National Aeronautics and Space Administration

Teaching Vocabulary Awareness with *Observing Stars*

strategy guide

Common Core State Standards for English Language Arts Literacy in Science & Technical Subjects, Grades 6–8

KEY IDEAS AND DETAILS

RST.6–8.1. Cite specific textual evidence to support analysis of science and technical texts.

CRAFT AND STRUCTURE

RST.6–8.4. Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6–8 texts and topics.

RANGE OF READING AND LEVEL OF TEXT COMPLEXITY

RST.6–8.10. By the end of grade 8, read and comprehend science/technical texts in the grades 6–8 text complexity band independently and proficiently.

Vocabulary Awareness

About this strategy. Vocabulary awareness—the ability to identify and understand key terms as well as unfamiliar words and phrases—is critical. However, knowing the meaning of technical terms often found in science text is only one factor of vocabulary awareness. Students also benefit from metacognitive attention when they encounter unknown words. For example, in the article *Observing Stars*, the word *nebula* may be an unfamiliar yet important word for students to know in order to comprehend the text and make sense of the concepts. Students benefit from opportunities to hear and use precise scientific words while engaging with text and firsthand investigation. Therefore, promoting vocabulary awareness is a useful strategy for making students feel more comfortable when they come across challenging vocabulary and for supporting their developing understanding of new words in science class.

Observing Stars

About the article. *Observing Stars* describes the process scientists use to observe and collect evidence about the life cycle of a star. Long ago, space scientists thought stars never changed, but now they describe how stars are born, change, and die. To gather evidence about different stages of various stars, scientists use telescopes to observe remnants—objects left after a star has died. In addition to the term *remnants*, students will encounter the following challenging terms in this article: *nebula/nebulae*, *supernova*, and *neutron star*.

Flesch-Kincaid Grade Level Readability: 6.9; Lexile Framework for Reading: 1020

Getting Ready

- ★ Make one copy of the Vocabulary Awareness copymaster for each student. Select 3–5 difficult vocabulary terms to use with this strategy. Suggestions include *remnants*, *nebula*, *supernova*, and *neutron star*.
- ★ Make one copy of the article *Observing Stars* for each student.
- ★ Preview the URLs referenced in the teaching instructions.

Educational Product

Educators & Students | Grades 6–8

Disciplinary Literacy in Science

Literacy is an integral part of science. Practicing scientists use reading, writing, and oral communication to explain their findings, conduct research, connect to the work of other scientists, and communicate ideas to a variety of audiences. Situating literacy instruction in a content area, such as science, has several benefits. First, it helps students develop ways of thinking that are characteristic to the discipline. By building background knowledge, science also helps students access high-level content in text that often can be difficult to grasp. Finally, science provides an authentic reason for reading—to better understand the science ideas under study. Reading, like science, can be an act of inquiry when there are genuine questions to be investigated.

AAAS Benchmarks for Scientific Literacy

- ★ **1A/E2** 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.
- ★ **4A/E2** 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 the number of stars that can be seen by the unaided eye.
- ★ **4A/H1a** The stars differ from each other in size, temperature, and age, but they appear to be made of the same elements found on Earth and behave according to the same physical principles.
- ★ **4A/P1** There are more stars in the sky than anyone can easily count, but they are not scattered evenly, and they are not all the same brightness or color.
- ★ **12A/H4** Scientists value evidence that can be verified, hypotheses that can be tested, and theories that can be used to make predictions.

Teaching Vocabulary Awareness with *Observing Stars*

Activate and Build Background Knowledge

1. On the board, write the following guiding question: **"How do scientists observe stars?"**
2. Pose the guiding question and invite students to turn to a neighbor to talk about their thoughts.
3. Project an image of a "dying" star, such as the one found here: http://www.nasa.gov/multimedia/imagegallery/image_feature_783.html. Ask if students have ever thought about a star as being alive. Explain that stars aren't actually alive but that scientists think of them that way because they have stages that are like a life cycle.

Set Purpose for Reading

1. Introduce the article *Observing Stars* and tell students it provides information on how scientists gather evidence about stars.
2. Distribute copies of the Vocabulary Awareness copymaster and write on the board the 3–5 words that you selected. Model by thinking aloud about one of the words, using the descriptors above each column on the copymaster:
   - ★ I do not know anything about this word.
   - ★ I have seen or heard this word before.
   - ★ I know something about this word and can relate it to a situation.
   - ★ I know this word well and can explain it and use it.
3. Direct students to write the selected terms in the space provided on the copymaster and rate their familiarity with each word. Remind students that they are not expected to know every word.
4. Distribute copies of *Observing Stars* and prompt students to locate one of the selected words in the text. Have a student read aloud the sentence that contains the word.
5. Discuss how the context of the word can help students figure out the word's meaning.
6. Ask students to read the article and annotate places in the text where they identify the words in context. When students finish reading, have them pair up to discuss the words.

Integrate Text and Experience

1. After students have finished reading, discuss each of the words, prompting students to identify places in the text that helped them figure out the meaning.

Teaching Vocabulary Awareness with *Observing Stars* (continued)

2. Project the color images of two supernova explosions, which can be found at http://www.nasa.gov/mission_pages/chandra/multimedia/photo09-105.html.
3. Have students describe the images to a partner. Prompt them to use the words you discussed from the reading. After students describe the images, explain what the images show.
4. Project the color image of a planetary nebula, which can be found at http://www.nasa.gov/multimedia/imagegallery/image_feature_77.html.
5. Have students compare and contrast the supernova with the planetary nebula.
6. Have students rate their familiarity with each word again, this time marking responses in the After Reading section. Discuss how their understanding changed after reading, discussing, and viewing images.

Apply New Ideas

1. Return to the guiding question **How do scientists observe stars?**
2. Discuss the historical development of tools for scientific investigation, such as telescopes and their role in scientific discovery.
3. Elicit new questions from students about observing stars or any of the concepts in the article. Provide time for students to research new information about their questions and share their findings with others.
4. See below for additional or updated NASA resources.

Additional Support for Students with Dyslexia

★ **Modify reading materials.**
The student articles and copymasters are available in the Dyslexie font, a typeface developed to help individuals with dyslexia read more fluently. For more information, see http://www.studiostudio.nl/.

★ **Provide explicit instruction.**
Define each term using NASA's online Picture Dictionary: http://www.nasa.gov/audience/forstudents/k-4/dictionary/index.html.

★ **Provide more experience.**
Schedule a field trip to a local planetarium, observatory, or public science center that has a space science exhibit. Alternatively, schedule a telescope demonstration in your classroom.

★ **Engage another learning modality.**
Listen to a podcast of an interview with a Solar System ambassador, Sgt. James Wallace (6 minutes, 22 seconds): http://www.nasa.gov/mp3/157729main_ambassador-20060914.mp3.

★ **Allow independent exploration.**
Make a Star Finder by following the directions in this NASA feature: http://www.nasa.gov/vision/universe/watchtheskies/starfinder_06-19-03.html.

NASA Resources

Star Finder Activity: http://www.nasa.gov/vision/universe/watchtheskies/starfinder_06-19-03.html

Nebula Image: http://www.nasa.gov/multimedia/imagegallery/image_feature_77.html

Supernova Remnants Images: http://www.nasa.gov/mission_pages/chandra/multimedia/photo09-105.html

Neutron Star Video: http://www.nasa.gov/multimedia/videogallery/index.html?media_id=65982611

Star Drama Podcast: http://www.nasa.gov/mp3/159334main_stars-20060926.mp3

Star Life Cycle Video: http://www.nasa.gov/mov/196759main_049_LifeCycle_Star.mov

Name _____ **Date** _____

Vocabulary Awareness

Title of article: _____

Mark an X in one column to show how much you know about each word.

BEFORE READING

Word	I do not know anything about this word.	I have seen or heard this word before.	I know something about this word and can relate it to a situation.	I know this word well and can explain it and use it.

AFTER READING

Word	I do not know anything about this word.	I have seen or heard this word before.	I know something about this word and can relate it to a situation.	I know this word well and can explain it and use it.

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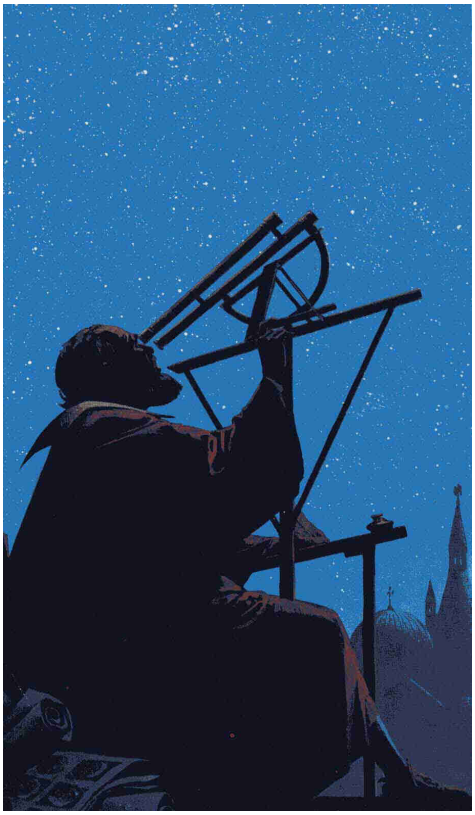
Observing Stars



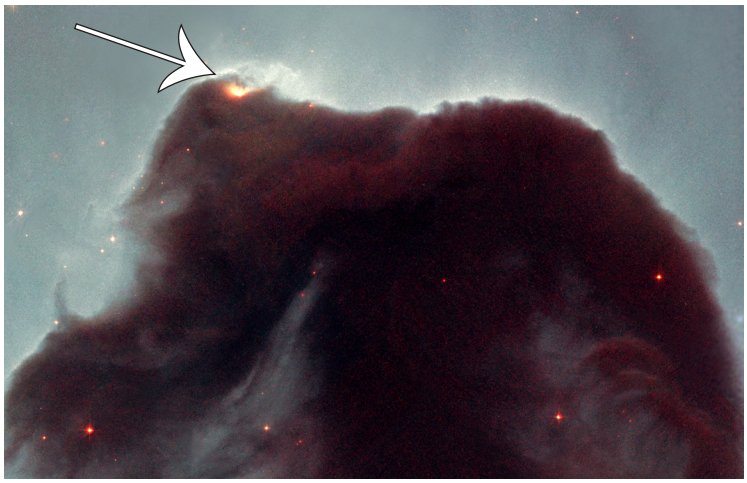
Long ago, scientists thought that stars never changed.

There was a time when scientists thought that stars never changed. They thought that the stars they saw at night were the stars that had always been there and always would be there. This idea was based on the available evidence. In a person's lifetime, no one had observed stars being born or stars dying, so scientists concluded that these events did not happen.

Now, space scientists think of stars differently. They describe how stars are born, how stars go through changes during their life cycles, and even how stars die. Scientists still cannot watch the process that creates stars because it takes too long. The big changes that happen during the life cycles of stars are almost always too slow to observe. The death of stars is usually a slow process, too. If space scientists have not seen these things, what evidence do they have that these changes happen? Instead of observing any particular star going though its life cycle, space scientists observe many different stars that are in different stages of their life cycles. From this, scientists have pieced together the story of the lives of stars.

Evidence for Star Birth

With telescopes, scientists have observed fuzzy, irregular clouds of gas and dust that are huge—more than 10 light-years across. Some are even wider than 100 light-years across. Inside a nebula like this, scientists can observe clumps of matter coming together to form stars. Many of these nebulae have clusters of stars in them that are newly formed.



The Horsehead Nebula is a thick cloud of gas and dust where new stars are forming. You can see a new star burning away part of the cloud at the upper left.

Evidence for Star's Temperature and Mass

The stars we see at night are only the very brightest stars. There are many more that are faint or far away that we can see only by using telescopes. The bright stars tend to be white, or even slightly blue, but a few of the brightest stars are slightly red. The fainter stars that are hard to see are mostly

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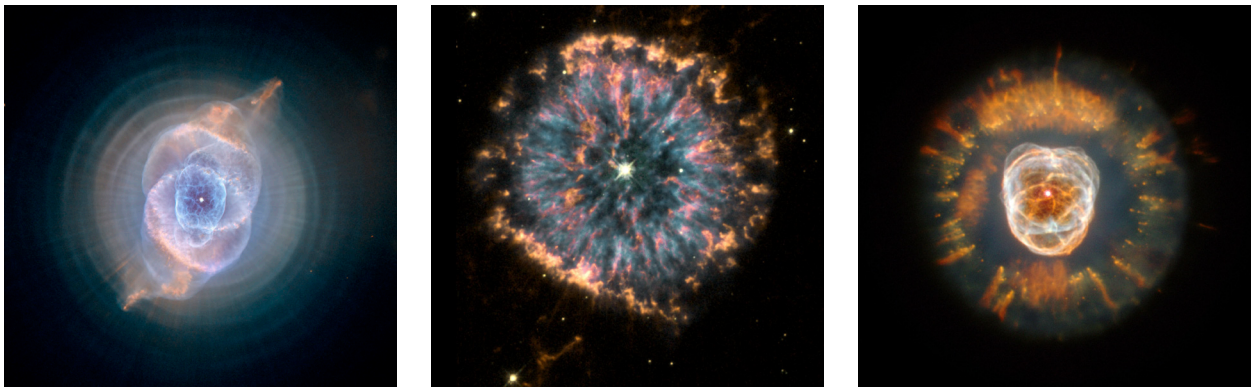
red. The color and brightness of stars are evidence that helps scientists determine their temperature and mass. This evidence helps scientists make explanations about how stars with different amounts of mass change over time.

Remnants Are Evidence of Stars That Have Died

With telescopes, space scientists have observed many objects that are left after stars have died. These are called the remnants of stars. White dwarfs are the remnants of stars that have died and collapsed. They are about the size of Earth. Many white dwarfs have glowing clouds of gas around them called planetary nebulae. (They have nothing to do with planets.) Planetary nebulae are smaller than the nebulae in which stars are formed, and they often have interesting shapes. They may be circular, doughnut shaped, or shaped like butterflies. Some even look like eyes. Planetary nebulae are just a few light-years across.



The Cat's Eye, NGC 6751, and the "Eskimo" are planetary nebulae with white dwarfs around them.

The Crab Nebula is the remnant of a supernova that people first saw exploding more than a thousand years ago.

Another kind of remnant is the matter left from a star that has exploded as a supernova. Unlike most big changes that happen to stars, a supernova is an explosion that happens quickly enough for scientists to observe. During a supernova, a star gets millions of times brighter. This brightness can last for weeks before fading away, leaving behind a cloud of matter that spreads out in space. The cloud of matter is a supernova remnant. In the middle of some supernova remnants, scientists have observed strange objects called neutron stars. Neutron stars are more massive than the Sun but are only the size of a city.

Star remnants can eventually become part of a new star-forming nebula. Our Sun and its planets, including Earth, were formed in a nebula that contained matter from stars that died. You could say that we are all remnants of stars.

All photographic images courtesy of NASA.

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