



LET'S INVENT

Explore how ancient and modern inventions have changed the world. Learn about the invention process, how paper revolutionized ancient China and medieval Europe, and how synthetic rubber came to be.

CONVERSATION QUESTION

How do inventors impact our everyday lives?

TEACHING OBJECTIVES

- Students will learn how invention spurs social change.
- Students will explain probable causes and effects of events and developments.
- Students will learn about ancient Chinese history.
- Students will classify a series of historical developments as examples of historical change and/or continuity.
- Students will generate questions about individuals who have shaped significant historical changes.
- Students will use details from a text to write a realistic fiction narrative.
- Students will conduct research and create a multimedia presentation.
- Students will write a biography.



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

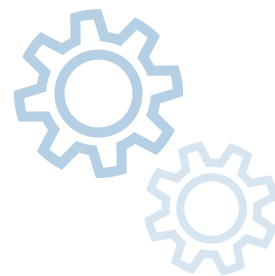
SELECTIONS

- **What Is Invention?**
Expository Nonfiction, ~850L
- **Paper Power**
Expository Nonfiction, ~1050L
- **A Closer Look**
Expository Nonfiction, ~1150L

I CAN INVENT

What are inventions and how can kids invent things that matter?

Inventions are all around us. They solve problems and make our lives easier. **Use this month's magazine to help students learn about the invention process and meet some young inventors through reading about them and their work.** Then, they can try inventing on their own and/or in groups, at school or at home.



Dear Educator,

Your students are invited to use this month's magazine to spark discussion about invention and then share their own invention ideas in the Dr. InBae Yoon Spark!Lab Invention Challenge, an international contest for young inventors sponsored by the Smithsonian and Cricket Media. Students can enter as individuals or teams by submitting a PowerPoint presentation or video outlining their idea. (Your whole class can even participate as a single team!)

For 2019, the Challenge is asking students to create entries that enhance the lives of older adults, and we are accepting entries from January 17, 2019–April 5, 2019. Winners can receive prizes, a trip to Washington, DC, to meet other inventors, and an educational session on how to patent their invention!

Learn all about [this year's challenge on the website](#), and use this special edition teacher guide to discover how to integrate the magazine into your classroom discussions with Challenge participation!

Happy Inventing!

The Cricket Media Education Team



UNIT OVERVIEW

Essential Question:

What are inventions and how can kids invent things that matter?

Supporting Questions:

- How do inventors get their ideas?
- What are some common inventions and what problems do they solve?
- How do inventors impact our everyday lives and make our world a better place?
- What makes an invention successful?
- What special needs might older people have?
- How might I come up with an invention that helps older people stay independent and be mentally, socially and physically active?

Objectives:

Students will know and be able to:

- describe the steps in the invention process
- engage in the invention process
- participate in a global invention challenge
- explain how inventors use the invention process
- explain the impact of inventions on human society over time
- explore the invention process through articles and by designing and/or inventing an invention
- communicate design ideas using words, drawings and/or models

Resources:

- February 2019 Invention edition of magazine
- Teacher Resources for leading students in Spark!Lab Invent It Challenge submission: <https://inventitchallenge2019.epals.com/educator-resources/>
- Student Resources for Spark!Lab Invent It Challenge participation: <https://inventitchallenge2019.epals.com/student-resources/>

Next Generation Science Standards:

- Engineers improve existing technologies or develop new ones to increase their benefits, decrease known risks, and meet societal demands. (3-5-ETS1-2)
- Possible solutions to a problem are limited by available materials and resources (constraints). The success of a designed solution is determined by considering the desired features of a solution (criteria).
- Different proposals for solutions can be compared on the basis of how well each one meets the specified criteria for success or how well each takes the constraints into account. (3-5-ETS1-1)

See additional standards at the end of the discussion guide.

Vocabulary

- **invent:** the process of coming up with new ideas or designs to solve problems
- **invention:** a new device or process that's designed to solve a problem
- **inventor:** a person who dreams up, designs, and builds new things that make our lives better
- **invention process:** a series of steps that inventors might follow to come up with a solution to a problem
- **patent:** a legal right given to an inventor by the government that allows the inventor to prevent others from making, selling, or using their invention for a period of time
- **prototype:** a model or practice version of a design that can be tested and checked before an actual version is created
- **senior:** an elderly or aging person, usually retired (also called "senior citizen")
- **sketch:** a drawing (Inventors use sketches to show and explain their ideas and inventions. Sketches are needed to apply for a patent.)
- **user:** a person who will use an invention

Use the following activities to give students opportunities to explore ideas about the topic by participating in both small and large group peer discussions, using the articles they have read and their discussions to support their statements and opinions.

SPARKING COMPREHENSION AND CONVERSATION

Introduce the Magazine and the Invent It Challenge

1. **Engage: Introduce Inventors.** Start by sharing pictures of the inventors in the articles. What do these kids and adults have in common? They have invented things that make life better.

In this magazine, we're going to learn about inventors and their inventions. And, if the class is interested, we can try inventing ourselves and participate in the Spark!Lab Invent It Challenge. Winners can receive prizes, a trip to Washington, DC, to meet other inventors, and learn how to patent and sell their inventions!




2. **Present the Essential Question: *What are inventions and how can kids invent things that matter?*** Ask students to list inventions they have seen or heard about. Who came up with each invention? How did the person or team come up with the idea? What might have been the process? Post the Essential Question and read it aloud, connecting it to the inventions students mentioned. Remind students that this question does not have one right answer and that they should revisit it with each selection they read.


- Activate Prior Knowledge.** As a class, start a 3-column *What, How, Why* Chart. Make the chart on paper or a place on a board where you can keep it throughout the discussion. Ask students to fill in an invention they already know about. Have students continue to complete the class chart as they read selections from the magazine, listing inventions they learn about, who came up with them and how they did it, and finally why the invention is important.

What? What is the invention?	How? Who came up with the invention? How did they come up with it?	Why? Why is the invention important?


- Build Background:** Teach the Invention Process. Tell students that there are key steps that inventors often use. Read each step aloud as you write it on the board and share with them the [step-by-step videos found here](#), which contains an explanation of each step.


Invention is a process, from creative ideas all the way to successful marketing. Inventors will usually pass through each of the following steps (though not always in the same order!):

 Think It - Identify a problem or need


 Explore It - Conduct Research

 Sketch It - Make sketches

 Create It - Build prototypes

 Try It - Test the invention

 Tweak It - Refine the invention

 Sell It - Market the invention Ask students to think about why each step is important. Tell them to think about these steps as they read and discuss the articles. How is the invention process used by inventors in the articles?

- Get Students Thinking About The Challenge.** This year's challenge is about helping older people. Sometimes as we get older, it's harder to do things, such as get up out of a chair, fasten a seat belt, or open a jar. Show the [Learn About the Challenge Video](#). Ask students if they have a grandparent or older person in their lives. Can they think of inventions that make these older people's lives easier?

Use a Read-Aloud to Spark More Discussion

- Preview the Read-Aloud.** Introduce and project the Read-Aloud article, "[Helping Seniors Communicate.](#)" Tell students this invention was created for the Spark!Lab Invention Challenge.

- Remind students that they will be discussing this and other articles with each other. Encourage students to jot down details or questions to share with each other.
- Encourage students to listen for details that build understanding around the Essential Question, as well as the invention process, and any information they might add to the class *What, How, Why* Chart.



Helping Seniors Communicate

Matias Osuna, 17, knows that talking is an important part of our lives. "Our personality is what we say and how we say it," he says. "Communication is what makes us us."

He thought about communication when his school's FIRST Lego League team was entering an inventing contest. The challenge was to solve a problem seniors face as they age, or get older. Seniors is the team for people age 65 and up.

That was 2012. Matias was 11 and new to the team. He was eager to learn from the other students. And he was excited to invent something helpful!

Think It - FIND A PROBLEM
Matias's team of 7 kids set out to learn about aging. They visited a senior care home near their school. They learned that a common problem is "dementia." People with dementia can have trouble remembering things. They can forget how to do simple tasks. They might even have trouble putting words together in a sentence. That makes it hard for them to say what they need. And it makes it hard for caregivers to help them.

In Colombia, where Matias lives, and around the world, dementia is a serious problem that affects a lot of people. Matias's team wanted to invent something to help people with dementia and their caregivers.

Explore It - STUDY THE OPTIONS
Matias and his team knew some computer programming. They wondered if they could make a communication app. They learned about an emergency communication system that asks people questions. In that app, the people select an answer from a set of options. The team liked this model. The team also learned that many people in Colombia have tablets. Tablets are easy for seniors to hold and tap. An app for a tablet could be a good solution!

Sketch It - DRAW A PICTURE
The team imagined an app with simple icons. The icons would stand for basic needs. They sketched the icons and the screens the seniors would see. They drew icons for food, bathroom, drawing, and health needs. There was also an emergency "panic button" and an icon for basic words, such as "Hello" and "Goodbye."

Sketching plans for the team

2. **Introduce the Reading Skill: Prereading.** Before you begin reading, tell students that this article contains headings, pictures, and captions that give clues about the text. Invite students to skim the headings and look at the pictures. Invite students to skim the headings and look at the pictures. Then, ask the following questions:
 - What do you think this article is about?
 - What does it mean to invent?
 - What problem does Matías want to solve?

3. **Introduce Vocabulary.** Introduce two topic-specific words that students will encounter in this article:
 - prototype: a working model
 - patent: a legal right given to an inventor by the government that allows the inventor to prevent others from making, selling, or using their invention for a period of timeBefore providing each definition, have students look for these words in the article itself. Ask students to infer the meanings based on the context. Help students look for context clues in the text and refine their definitions.

4. **Read and Model.** Complete the following activities as you read the selection. Using Headings, use “Think-Alouds” to model how the headings help you navigate the text. For example, after the introductory paragraph, point out the first heading and link it to the first step in the diagram of the Invention Process. Then present this Think- Aloud:

The heading of this next section is Think It: Describing the Problem. This is the first step in the Invention Process. This helps me know as a reader where I am in the invention process and what happens during the first step. After I read this section, I’ll see if I can describe the first step in the invention process.

5. **Discuss.** After you read, show students a list of the key steps in the Invention Process. Then discuss each step in the context of Matías’ process.
 - a. Think It: What problem was Matías and his team trying to solve? (They wanted to find a way to help older people communicate with their caregivers.)
 - b. Create It: How did Matías’ team create his invention? (They used a computer program called Flash to create the application.)
 - c. Try It: What did Matías’ team learn from the first round of tests? (The buttons were too small and not all needs could be communicated.)
 - d. Tweak It: How did Matías improve the invention? How could you improve on it? (He made the icons bigger, added more options, and changed the basic words to basic questions.)

Explore and Discuss the Articles

1. **Preview the Selections.** Tell students it’s now time to read about the process of invention on their own! Direct them to flip through the magazine and preview the articles in this unit. Encourage them to skim each article as they think about which one interests them the most. Explain that while they are encouraged to read all the articles in this magazine, they will be choosing one “focus article” to read closely and discuss with their peers.

2. **Select a Focus Article.** After students have had time to preview the articles, tell them to pick one that they’d like to spend more time on and discuss with their classmates. Have them read a few paragraphs to see if they have any trouble reading it but encourage them to “stretch” their reading skills a little if they like the story.

3. **Read and Take Notes.** Suggest that students track the invention process steps used by the inventor(s) in their focus article. Also remind them to jot down questions they'd like to share with their classmates. When they are finished, encourage students to think about an invention they would like to work on. If they aren't sure, encourage them to read additional articles in the magazine to continue to build their knowledge about inventions and the invention process.
4. **Discuss the Articles.** Have students form small groups based on the article they read. Provide them with the following questions to use as discussion prompts. Tell them that they will be sharing what they learned with the rest of the class, and suggest that one or more students record the answers they come up with. Also, encourage them to add the invention they read about to the class *What, How, Why* Chart.

Discussion Prompts

- What problem does each inventor try to solve?
- What solutions does the inventor consider or try?
- How well did the first design or prototype work?
- How did the inventor improve the invention over time?
- Which steps in the invention process did the inventor follow?
- Who is likely to use the invention and how might it help them?

Reflect and Discuss

1. **Share Ideas.** Bring the small groups together for a whole-class discussion. Ask students to share what they learned from their individual articles with the rest of the class. Move from group to group, asking volunteers to share the summary of the article, and then important ideas from their discussion.
2. **Synthesize.** After small groups have shared their ideas, discuss the following questions as a class. Encourage students to support their answers with details and evidence from the focus article they read.
 - How do inventions help us in our daily lives?
 - What role might invention play in the future?
 - What would life be like without inventions?
3. **Revisit the Essential Question.** Bring the class together to allow students to share what they've learned. Then, return the conversation to the Essential Question: What are inventions and how can kids invent things that matter?

Allow students to share how their understanding around this question has grown based on their reading and discussions.

Participate in The Spark!Lab Invention Challenge!

Now that students have built their background knowledge about inventors and the invention process, lead your students in engaging in the invention process, using the theme of the Challenge (helping aging people) and help them submit their ideas online to the international competition.

See the [Spark!Lab invention website](#) for additional details and resources to support students in creating and submitting their invention ideas.



STANDARDS ALIGNMENT

National Council of Social Studies Standards

- Theme 2: Time, Continuity and Change
- Theme 8: Science, Technology and Society

CCSS Anchor Standards for Reading

Key Ideas and Details

- Read closely to determine what the text says explicitly and to make logical inferences from it; cite specific textual evidence ... to support conclusions drawn from the text.
- Determine central ideas or themes of a text and analyze their development; summarize the key supporting details and ideas.
- Analyze how and why individuals, events, and ideas develop and interact over the course of a text.
- Interpret words and phrases as they are used in a text. Integration of Knowledge and Ideas
- Analyze how two or more texts address similar themes or topics in order to build knowledge or to compare the approaches the authors take.
- Range of Reading and Level of Text Complexity
- Read and comprehend complex literary and informational texts independently and proficiently.

Anchor Standards for Writing

Text Types and Purposes

- Write informative/explanatory texts to examine and convey complex ideas and information clearly and accurately.
- Write narratives to develop real or imagined experiences or events. Production and Distribution of Writing
- Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
- Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach.
- Use technology, including the Internet, to produce and publish writing and to interact and collaborate with others.

Research to Build and Present Knowledge

- Gather relevant information from multiple print and digital sources, assess the credibility and accuracy of each source, and integrate the information while avoiding plagiarism.
- Draw evidence from literary or informational texts to support analysis, reflection, and research.

Range of Writing - Write routinely over extended time frames and shorter time frames for a range of tasks, purposes, and audiences.

Anchor Standards for Speaking and Listening

- **Comprehension and Collaboration** - Prepare for and participate effectively in a range of conversations and collaborations with diverse partners
- **Presentation of Knowledge and Ideas** - Present information, findings, and supporting evidence such that listeners can follow the line of reasoning and the organization, development, and style are appropriate to task, purpose, and audience.

What Is Invention?

pp. 2–3, Expository Nonfiction

Learn how one invention can cause a chain of events that changes the world.



OBJECTIVES

- Students will read and analyze a nonfiction article.
- Students will learn how invention spurs social change.
- Students will explain probable causes and effects of events and developments.
- Students will use details from a text to write a realistic fiction narrative.

KEY VOCABULARY

- **adapt (p. 3)** to change something so it is suitable for a new use
- **persistence (p. 3)** the quality that makes someone want to continue to try to do something even though it is difficult

ENGAGE

Conversation Question: How do inventors impact our everyday lives?

Tell students to imagine they are inventors who have the ability to create something that could change the world. What would they invent? Would they adapt something that already exists or would they invent something new? How would their inventions help others?

INTRODUCE VOCABULARY

Read aloud the vocabulary words and definitions. Then have students make predictions about the topic of the article based on the vocabulary words. If necessary, help students guess the topic by revealing the title of the article. Remind students to look for the vocabulary words as they read the article.

READ & DISCUSS

Have students read the article with a partner. Then use these prompts for discussion:

1. How can existing inventions help lead to new inventions?
2. How can accidental occurrences help lead to new inventions?
3. What qualities do inventors possess?

SKILL FOCUS: Explain Causes and Effects

INSTRUCT: Explain that events in history, including inventions, have both causes and effects. Remind students that the article describes several inventions and the events that led to, or caused, them to be invented. Have students draw a T-chart on paper with the headings: “Problem: Cause” and “Invention: Effect.” Invite one or two volunteers to identify a problem in the article that caused an invention to be created to solve it.

ASSESS: Have students work in pairs to scan the article and record three more problems and the inventions they caused. Have students gather in groups to share their charts. Then bring students together for a class discussion on how adaptation and persistence help inventors invent.

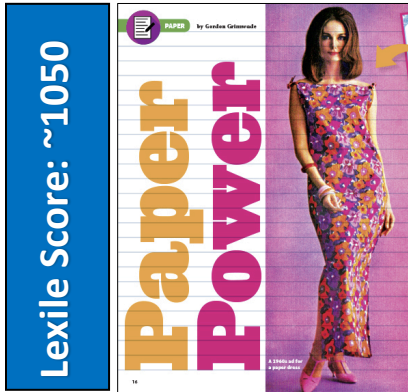
EXTEND

English Language Arts Ask students to write a one-page realistic story about an inventor whose work leads to change in their school, local community, country, or the world (or all of them!). Remind students that realistic fiction stories resemble real life and tell about characters, settings, and events that could actually exist.

Paper Power

pp. 16–19, Expository Nonfiction

Discover how the Chinese invention of paper led to the invention of the printing press, paper money, and even paper clothes and homes!



OBJECTIVES

- Students will read and analyze a nonfiction article.
- Students will learn about ancient Chinese history.
- Students will classify a series of historical developments as examples of historical change and/or continuity.
- Students will conduct research and create a multimedia presentation.

KEY VOCABULARY

- **fiber (p. 17)** a thin thread of natural or artificial material that can be used to make cloth and paper
- **printing press (p. 18)** a machine that prints books, magazines, and newspapers, usually in large numbers
- **manufacturing (p. 18)** the industry or business of making products, especially with machines in factories

ENGAGE

Conversation Question: How do inventors impact our everyday lives?

Ask students to list the different ways paper is used by people. Guide them to understand that some of its uses are as a form of money, as a material for writing upon, and as a way to capture images. Then discuss how the invention of paper probably changed the way people lived.

INTRODUCE VOCABULARY

Review the vocabulary words and definitions. Then have students work in pairs to write a sentence about paper that uses two or more vocabulary words. Invite students to share their sentences. Then remind them to look for the vocabulary words as they read the article.

READ & DISCUSS

Have students read the article with a partner. Then use these prompts for discussion:

1. What problems did the invention of paper in ancient China help to solve?
2. How did the use of paper change medieval European society?
3. How might the world be different if paper was never invented?

SKILL FOCUS: Classify Events

INSTRUCT: Tell students that events and developments in history can be considered examples of change or of continuity. Explain that change occurs when historical events or developments reflect new ways of thinking about or doing things. Then explain that historical continuity occurs when events represent a continuation of a historical trend.

ASSESS: Have students work in pairs to reread the article and identify one example each of historical continuity and change related to the invention of paper.

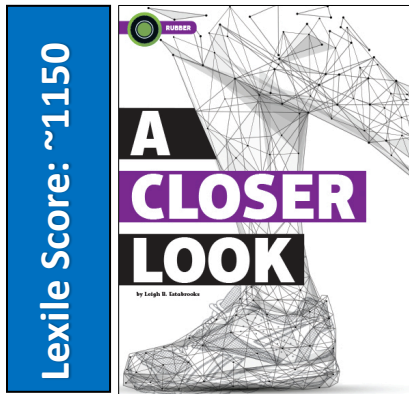
EXTEND

Social Studies Have students use online or library resources to gather information about the invention of paper money and how it changed the way people lived. Then have them create a three-slide multimedia presentation about what they learned and share it with the class.

A Closer Look

pp. 36–38, Expository Nonfiction

Explore how manipulating a substance derived from trees eventually led to the existence of elastic, stretchy, waterproof items such as raincoats and tires.



RESOURCES

- Generating Questions

OBJECTIVES

- Students will read and analyze a nonfiction article.
- Students will generate questions about individuals who have shaped significant historical changes.
- Students will write a biography.

KEY VOCABULARY

- **natural (p. 38)** existing in nature and not made or caused by people
- **synthetic (p. 38)** made by combining different substances; not natural
- **properties (p. 38)** special qualities or characteristics of something

ENGAGE

Conversation Question: How do inventors impact our everyday lives?

Invite students to examine their shoes, clothing, and other belongings to determine if any of them have parts made from rubber (e.g., shoe soles, pencil erasers). Ask students to hypothesize why rubber is an ideal substance for this part of their clothing or belongings. Discuss what these items would be like without the existence of rubber and whether they would even exist.

INTRODUCE VOCABULARY

Read aloud the vocabulary words and definitions. Then display the sentences below. Have students use the vocabulary words to complete the sentences. Then remind students to look for the vocabulary words as they read the article and tell them to check whether their placement of the words *synthetic* and *natural* in these sentences is correct.

- The _____ of _____ rubber make it less sticky than _____ rubber.
- Although _____ rubber was plentiful, its _____ made it less useful than _____ rubber.

READ & DISCUSS

Have students read the article with a partner. Then use these prompts for discussion:

1. Who were Thomas Hancock and Charles Goodyear?
2. How did Hancock and Goodyear change the way people lived?
3. What are some objects used today that were made possible by Hancock's and Goodyear's inventions?

SKILL FOCUS: Generate Questions

INSTRUCT: Explain to students that they will work with a partner to generate research questions about the two main individuals discussed in this article—Thomas Hancock and Charles Goodyear. Continue by explaining that they will use these questions to help them write a biography of one of the men. Remind students that a biography is a factual story of someone's life. Distribute the *Generating Questions* organizer to each student. Point out the 5W words in the first column and help students use them to brainstorm a few questions.

ASSESS: Have partners generate more questions and add them to their organizers. After pairs have recorded at least one question in each section, have them individually choose which man they will write about.

EXTEND

English Language Arts Remind students that they are going to write a biography of Hancock or Goodyear. Have students use books and online sources to find answers to their questions about the man they will write about. Allow time for students to write and revise a two- or three-paragraph biography. Invite volunteers to share their bios with the class.

Generating Questions

Both Thomas Hancock and Charles Goodyear helped to change the way people live by inventing the process of vulcanization. In the article, you learn a little about each man. What else would you like to learn about them? Think of some questions and note them in the chart. Write at least one question for each question word.

	Thomas Hancock	Charles Goodyear
Who?		
What?		
Where?		
When?		
Why?		
How?		