

Exploring Stars

Teacher's Guide

Grade Level: 4-5

Curriculum Focus: Earth and Space

Lesson Duration: 2-3 class periods

Program Description

Characteristics of Stars (4 min.) – Discover what it takes to be a star. *Understanding Stars* (8 min.) – Learn more about those twinkling objects in the night sky. *Studying the Stars* (9 min.) – From Galileo to Hubble, see how telescopes have helped us with studying the stars.

Onscreen Questions

- How are stars different?
 - How does the sun compare to other stars?
 - How are adaptations important for survival?
 - What environmental challenges cause animals to develop adaptations?
 - What do the terms luminosity and magnitude mean in describing stars?
 - Explain why stars are blue, red, or yellow.
 - How many stars may be in the universe?
 - What do you think a star is made of?
 - How does a nebula become a protostar?
 - What are the differences between a neutron star, a red supergiant, and a black hole?
 - How did the invention of the telescope provide information about our galaxy?
 - What is an optical telescope?
 - Describe the difference between a refracting and a reflecting telescope.
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Lesson Plan

Student Objectives

- Describe the life cycle of a small, medium, or large star using correct vocabulary for the stages in a star's life.

- Make flipbook “movies” detailing the life cycle of a small, medium, or large star.
- Compare the life cycles of small, medium, and large stars.

Materials

- *Exploring Stars* video and VCR, or DVD and DVD player
- Heavy white paper, 15 to 20, 3” x 5” (7.62 cm x 12.7 cm) sheets per student (for flipbooks)
- 1 finished flipbook for class demonstration (any topic)
- Crayons, markers, or colored pencils
- Heavy duty stapler or hole punch and string for binding flipbooks
- Texts with pictures and information about the life cycles of stars (Science texts, encyclopedias, and magazines)
- Computer with Internet access (optional)

Procedures

1. Talk about the life of a star. A good way to introduce this topic is to show *Exploring Stars*. After watching the program, talk about the different types of stars found in the universe. What are stars? What are they made of? How is a red star different from a blue star? Discuss and review the life cycles of small, medium, and large stars. What is the first stage in the life cycle of a star? How does a large star die?
2. Explain to students that they will be making a “movie” of the life of a star. Show students a finished flipbook that you have made and demonstrate how each page details a “frame” in the movie; each page has a slightly different picture than the one before and after it. When you flip the pages the pictures appear to move, becoming an animated movie. Explain to students that when they construct their flipbooks, they need to make sure their pages are fastened in order and that the pages are lined up before fastening them together or else the flipbook won't work correctly. Talk about how to draw the pictures so that each page is only slight different from the one before it.
3. Tell students they may choose to make a flipbook movie of a small, medium, or large star. Each flipbook must start with a drawing of the star's beginning and the pages must detail the changes that take place in a star over the course of its lifetime. Allow students time in class to use *Exploring Stars* and texts with pictures and information about the life cycles of stars to research their flipbook drawings. The following Web sites also have good information and images about the life cycles of small, medium, and large stars.
 - http://www.astro.keele.ac.uk/workx/starlife/StarpageS_26M.html
 - <http://www.telescope.org/pparc/res8.html>
 - http://outreach.physics.utah.edu/labs/star_life/starlife_main.html
 - <http://library.thinkquest.org/26220/stars/formation.html>



4. Once students have finished their drawings, have them staple the pages of their flipbooks in order and test them out. Place students in groups of 3-5 according to what size star they researched; each group should have at least one person who made a flipbook for a small star, one who made a flipbook for a medium star, and one student who made a flipbook for a large star. Have them share their flipbooks with one another and ask them to describe the life cycle of the star in their flipbook to the rest of their group. Have the groups compare the life cycles of small, medium, and large stars with one another. Which stars form a red supergiant? What comes after a white dwarf in the life cycle of a medium star? How does the death of a large star differ from the death of a small star?
5. Walk around the classroom to assess student knowledge as the students share their flipbooks and information with one another. Listen to make sure students have picked up on the names of the different stages in a star's life cycle. Once all flipbooks have been shared, ask for volunteers to share some of what they learned with the rest of the class. Review the similarities and differences between the life cycles of small, medium, and large stars with the class.
6. Display the flipbooks in the classroom so that students have a chance to watch the star "movies" during their free time.

Assessment

Use the following three-point rubric to evaluate students' work during this lesson.

- **3 points:** Students were highly engaged in class and group discussions; produced creative, colorful, and accurate flipbooks of the life cycle of a star; accurately described the life cycle of a small, medium, or large star using the correct vocabulary for each stage; and successfully compared the life cycles of small, medium, and large stars with one another.
- **2 points:** Students participated in class and group discussions; produced creative and mostly accurate flipbooks of the life cycle of a star; somewhat accurately described the life cycle of a small, medium, or large star using mostly the correct vocabulary for each stage; and compared the life cycles of small, medium, and large stars with one another.
- **1 point:** Students participated minimally in class and group discussions; produced incomplete and/or inaccurate flipbooks of the life cycle of a star; inaccurately described the life cycle of a small, medium, or large star using little to none of the correct vocabulary for each stage; and did not compare the life cycles of small, medium, and large stars with one another.

Vocabulary

protostar

Definition: An early stage in the evolution of a star, after the beginning of the collapse of the gas cloud from which it is formed, but before sufficient contraction has occurred to permit initiation of nuclear reactions at its core.

Context: The material in the center of the nebula forms a clump, called a protostar.

white dwarf



Definition: A star, approximately the size of the earth, that has undergone gravitational collapse and is in the final stage of evolution for low-mass stars, beginning hot and white and ending cold and dark

Context: Similar to the neutron star, the medium-sized star will dim and shrink, becoming a white dwarf.

nebula

Definition: A cloud of interstellar gas and dust

Context: A star forms from a cloud of dust and gas known as a nebula.

neutron star

Definition: Extremely dense, compact star composed primarily of neutrons, formed from the collapsed core of a supernova

Context: Neutron stars may be only 20 km in diameter, but they have a mass equal to about one-and-a-half times the mass of the sun.

red giant

Definition: an intermediate stage of a star's evolution during which the hydrogen fuel supply begins to run out the star's core contracts; the outer shell begins to expand and, because it is also cooling, glows red

Context: The sun will become a red giant in about five billion years.

supernova

Definition: The final explosion of a large star, caused by the gravitational collapse of the core, during which the star's luminosity increases by as much as 20 magnitudes and most of the star's mass is blown away at very high velocity, sometimes leaving behind an extremely dense core

Context: Supernovas burn so brightly they can be seen up to 10 billion light years away.

Academic Standards

National Academy of Sciences

The National Academy of Sciences provides guidelines for teaching science in grades K-12 to promote scientific literacy. To view the standards, visit this Web site:

<http://books.nap.edu/html/nses/html/overview.html#content>.

This lesson plan addresses the following national standards:

- Earth and Space Science: Objects in the sky; Changes in earth and sky
- Physical Science: Properties of objects and materials
- History and Nature of Science: Science as a human endeavor; Nature of scientific knowledge

Mid-continent Research for Education and Learning (McREL)

McREL's Content Knowledge: A Compendium of Standards and Benchmarks for K-12 Education

addresses 14 content areas. To view the standards and benchmarks, visit <http://www.mcrel.org/compendium/browse.asp>.

This lesson plan addresses the following national standards:

- Science: Earth and Space Science—Understands the composition and structure of the universe and the Earth's place in it
 - Nature of Science: Understands the nature of scientific knowledge
 - Language Arts – Viewing: Uses viewing skills and strategies to understand and interpret visual media; Reading: Uses reading skills and strategies to understand and interpret a variety of informational texts
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Support Materials

Develop custom worksheets, educational puzzles, online quizzes, and more with the free teaching tools offered on the Discoveryschool.com Web site. Create and print support materials, or save them to a Custom Classroom account for future use. To learn more, visit

- <http://school.discovery.com/teachingtools/teachingtools.html>
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