Ask® Teacher Guide: January 2022

Ask®

Deep Space Mysteries

Explore mysteries of the universe using the engaging articles in this issue of Ask and the related activities in this teacher guide.

CONVERSATION QUESTION

How is science used to solve mysteries?

TEACHING OBJECTIVES

- **Students will analyze evidence.**
- **Students will integrate information from different sources.**
- **Students will ask questions to obtain information.**
- **Students will write narratives to develop imagined experiences.**
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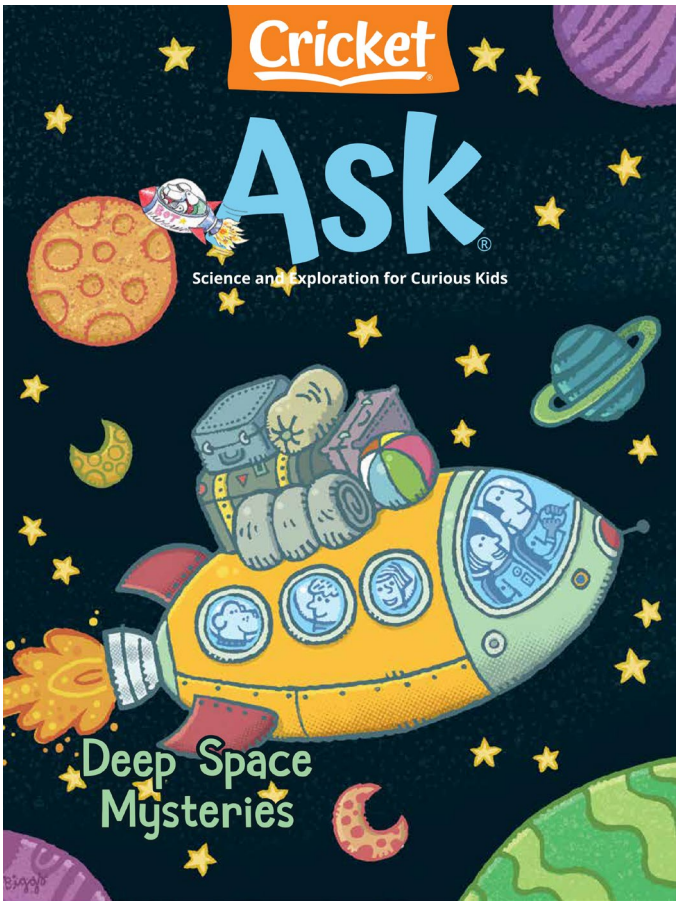
- **Students will conduct short research projects by writing and conducting interviews.**



In addition to supplemental materials focused on core STEAM skills, this flexible teaching tool offers vocabulary-building activities, questions for discussion, and cross-curricular activities.

SELECTIONS

- **The Guest Star**
Expository Nonfiction, ~930L
- **What Is a Black Hole?**
Expository Nonfiction, ~810L
- **How to Find a Black Hole**
Interview, ~720L

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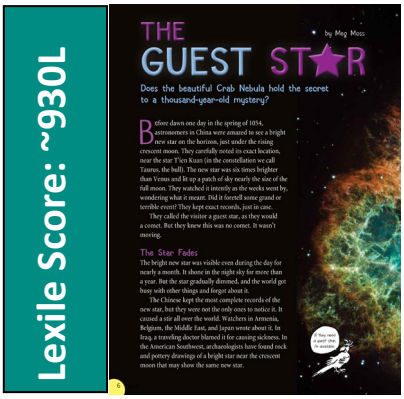
The Guest Star

pp. 6-10, Expository Nonfiction

Use this article to help students understand how science is used to study the unknown.



RESOURCES

Using Evidence

OBJECTIVES

- Students will read and analyze a nonfiction science article.
- Students will analyze evidence.
- Students will write narratives to develop imagined experiences.

KEY VOCABULARY

- ***dimmed* (p. 6)** became less bright
- ***plotted* (p. 8)** marked something on a map, graph, or chart
- ***constellation* (p. 8)** a group of stars that forms a particular shape in the sky and has been given a name

ENGAGE

Conversation Question: How is science used to solve mysteries?

Tell students that humans have always looked at the sky and wondered about what they saw. Invite students to share what they wonder about the universe and space. If necessary, share a few thoughts of your own. Use students' ideas to create an idea web.

INTRODUCE VOCABULARY

Review the vocabulary words and their meanings. Ask students to think about how the words might be related in the context of scientists studying stars. Have students craft sentences that use two or more vocabulary words. Tell students to work in small groups to share their sentences and ask questions to ensure each sentence makes sense.

READ & DISCUSS

Read the article together. Then use these questions for discussion:

1. What did the Chinese astronomers notice about the new star?
2. How do we know other watchers saw the star?
3. How did the development of the telescope change the way scientists looked at the sky?
4. Why did people think the nebula was a comet?
5. What is the latest information scientists have learned about the Crab Nebula?

SKILL FOCUS: Using Evidence

INSTRUCT: Have students reread the article closely to find and highlight or underline the different evidence astronomers used to support their reasoning about what they were seeing in the sky. Students should record evidence in the corresponding *Using Evidence* graphic organizer.
ASSESS: Have students work with a partner to compare their responses and discuss how and why astronomers' understanding of the Crab Nebula has changed over time.

EXTEND

Language Arts Tell students to imagine they are one of the astronomers in the article. Have them write a journal entry describing what they see in the sky. Remind them to include thoughts, feelings, and reactions in their entries. Have students refer to the article to help them write.

Using Evidence

Read the article and record the evidence different astronomers used to draw conclusions about the Crab Nebula. A sample chart entry is shown.

Page	Evidence	What it Shows
6	The Chinese astronomers noticed that the guest star wasn't moving.	The star was not a comet.

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What Is a Black Hole?

pp. 14-17, Expository Nonfiction

Have students compare information in text and illustrations to help them understand concepts related to black holes in space.

OBJECTIVES

- Students will read and analyze a nonfiction science article about black holes.
- Students will integrate information from different sources.
- Students will write narratives to develop imagined experiences.

KEY VOCABULARY

- ***galaxy* (p. 14)** any one of the very large groups of stars that make up the universe
- ***singularity* (p. 14)** the point at the center of a black hole, where all its mass is located
- ***gravity* (p. 15)** the natural force that tends to cause physical things to move towards each other
- ***event horizon* (p. 16)** the edge or boundary around a black hole

ENGAGE

Conversation Question: How does science solve mysteries?

Ask students what they know about black holes. Then explain that a black hole is an area in space where the gravity is so strong, almost nothing can escape from it. Give student pairs five minutes to write an imaginative story about what happened when they fell into a black hole. Invite students to share their stories. Then explain that this article will give them facts about black holes and what would happen if they entered one.

INTRODUCE VOCABULARY

Assign each student with one of the four words to become an "expert" at explaining this word to a group of four. Each student will look for his or her word in the article and other sources in order to explain the meaning of the word to their group. When reading the article, have students stop at these words and allow the expert to explain what it means in the context of the article.

READ & DISCUSS

Have students read the article with a partner, then facilitate a class discussion with the following prompts:

1. How is a black hole the opposite of a hole?
2. What events occur when a supermassive star becomes a black hole?
3. Describe what would happen if you fell into a black hole.

SKILL FOCUS: Make Comparisons

INSTRUCT: Have students reread the article and study the illustrations on each page. Then have students work in pairs or small groups to highlight or underline the information in the text that is depicted in the illustrations. Ask students to discuss what, exactly, each illustration helps them understand.

ASSESS: Walk around the room as groups share information to see how well students are following directions. Provide guidance as needed.

EXTEND

Language Arts Share with students poems about space by well-known and lesser-known poets. You can find many poems on the internet, even some written by explorers at NASA. Next, have students look at images of planets, stars, and space; choose one image; and write a poem about it. Invite students to share their poems with the class.

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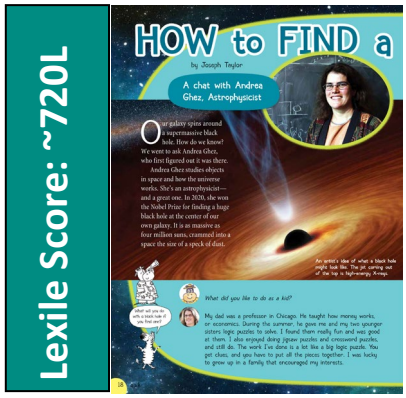
How to Find a Black Hole

pp. 18-21, Interview

Use this interview to help students analyze how well-formed questions provide information about our galaxy.



OBJECTIVES

- Students will read and analyze a nonfiction science article.
- Students will ask questions to obtain information.
- Students will conduct short research projects by writing and conducting interviews.

KEY VOCABULARY

- ***physics*** **(p. 19)** a major branch of science that deals with the study of matter and how it moves through space
- ***technology*** **(p. 19)** a machine, piece of equipment, or method that is created by technology
- ***observe*** **(p. 21)** to see and notice something

ENGAGE

Conversation Question: How is science used to solve mysteries?

Tell students the next article is about an astrophysicist, or a scientist who studies stars, planets, and other objects in outer space. Ask students what skills and qualifications they think someone would need to be an astrophysicist. Create a list using students' suggestions. After reading the article, return to this list and have students add and edit with new information.

INTRODUCE VOCABULARY

Review the vocabulary words and their meanings. Ask students to think about how the words might be related to the concept of black holes. For each vocabulary word, have students write a sentence that uses it. Tell students to work in small groups to share their sentences and ask each other questions to ensure each sentence makes sense.

READ & DISCUSS

After all students have read the article independently, use the questions below to discuss it:

1. What led Andrea Ghez to become an astrophysicist?
2. How did Andrea Ghez's family support her in becoming a scientist?
3. What did Andrea Ghez learn from using the telescope at UCLA?
4. Identify at least two things Andrea Ghez has learned about stars from her research.

SKILL FOCUS: Asking Questions

INSTRUCT: Explain how interviews are used during research to gain information about a topic. Review the questions asked in this interview and point out how the questions are asked in a way that encourages explanation, rather than "yes" or "no" answers. Ask students what other open-ended questions they would ask Andrea Ghez.
ASSESS: Review the questions students share to find out if they understand the kinds of questions that cause more informative responses.

EXTEND

Language Arts/Writing Have students write a five-question interview to learn more about a career of a family friend, parent, or school professional. After conducting their interviews, have students share what they learned and assess which questions gave them the most information.