these interviews to learn more about space science AND what it's like to be a scientist.
5. Share what you've learned with the class. If you were interviewing this scientist, what other questions would you ask? What more do you wonder about space science?

Explain

1. Your teacher will randomly pair you with another student to form a research team. Each team will learn more about space weather, Earth's magnetosphere, Earth's magnetic fields, auroras, solar cycles, or solar storms.
2. Find out more about your assigned topic by visiting the Space Weather Center, <http://www.spaceweathercenter.org/> Investigate one of these topics:
 - **Amazing Plasmas** – Learn more about plasma -- on Earth and in the Universe
 - **Living With a Star** – Find out more about our Sun, the solar cycle, and solar wind.
 - **Protective Shield** – Learn more about Earth's magnetic field and auroras.
 - **Research** – Discover what tools help us learn more about the Sun-Earth connection.
3. Learn more about Space Weather Reports at <http://www.spaceweathercenter.org/stormalert/01/01.html>
4. Dr. Nicky Fox, a space physicist, shares more information about solar wind, auroras, and space weather in the following two interviews.

You can see one interview using the Sun-Earth Viewer, http://sunearth.gsfc.nasa.gov/sunearthday/media_viewer/viewer.swf

A vodcast interview can be downloaded from the fourth NASA EDGE program. In this interview, Dr. Fox helps us visualize what it's like to live in the Sun's atmosphere with these words from the vodcast ...

DR. FOX: The Sun has an atmosphere, which is continually streaming away. We call it the solar corona. We like to say, "whenever the Sun sneezes, the Earth will catch a cold."

BLAIR: Wow, that's gross.

[all laughing] Is there any way we can stop this germ-spreading star at the center of our solar system?

DR. FOX: Yes. Well, fortunately we have a protective outer layer, maybe a Kleenex layer, which is the Earth's magnetosphere. It's the magnetic atmosphere that surrounds our planet and that manages to keep away most of those harmful germs or that high radiation that would be coming from the Sun all the time. That's why we're safe down here on the planet. When you are at solar maximum, you are seeing these storms very frequently,

maybe as many as two or three in a month. Down at solar minimum, you are probably around one every two months and they're much smaller.

FRANKLIN: Say Dr. Fox, are there any adverse effects on the Earth's surface if the Earth's magnetosphere, the Kleenex, does not catch all of that sneeze?

BLAIR: That also is very gross.

[more laughing] I'm really nervous now. That's what happened to me this weekend.

DR. FOX: Well, no. Fortunately, we are very well protected because of the various layers of our atmosphere do a very good job of protecting us. However, anything that's out in space, for example satellites, will see effects because of this increased radiation that can come in around them. One of the most beautiful side effects of these "sneezes," is, in fact, you will see very beautiful aurorae or the northern and southern lights.

Download the entire NASA EDGE vodcast, <http://www.nasa.gov/multimedia/podcasting/nasaedge/index.html>, to hear more of this interview.

5. How does a space weather report compare to a weather report on Earth? Find out more by viewing a 30-second video at <http://education.jsc.nasa.gov/explorers/p11.html> and reading the background information you'll find at the 21st Century Explorer Web site.

6. What's today's space weather? Track today's solar activity at NOAA's National Weather Service Space Environment Center, <http://www.sec.noaa.gov/SWN/>

7. How does space weather impact YOUR life? Learn more about solar storms and how this affects your health, the environment, and technology at this Space Weather Web site, <http://www.solarstorms.org/>

8. Work with your partner to choose the most interesting and important information to help people understand how the Sun affects life here on Earth. Create a PowerPoint presentation or a 60-second video infomercial to share this information. Solar images may be found at <http://sunearthday.nasa.gov/2007/multimedia/gallery.php>

TIP: When you decide what images (pictures), sounds or text that you want to use in your infomercial, be sure to check for a copyright notice ©. Some Web sites want you to use their materials for educational projects while others don't. A good practice for you should be to look for an email on the Web page you want to use materials from and use it to send a request for permission to use it in your class project.

It is also important that you identify materials that you use completely in your presentation. This is called "making a citation" of someone else's work. The format that is typically used is as follows:

Last Name, First Name of Author (if known). "Title of work/article/page." *Title of Complete Document* (if applicable). Date last modified. URL (date visited).

Elaborate

1. Use PowerPoint, MovieMaker, or another presentation software package to share what you've learned. Or ... create a video solar infomercial.
2. Before you begin your production, you may want to review the **Nortel LearniT** training video about digital imaging:
 - **Digital Imaging Project**, <http://video.google.com/videoplay?docid=-939683545412310982&hl=en>
3. Before you begin creating your own PowerPoint slides or video, you might want to take a look at a Nortel LearniT video tutorial to get some good tips and tricks on making a great presentation.
 - **PowerPoint**, <http://www.nortellearnit.org/DiscoveriT.aspx>.
 - **Video Production**,
http://www.nortellearnit.org/technology/Video_Productions/
4. As a team, use a story board to creatively organize your slides or frames into an interesting and entertaining presentation.
http://www.nortellearnit.org/Deliver/Word/Storyboard_kica.doc
5. Pictures and sounds will be very important in helping your audience visualize the Sun-Earth connection.

Download images and sounds to your hard drive, or save the URL as a 'Favorite' in your Web browser.

6. Put a descriptive title screen and credits and references at the end of the PowerPoint presentation or video. Using the multimedia (pictures, images, sounds etc.) throughout the presentations will help you to communicate your key information.

Tip: Remember to ONLY use images or sounds that you have permission to include in your presentation. To learn more about copyright (and copy wrongs!) be sure to watch the Nortel LearniT video tutorial at <http://tinyurl.com/s2pvb>

7. Determine how you and your partner will share the work. One way would be for each partner to create two to three slides explaining your research. These will be combined to create the solar infomercial. One interesting way to present your research might be as a space weather report. Remember to be entertaining, yet factual, as you present this information.

8. The final step in your project is to share your presentation with your class. Practice your presentation and consider ways to add interest to your work. Perhaps you might want to dress up for the space weather report.

Evaluate

PowerPoint Project Evaluation Rubric

Criteria	Unsatisfactory	Needs Improvement	Satisfactory	Exemplary
Research	Limited research, from limited sources	Somewhat well researched from somewhat varied sources.	Well researched, from various sources	Thorough research from varied sources presenting different points of view
Storyboard / planning	Limited planning evident	Some planning evident	Planning evident	Thorough planning evident
Content	Lacks detail	Some detail	Good detail	Excellent detail
Technology Use to Demonstrate Understanding	Technology use with little purpose	Technology use with some purpose	Technology use with purpose	Intuitive technology use with specific purpose
Overall Final Project	Inconsistent and inappropriate aesthetics and technical functionality	Somewhat consistent and appropriate aesthetics and technical functionality	Consistent and appropriate aesthetics and technical functionality	Consistent, creative and appropriate aesthetics and technical functionality

Group evaluation: What did each of you contribute to the task? How did you divide the work?

Self Evaluation: What did you learn? What do you know about the Sun-Earth connection that you did not already know?

Video Production Project Rubric

Criteria	Level 1 (D)	Level 2 (C)	Level 3 (B)	Level 4 (A)
Research / Content	Content lacks detail	Content somewhat detailed	Content is detailed	Content is appropriate and detailed
Planning / Storyboard	Incomplete	Somewhat complete	Complete	Complete and thorough
Communication of Understanding	Communicates little information with clarity	Communicates some information with some clarity	Communicates information with clarity	Communicates comprehensive information with clarity
Technical quality of video (e.g. editing, transitions, lighting, composition, audio)	Poor	Satisfactory	Good	Excellent
Overall use of Technology to Present Findings	Use of technology to present findings using a few simple ideas	Use of technology to present findings using some simple ideas	Use of technology to present findings using ideas of some complexity	Use of technology to present findings using complex ideas

Group evaluation: What did each of you contribute to the task? How did you divide the work?

Self Evaluation: What did you learn? What do you know about the Sun-Earth connection that you did not already know?

Consider some of these ideas for extensions:

1. Help your teacher set up a "Space Weather Action Center" in your classroom. Everything you need to know can be found at this Web site, <http://sunearthday.nasa.gov/swac/>

An instructional guide, http://sunearthday.nasa.gov/swac/instructional_guide.pdf, and set-up guide, http://sunearthday.nasa.gov/swac/setup_guide.pdf, are available to get the "Space Weather Action Center" up and running in no time at all.

Take a look at these materials and see what you can do to help your teacher with this project.

2. Find out more about studying Earth's magnetosphere at the poles. Research space science and Antarctica to learn more about magnetometers placed in this remote land.

3. Try to contact one of the space scientists from the Greenland Space Science Symposium 2007 and create a "Career Byte" based upon this person's life. For ideas on how to create a "Career Byte" go to http://www.nortellearnit.org/resources/career_bytes/

4. Share your work with parents, families, and other students.

The National Council of Teachers of English

K-12.7. Evaluating Data

Students conduct research on issues and interests by generating ideas and questions, and by posing problems. They gather, evaluate, and synthesize data from a variety of sources (e.g., print and non-print texts, artifacts, people) to communicate their discoveries in ways that suit their purpose and audience.

K-12.8. Developing Research Skills

Students use a variety of technological and information resources (e.g., libraries, databases, computer networks, video) to gather and synthesize information and to create and communicate knowledge

National Science Education Standards

Level K-4 Earth and Space Science

As a result of their activities in grades K-4, all students should develop an understanding of

- Objects in the sky
- Changes in Earth and sky
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Level 5-8 Earth and Space Science

As a result of their activities in grades 5-8, all students should develop an understanding of

- Earth in the solar system

