Hubble Space Telescope Lesson Booklet

Author: Karen Freiboth

Astronomy

Grade Levels: 3-5

Subject Areas: Science/History/Technology/Art

Time Duration: Four 40-minute Classroom Periods

Description of Lesson:

The Hubble Space Telescope Lesson is designed in a booklet format to make learning science fun and engaging for all students. The lesson booklet also provides a way for each student to have their own individual copy of the booklet during the teaching of the lesson and, most of all, to keep at the completion of the lesson. The 8 ½ in. by 11 in. educational booklet was created on Windows Microsoft Publisher 2007. The lesson provides students with a brief history and background of NASA's Hubble Space Telescope. The booklet also provides students with a fun and engaging hands-on science/art project. During this project, students will be introduced to an extraordinary website filled with fascinating Hubble images and fundamental Hubble Space Telescope educational material.

Materials Needed:

Important Note: Staple each booklet together on the left side, using 3 staples

- Hubble Space Telescope Lesson Booklet (1 copy per Student)
- Hubble Space Telescope Lesson Booklet (Teacher's Guide)
- Pens / Pencils
- Standard Size Staples
- Stapler
- Multiuse Paper For lasers, inkjets and copiers (Color White, Size 8 ½ in. X 11in.)
- Calculator (1 per student)
- Computer
- Color Printer
- Internet Access
- Heavy Construction Paper (Color Black, Size 9 in. X 12 in.) **(3 Sheets per Student)**
- 1 Ball of Yarn (Color Red)
- 1 Ruler (Size 12 in.)
- 1 Hole Puncher

- Scissors (1 per Student)
- Glue Sticks (1 per Student)
- **Student Handout** My Very Own Hubble Space Telescope Photo Album Cover Sheet (1 per Student)
- **Student Handout** My Very Own Hubble Space Telescope Photo Album Hubble Images Description Sheet (5 per Student)
- **Student Handout** My Very Own Hubble Space Telescope Photo Album Hubble Images Student Selection Packet (1 per Student)
- **My Very Own Hubble Space Telescope Photo Album Images Teacher's Selection Packet Note:** The Hubble Images Selections Packets were designed because some teachers/classrooms do not have direct access to a color printer. The Packets also provide both the students and teachers with a hard copy of the Hubble images and their descriptions.

Pre-Lesson:
Teacher Will:

- Print 1 copy of the HST Lesson Booklet **Teacher's Guide** (Staple Booklet)
- Print 1 copy per student of the HST Lesson Booklet (Staple each Booklet)
- Print all of the required student handouts (Staple each student selection packet together in the upper left-hand corner)
- Print 1 copy of the Teacher's Selection Packet (Staple the packet together in the upper left-hand corner)
- Hole punch and fold students' construction paper for the *My Very Own Hubble Space Telescope Photo Album*
- Pre-Make a student display model of the *My Very Own Hubble Space Telescope Photo Album*
- Display a model of the *My Very Own Hubble Space Telescope Photo Album*
- Provide students with a brief introduction to the Hubble Space Telescope Lesson Booklet
- Discuss the lesson's checklist grading rubric with students

Procedure: Teacher will teach the lesson booklet to students in a whole-group instruction. Before Teacher begins teaching the Hubble Space Telescope Lesson Booklet, teacher should ask students to turn to the Vocabulary Words page located in the front of the lesson booklet and read aloud all of the vocabulary words listed on the page. The vocabulary words will build students vocabulary and it will aid in teaching the lesson because all of the words are in the lesson. Then, teacher should ask students to turn to the glossary at the end of the lesson

booklet. Teacher should review any or all of the terms (**Note:** the terms listed in the glossary are all of the words from the Vocabulary Words page). After teacher reviews all of the lesson's vocabulary words, teacher will begin teaching the Hubble Space Telescope Lesson Booklet.

Goals:

- Students will gain knowledge of the Hubble Space Telescope.
- Students will gain knowledge of elliptical galaxies, spiral galaxies and barred spiral galaxies.
- Students will use technology to create their own individual Hubble Space Telescope photo album.
- Students will use their knowledge of the Hubble Space Telescope to participate in whole-group class discussions.

Lesson Objectives:

Students Will Learn:

- New vocabulary terms
- About the American astronomer Edwin P. Hubble
- About Edwin P. Hubble's scientific contributions to astronomy
    - The Hubble Tuning Fork Diagram
    - Hubble identified and classified three types of galaxies: elliptical galaxies, spiral galaxies and barred spiral galaxies
- To recognize and identify three types of galaxies:
    - Elliptical galaxies
    - Spiral galaxies
    - Barred spiral galaxies
- About NASA's Hubble Space Telescope (HST)
    - HST is named after the famous American astronomer Edwin P. Hubble
    - HST is a large orbiting telescope in space
    - HST is a reflecting telescope
    - HST is used by astronomers to study the Universe
    - HST captures images of stars, planets, galaxies and other celestial objects
- About NASA's Space Shuttle Discovery
    - NASA's Space Shuttle Discovery STS- 31 Crew
    - Launched the HST into space
    - Positioned and released the HST into space
- About NASA's Hubble Space Telescope Servicing Missions
- Examine images taken by the HST

- About images of celestial objects taken by the HST through making their own individual HST photo album
- About the HST during a whole-group class discussion

Adaptations for Students with Learning Disabilities:

- Teacher will work with students on a one-to-one basis
- Students will keep their own copies of the **Hubble Space Telescope Lesson Booklet**, which will enable the students to grasp the educational material and understand the concepts.
  Note: by having the lesson booklet in their possession, students could read and review the lesson as many times as they need to.

  Adaptations for Gifted Students:
- Hubble's Tuning Fork Diagram is written into the lesson.
- Students could learn more about *Betelgeuse***, a Red Supergiant Star** and the **Hercules Galaxy Cluster** (from pages 14 & 15 of the lesson booklet.)

Assessment:
Teacher will assess students' knowledge based on:
- Students' answers to the **Identify The Galaxies** activity on page 6 of the Hubble Space Telescope Lesson Booklet.
- Students' completion of their own individual Hubble Space Telescope photo albums.
- Students' participation during the **Questions for Discussion** portion of the lesson.

Rubric:
Pre-Lesson
Before the lesson begins, teacher will assess:
- Students' knowledge of the Hubble Space Telescope by asking students' to write a few sentences about the Hubble Space Telescope.

Post- Lesson
Grades will be based on a total 100 possible points to be earned:
- Hubble Space Telescope Checklist Grading Rubric

Extensions:

Students will visit the following Educational Web Sites to Learn More about the Hubble Space Telescope and Hubble careers.

HUBBLESITE
THE TELESCOPE
Where's Hubble Now?....
http://hubblesite.org/the_telescope/where.a.s_hubble_now/

For Basic Hubble Tracking
Visit This Web site:
http://hubblesite.org/the_telescope/where.a.s_hubble_now/basic_version.php

For More Advanced Hubble Tracking
Visit This Web site:
http://hubblesite.org/the_telescope/where.a.s_hubble_now/advanced_version.php

NASA
NASA Education
Educational Information
Hubble Careers
Hubble Careers in Action
http://www.nasa.gov/audience/foreducators/hubble-careers.html

Standards:

> **AAAS**
> **ADVANCING SCIENCE, SERVING SOCIETY**
> **Benchmarks for Science Literacy**
> **Grades 3 - 5**
>
> 1. **The Nature Of Science**
>   A. **The Scientific Worldview**

Science is a process of trying to figure out how the world works by making careful observations and trying to make sense of those observations. 1A/E2**

B. The Scientific Enterprise

Science is an adventure that people everywhere can take part in, as they have for many centuries. 1C/E1

Doing science involves many different kinds of work and engages men and women of all ages and backgrounds. 1C/E3

Many social practices and products of technology are shaped by scientific knowledge. 1C/E4**

2. The Nature of Mathematics
A. Patterns and Relationships

Mathematics is the study of quantity and shape and is useful for describing events and solving practical problems. 2A/E1*

B. Mathematical Inquiry

In using mathematics, choices have to be made about what operations will give the best results. Results should always be judged by whether they make sense and are useful. 2C/E2

3. The Nature of Technology
A. Technology and Science

Technology enables scientists and others to observe things that are too small or too far away to be seen otherwise and to study the motion of objects that are moving very rapidly or are hardly moving at all. 3A/E2

Technology extends the ability of people to change the world: to cut, shape, or put together materials; to move things from one place to another; and to reach farther with their hands, voices, senses, and minds. The changes may be for survival needs such as food, shelter, and defense; for communication and transportation; or to gain knowledge and express ideas. 3A/E4

B. Design and Systems

Even a good design may fail. Sometimes steps can be taken ahead of time to reduce the likelihood of failure, but it cannot be entirely eliminated. 3B/E2

C. **Issues in Technology**

The technology available to people greatly influences what their lives are like. 3C/E1c

Factors such as cost, safety, appearance, environmental impact, and what will happen if the solution fails must be considered in technological design. 3C/E4*

4. **The Physical Setting**
    A. **The Universe**

Telescopes magnify the appearance of some distant objects in the sky, including the moon and the planets. The number of stars that can be seen through telescopes is dramatically greater than can be seen by the unaided eye. 4A/E2

A large light source at a great distance looks like a small light source that is much closer. 4A/E6** (BSL)

8. **The Designed World**
    D. **Communication**

People have invented devices such as paper and ink, engraved plastic disks, and magnetic tapes for recording information. These devices enable great amounts of information to be stored, retrieved, and sent to other people or places. 8D/E3

Communication technologies make it possible to send and receive information more and more reliably, quickly, and cheaply over long distances. 8D/E4

D. **Information Processing**
Computers can be programmed to store, retrieve, and perform operations on information. These operations include mathematical calculations, word processing, diagram drawing, and modeling complex events. 8E/E2

Habits of Mind
    A. **Values and Attitudes**

B. **Computation and Estimation**

Make calculations when necessary to solve real-world problems and decide whether to make the calculation mentally, on paper, or with the help of a calculator or computer. 12B/E1*

B. **Communication Skills**

Locate information in print and electronic resources. 12D/E8** (BSL)

Interpret written descriptions of real-world objects and events. 12D/E6**

C. **Critical-Response Skills**

Seek reasons for believing something rather than just claiming "Everybody knows that…" or "I just know" and discount such claims when made by others. 12E/E3*

5. **The Nature of Technology**
   E. **Technology and Science**

Technology enables scientists and others to observe things that are too small or too far away to be seen otherwise and to study the motion of objects that are moving very rapidly or are hardly moving at all. 3A/E2

Technology extends the ability of people to change the world: to cut, shape, or put together materials; to move things from one place to another; and to reach farther with their hands, voices, senses, and minds. The changes may be for survival needs such as food, shelter, and defense; for communication and transportation; or to gain knowledge and express ideas. 3A/E4

   F. **Design and Systems**

Even a good design may fail. Sometimes steps can be taken ahead of time to reduce the likelihood of failure, but it cannot be entirely eliminated. 3B/E2
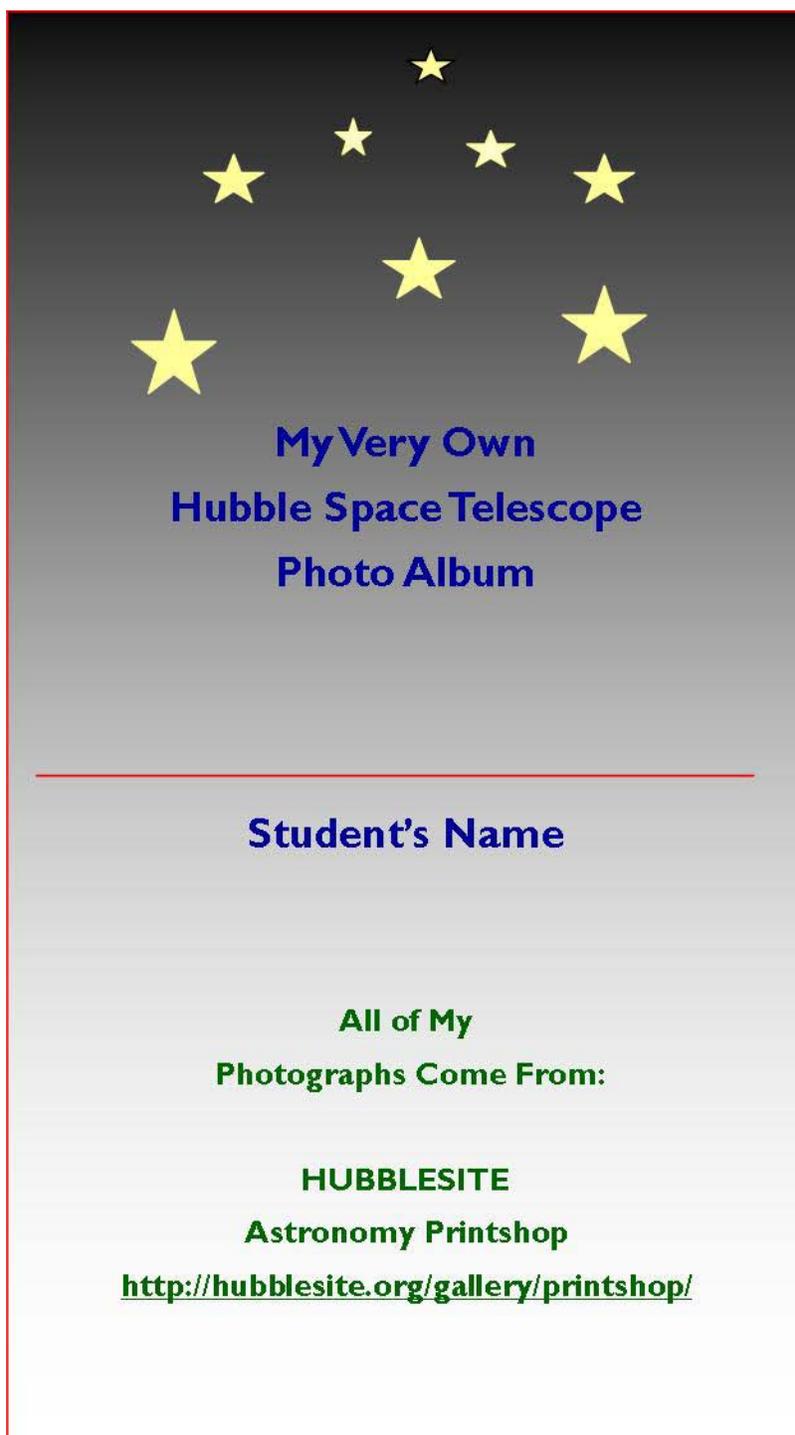
   G. **Issues in Technology**

The technology available to people greatly influences what their lives are like. 3C/E1c

Factors such as cost, safety, appearance, environmental impact, and what will happen if the solution fails must be considered in technological design. 3C/E4*

Student Handout

Cover Sheet **for My Very Own Hubble Space Telescope Photo Album**

Student Handout

Description Sheet for My Very Own Hubble Space Telescope Photo Album

This Image Taken by the
Hubble Space Telescope is a Picture of

_____

_____

_____

_____

I Like This Picture Because

_____

_____

_____

_____

Hubble Space Telescope Lesson
Checklist Grading Rubric

Student's Name:_____

Date: _____

Identify The Galaxies

10 Points   **5 Points**   **0 Points**

Identified All
3 Galaxy Types

Identified Some
Galaxy Types

Did Not Identify
Any Galaxy Types

☐   ☐   ☐

My Very Own Hubble Space Telescope Photo Album

50 Points   **25 Points**

Photo Album Complete   Photo Album Incomplete

☐   ☐

Technology

15 Points   **0 Points**

Used Computer to
access websites

Did not use Computer to
access websites

☐   ☐

Questions For Discussion

25 Points   **0 Points**

Participated in
Discussions

Did not Participate
in Discussions

☐   ☐

Possible Points Earned : 100   **Total Points Earned: _____**

Teacher's Comments: