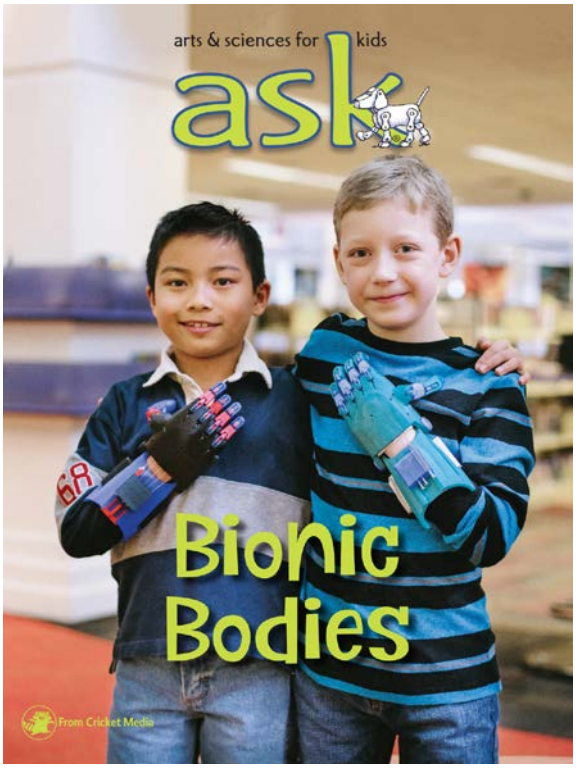
Ask® Teacher Guide: September 2018

Bionic Bodies

This issue of ASK explores how amazing advancements in technology are helping scientists to produce optimally functioning prosthetic devices. Readers are treated to heart-warming stories, as well as technical information, that emphasize strides in medical engineering and strength of the human spirit.



CONVERSATION QUESTION

How are advancements in science helping to create more effective prosthetic devices?

TEACHING OBJECTIVES

- **Students will learn about the experiences of a young woman who uses a prosthetic leg.**
- **Students will learn about the scientific progress being made in the development of prosthetic devices.**
- **Students will learn how teams of scientists are working collectively to create artificial skin.**
- **Students will identify problems and solutions.**
- **Students will determine structure and function.**
- **Students will use deductive reasoning to draw conclusions.**
- **Students will develop and conduct an interview.**
- **Students will create graphic features and corresponding text.**
- **Students will create a historical timeline illustrating the advancements in prosthetic devices.**

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

SELECTIONS

- **Claire's Other Leg**
Nonfiction with Interview, ~550L
- **Building Bionic Bodies**
Nonfiction with Graphic Text, ~650L
- **Helping Robot Hands Say "Ow!"**
Expository Nonfiction, ~650L

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Claire's Other Leg

pp. 7–11, Nonfiction with Interview

This article explores the life of Claire Williams, a young woman who is living a full life with the aid of a prosthetic leg. Students will learn how she effortlessly navigates everyday existence in addition to successfully pursuing challenging activities.

Lexile Score: ~550

RESOURCES

- New and Improved!

OBJECTIVES

- Students will learn about the experiences of a young woman who lives her life with the aid of a prosthetic leg.
- Students will identify problems and solutions.
- Students will develop and conduct an interview.

KEY VOCABULARY

- ***dismantle* (p. 8)** break down a machine or structure to its pieces
- ***prosthetic* (p. 6)** a manufactured replacement body part
- ***spectrum* (p. 11)** a range of things

ENGAGE

Conversation Question: How are advancements in science helping to create more effective prosthetic devices?

Create a K-W-L (know, want to know, learned) chart on the board titled "Prosthetics," and record student responses. Introduce the title of the article, "Claire's Other Leg." Upon finishing the reading and the provided activity, refer back to the chart and amend the last column.

INTRODUCE VOCABULARY

Have students locate the key words in the text and infer specific meanings for the words. Share and review ideas and produce an accurate definition for the class to record. At the conclusion of the lesson, challenge students to summarize the article using these words.

READ & DISCUSS

Reinforce comprehension of the concepts and events in this article by using the following prompts to direct discussion.

- How did Claire's prosthetic leg need to change as she grew older?
- How has computer technology been incorporated into Claire's prosthetic limb?
- Explain how Claire is able to remain active despite having a missing limb.
- Why doesn't Claire want to be referred to as an inspiration?

CONCEPT/SKILL FOCUS: Problems and Solutions

INSTRUCT: Instruct students to reread the article with a partner and highlight passages that depict solutions to problems that arise in Claire's life. Distribute copies of the *New and Improved* graphic organizer and tell students that they will be responsible for recording the problem/solution relationships in the article. Encourage pairs of students to discuss their findings as they complete the chart.

ASSESS: Review the information that the students listed on their charts. Evaluate the thoroughness and accuracy of their statements. If errors are noted, direct students to return to the text to make corrections.

EXTEND

Language Arts: Have students reread the interview portion of this article, studying the nature of the questions. Assign students the task of creating interview questions that they can pose to a differently abled person (grandparent with hearing aid, peer with leg braces, etc.). Have the students peer-check each other's questions for form and appropriateness. Give the class the opportunity to conduct and share completed interviews.

New and Improved!

Use the information from the article to identify problems and solutions.

Problem/Challenge	Solution
Claire was born with a left leg only half the length of her right leg.	Claire needs the aid of a prosthetic leg to help her walk.
Claire began outgrowing her prosthetic leg.	
	Claire's new leg would be made out of titanium—a stronger, lighter material.

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Building Bionic Bodies

pp. 14–17, Nonfiction with Graphic Text Features

Readers will go on a journey through the human body and explore a variety of options available to replace missing limbs and improve the functioning of faulty systems. This interesting text is supplemented by graphic features ensuring all students will be engaged in learning more about modern prosthetics.

Lexile Score: ~650

RESOURCES

- Bionic Bodies

OBJECTIVES

- Students will learn about the scientific progress being made in the development of prosthetic devices.
- Students will determine structure and function.
- Students will create graphic features and corresponding text.

KEY VOCABULARY

- ***flex* (p. 15)** the action of bending
- ***grasp* (p. 15)** to hold firmly
- ***implant* (p. 17)** any material inserted into the body
- ***modified* (p. 19)** made changes to something so as to improve it
- ***scaffolds* (p. 19)** temporary structures for holding materials during the assembling process

ENGAGE

Conversation Question: How are advancements in science helping to create more effective prosthetic devices?

Motivate interest in the topic by having students experience the lessening/loss of an ability; cover one eye, place socks over hands, etc. Create a list on the board noting the physical limitations and frustrations, as well as the psychological impacts.

INTRODUCE VOCABULARY

List the key vocabulary terms on the board and have students use resources to define them accurately. Instruct the class to include the part of speech with the definition and use each word in a sentence.

READ & DISCUSS

Divide the class into three groups. Assign each group one of the questions below. Advise them to use information from the article, as well as their own thoughts, to develop complete answers. Allow each group to share their reflections.

- Describe some of the ancient replacements that were used as prosthetics.
- How has technology been able to constantly improve prosthetic devices?
- Why will 3D printers become an essential component in creating more capable prosthetic limbs?

CONCEPT/SKILL FOCUS: Structure and Function

INSTRUCT: Review how each different prosthetic device mentioned in the article is designed to function optimally. Present the graphic organizer, *Bionic Bodies*, and tell the class that they will be using information from the article to record these important functions.

ASSESS: Circulate and have mini-conversations with the students as they are working on their organizers. Collect their completed worksheets to further assess understanding.

EXTEND

Language Arts Instruct students to revisit page 17 of the article and take note of the drawings and captions. Students can work in small groups to create posters depicting what they have learned. Their projects must include drawings, as well as text/captions. Encourage the class to research other prosthetic devices not mentioned in this article to add to their poster.

Bionic Bodies

Use information from the article to describe the function of each prosthetic structure listed.

Structure	Function
Hands 3D Printed Hook	
Legs Motor Jaipur Running Blade	
Eyes/Ears Hearing Aid Cochlear Implant Prosthetic Eye	
Dentures	
Insulin Pump	
Pacemaker	
Joints	

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Helping Robot Hands Say "Ow!"

pp. 25–27, Expository Nonfiction

Modern prosthetic limbs can lift and grab, but have not been able to experience a true sense of touch. Delve into this article to learn how scientists and engineers are working together to develop artificial skin that would be beneficial to humans, as well as to robotic creations.

Lexile Score: ~650

RESOURCES

- Our Sensational Senses

OBJECTIVES

- Students will learn how teams of scientists are working collectively to create artificial skin.
- Students will use deductive reasoning to draw conclusions.
- Students will create a historical timeline illustrating the advancements in prosthetic devices.

KEY VOCABULARY

- ***detecting* (p. 25)** discovering or identifying the presence of
- ***sensors* (p. 25)** devices that respond to physical stimulus
- ***startle* (p. 27)** to cause a feeling of sudden shock or alarm

ENGAGE

Conversation Question: How are advancements in science helping to create more effective prosthetic devices?

Can experiencing pain ever be a GOOD thing? Brainstorm with the class to generate a list of the students' thoughts on this subject. Distribute the article for reading and instruct students to highlight any sentences that relate to the question.

INTRODUCE VOCABULARY

Post the key words and definitions on the board and have the students copy them into their science notebooks. Advise them that they will be selecting an additional seven words from the article to define. They will use all ten words to create a word search puzzle for their classmates to solve.

READ & DISCUSS

Pose the following questions that are relevant to the article's main idea. Facilitate meaningful dialog.

- What is the function of skin?
- Why are engineers trying to build artificial skin that will give prosthetics a true sense of touch? How will this also benefit robots?
- How are scientists using a variety of strategies to create skin that can sense heat, pressure, and texture?

CONCEPT/SKILL FOCUS: Deductive Reasoning

INSTRUCT: Review the reasons why our senses are so important to experiencing life, in addition to keeping us safe. Have students complete the graphic organizer, *Our Sensational Senses*, using information from the text and personal observation. Encourage students to share their work aloud, and amend their charts if necessary.

ASSESS: Collect the completed graphic organizers and use them to evaluate individual levels of understanding of the concepts presented. Remediate if necessary.

EXTEND

Social Studies Throughout history, people have designed devices to assist them when faced with physical impairments and challenges. Utilizing the materials and knowledge available at the time, many helpful devices were created. Assign small groups any specific time period and have students create a detailed timeline chronologically depicting prosthetic advancements.

Our Sensational Senses

Using information from the text, as well as personal observations, complete the chart below.

Experience	Senses	Explanation/Details
Taking a shower		
Playing a sport		
Making a cake		
Doing a puzzle		
Walking a dog		
Reading a book		

List activities that use ALL of your senses:

_____

_____

Can you think of any activities that use NONE of your senses?

_____