Desktop: How to prepare for an "Online exploration"

Description / overview of the lesson

How to prepare for an "Online exploration"

Preparation

Before using the activities...

1. Check out your computers.

2. Reserve a time to use the computer lab.

3. Bookmark the activity on the Web browser (Netscape Navigator or Microsoft Internet Explorer) of each student computer.

4. Determine a strategy for organizing your students. Options include the following:
   - Use a whole-class approach with one computer.
   - Use a team approach in a computer lab, with different students having specific responsibilities during the activity (such as "mouse user," "note taker," and "oral responder").
   - Have your students a computer/Web pre-assessment to determine their computer experience.
   - Organize your students in such a way that more experienced users are matched up with less experienced ones.

While students are doing an activity...

1. Share the objectives and the key vocabulary words used in the activity.

2. Identify patterns using scientific data.

3. Identify patterns using scientific data.

4. Estimate their distances from Earth.

The lesson is modular so that all or part of it may be completed using computers and the Internet.

Appropriate time to review the lesson.

2-3 class periods depending on the length of a class and ability level of the students.

Target audience / grade levels:

Identify patterns using scientific data

Classify

Predict

Characteristics of galaxies used for classification and identification

The number of galaxies in the universe

Astronomy

Math

Subject:

Appropriate for students at this age level. The lesson is primarily designed for students in grades 6-12 but can be used with younger or older students.

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Subject:
Hubble Deep Field Academy
Lesson Plan: Author

Educator's Information:

Name: Gina Cash
School: Hammond Middle
Address: 8110 Aladdin Drive, Laurel, MD, 20723
Years teaching: 3.5
E-mail address: none
Area(s) of expertise: Earth and Life Science

Name: Kirk Fitch
School: Takoma Park Middle
Address: 7611 Piney Branch Road, Silver Spring, MD, 20910
Years teaching: 8
E-mail address: none
Area(s) of expertise: Elementary and Earth Science

Scientist's Information:

Name: Ray Lucas
Institution: Space Telescope Science Institute
Address: 3700 San Martin Drive, Baltimore, MD, 21218
E-mail address: lucas@stsci.edu
Area(s) of expertise:

Supporting Cast:

Julia Hollis, Student Intern at ST ScI, Megan Donahue, ST ScI, the Hubble Deep Field team of scientists at ST ScI, and the entire staff at the Office of Public Outreach, ST ScI.

Please, send your comments about this page to: amazing-space@stsci.edu

Hubble Deep Field Academy

Lesson Plan: Details

Engagement activity:

In Activity One, students will classify selected objects from the Hubble Deep Field image. They will first give a rough estimate of the number of objects in the image based on their color and shape. Students will classify one Camera, (A, B, or C), containing 15 objects. Students will then compare their classification to a similar chart made by astronomers.

Preparation:

The introduction and each of the four activities have a "Hubble Academy Log" (worksheets) that you can print and copy beforehand. In addition, the images used in the "999,999 Cans of Soda on the Wall?" -- by Kirk Fitch, Montgomery County, MD activity are clickable galaxy icons. Students can click the galaxy icon to review information from the activities as they answer questions on paper. Several student answers can be used to calculate the number of objects in the field by "999,999 Cans of Soda on the Wall?" -- by Kirk Fitch, Montgomery County, MD.

Procedure / directions:

The "Hubble Academy Log" entries as well as Activity Four can be used as an effective basis for assessing students' success in the lesson. Other suggestions are:

- "What Does a Million Look Like?" -- by Kirk Fitch, Montgomery County, MD
- "999,999 Cans of Soda on the Wall?" -- by Kirk Fitch, Montgomery County, MD
- "Big Dipper" at the atmosphere
- "Home Schooler"

Goal / Purpose:

The purpose of this lesson is to allow students to experience the processes actual scientists go through to answer to any scientific inquiry. Students will have the opportunity to ask and answer questions of importance of collaboration among scientists as well as the possibility of more than one acceptable answer to any scientific inquiry. Students will use a "999,999 Cans of Soda on the Wall?" -- by Kirk Fitch, Montgomery County, MD. Students will use a clickable galaxy icon to review information from the activities as they answer questions on paper. Several student answers can be used to calculate the number of objects in the field by "999,999 Cans of Soda on the Wall?" -- by Kirk Fitch, Montgomery County, MD.

Materials:

- More information for the home-schooled can be found at: http://dir.yahoo.com/Education/Science/Teaching/Fine/Classroom/Teach/At-home/Links/GrabBag.
- "Big Dipper" at the atmosphere
- "Home Schooler"

Desired learning outcomes:

- Appreciate the interactive capabilities of the Internet
- Apply estimation skills to scientific data
- Organize and synthesize new information
- Learn to determine distances
- Generate questions that can be answered using scientific inquiry

Materials:

- "Big Dipper" at the atmosphere
- "Home Schooler"

Procedure / directions:

Steps:

1. Engage the students in a brief history of the development and use of the telescope. The professor will then provide a hook for the lesson and distribute copies of "999,999 Cans of Soda on the Wall?" -- by Kirk Fitch, Montgomery County, MD.
2. Ask students to come up with a list of potential applications for which they would use the skills learned in this lesson: (1) representative sampling, (2) classifying and identifying objects, and (3) determining distances
3. The teacher will present a brief overview of how astronomers classify objects using the Hubble Deep Field image and flexible teaching styles of the same tasks. Our goal is that students will come to appreciate the importance of collaboration among scientists as well as the possibility of more than one acceptable answer to any scientific inquiry.
4. Engage the students in a brief history of the development and use of the telescope. The professor will then provide a hook for the lesson and distribute copies of "999,999 Cans of Soda on the Wall?" -- by Kirk Fitch, Montgomery County, MD.
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Engagement activity:

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Activities:

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Activity Two:

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Activity Three:

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Activity Four:

In this Activity, students will classify selected objects from the Hubble Deep Field image. They will first give a rough estimate of the number of objects in the image based on their color and shape. Students will classify one Camera, (A, B, or C), containing 15 objects. Students will then compare their classification to a similar chart made by astronomers.

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Standard 1: Mathematics as Problem Solving

By the end of 8th grade students should know that:

- Mathematics is essential to asking and answering questions about the natural world.
- Mathematics can be used to model and analyze situations in order to represent and solve problems.
- Mathematics is used to communicate arguments with logical reasoning.
- Students should develop the ability to identify questions with scientific ideas, concepts, and applications.

From: National Science Education Standards

Standard 5: Number and Number Relationships

In grades 5-8, the mathematics curriculum should include exploration of a variety of systems of numbers, including the continued development of number and number relationships so that students can understand, use, and apply numbers in a variety of equivalent forms and contexts.

From: National Science Education Standards

Standard 10: Statistics

In grades 5-8, the mathematics curriculum should include exploration of data analysis, including the continued development of number and number relationships so that students can understand, use, and apply numbers in a variety of equivalent forms and contexts.

From: National Science Education Standards

ARCHIVED REFERENCES

By the end of the 8th grade students should:

- Know why it is important in science to keep honest, clear, and accurate records.
- Know that hypothesis are valuable, even if they turn out not to be true, if they lead to fruitful explanations for the same observations. Although scientific ideas change explanations of events, the scientific process is the same.
- Know that often different explanations can be given for the same evidence, and it is not always possible to tell which is correct. (p. 7)
- Know that sometimes experiments fail, and the data cannot be explained by scientific theories. (p. 6)

EVIDENCE TO SUPPORT THE CONCEPTS

...
There are several different classes of supernovae, so in order to use this technique scientists have to have a variable brightness. Their light variation period has been accurately related to their luminosities, called “Cepheid variables” have been studied in the Milky Way and other nearby galaxies. These stars are estimated to be about 10.5 billion light years away.

The nearest galaxies seen in the Hubble Deep Field are about 2.5 billion light years away. The furthest area of the sky that is as small as the size of President Roosevelt’s eye on a dime held at arm’s length. Hubble took a second deep look in the southern hemisphere in October of 1998, the HDF-South, to see what it might later evolve into elliptical galaxies.

The Hubble Deep Field exemplifies the work that astronomers face today in attempting to understand the basic units of mass in the universe and are visible from very great distances. Galaxies come in a menagerie of far more distant galaxies, some nearly as faint as 30th magnitude, or nearly four billion years old. One of the most interesting questions is how did the large-scale structure evolve in the universe? The Hubble Deep Field, along with other deep Hubble images, provides a snapshot in time of a large-scale region of the sky. This is an important clue to understanding the evolution of the universe. Some of the galaxies may have formed less than one billion years after the Big Bang.
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Other resources from ST ScI:

Other resources available outside ST ScI:

Below you will find a vast amount of information regarding the Hubble Space Telescope 2nd Servicing Mission. The information comes from many sources other than ST ScI.

Images used in Activity One: How Many Are There?
- Astronomers' Classification Table
- List of objects in order of distance
- Atmospheric turbulence
- Aiming the Hubble Space Telescope
- Space Shuttle Launch

Images used in Activity Two: Classifying and Identifying
- Galactic features
- Hubble Deep Field

Images used in Activity Three: Estimating Distances in Space
- Atmospheric and city lights effects on telescopes
- Hubble Academy Log

Images used in Activity Four: Review and Assessment
- COSMIC CLASSIFIER'S HAL
- All the HAL's
- Academy Orientation
- "999,999 Cans of Soda on the Wall?"

Extension Activities:
- Movies
- Icons used in the Hubble Academy Lesson

Resources:
- Other "Cool Stuff"
- Extension Activities
- Images:
  - Hubble Academy Logs
  - Images used in the Academy Orientation
  - Images used in Activity Three: Estimating Distances in Space
  - Images used in Activity Two: Classifying and Identifying

amazing-space@stsci.edu

CCD Images of Messier Objects -- University of Oregon
Galaxy Features On-Line
Faint Irregular Galaxies
Cartwheel Galaxy Interactions
Spiral Galaxy M100
Hubble Deep Field Home Page at Space Telescope Science Institute

NASA SpaceLink
Windows to the Universe -- University of Michigan
# Hubble Deep Field Academy

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