Ask® Teacher Guide: February 2015

KIDS INVENT

Young readers will be captivated by the stories of junior inventors whose determination led them to success despite their many failures. This issue of ASK examines the elements of the invention process and showcases several amazing student creations.

CONVERSATION QUESTION

How are ideas transformed into inventions?

TEACHING OBJECTIVES

- **Students will learn how a brilliant idea can be transformed into a winning invention.**
- **Students will learn how the InvenTeam is attempting to solve the mosquito problem.**
- **Students will learn how the failures of two young inventors eventually led to their successes.**
- **Students will demonstrate the ability to properly sequence and explain a studied process.**
- **Students will identify the structure and function relationship.**
- **Students will obtain information from a nonfiction science text.**
- **Students will generate a list of science competitions that are inclusive of their age group.**
- **Students will develop "How-to" presentations.**
- **Students will rename famous inventors using the literary device of alliteration.**

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

- **My Brilliant Idea**
Expository Nonfiction, ~550L
- **How to Shake Up a Mosquito**
Expository Nonfiction, ~650L
- **Fail Better**
Expository Nonfiction, ~750L

Special Feature Discussion Guide

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 gives 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.

3. **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?

4. **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?

5. **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


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 term for people age 60 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' 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, dressing, 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 icons

1. **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.

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 time

   Before 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.

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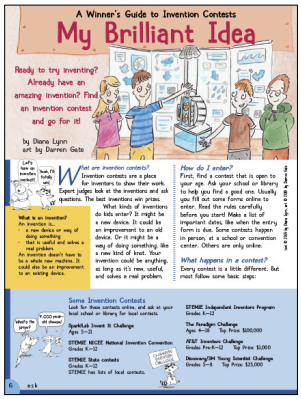
My Brilliant Idea

pp. 7–9, Expository Nonfiction

Students will be excited by this article that educates young creators about the invention process. The step-by-step guide will be sure to lead children into the winner's circle.

Lexile Score: ~550



RESOURCES

- Ready, Set, Invent!

OBJECTIVES

- Students will learn how a brilliant idea can be transformed into a winning invention.
- Students will demonstrate the ability to properly sequence and explain a studied process.
- Students will generate a list of science competitions that are inclusive of their age group.

KEY VOCABULARY

- ***contest* (p. 6)** an event in which people compete
- ***judges* (p. 6)** people who decide the result of a competition
- ***model* (p. 8)** a three-dimensional representation of something
- ***sketch* (p. 7)** a rough or unfinished drawing

ENGAGE

Conversation Question: How are ideas transformed into inventions?

Motivate the students to study the invention process by showing them preselected clips from the TV show, "Shark Tank." Have the class view several segments featuring child inventors. Discuss what character traits all of the young creators seem to possess.

INTRODUCE VOCABULARY

List the vocabulary terms on the board and have students share aloud any meanings or references to the words. Reveal that all of the words have more than one definition and can be nouns or verbs, depending on their usage. Discuss various meanings. Post the given definition next to the words on the board and ask students if that particular definition means that the word will be used as a noun or a verb in the following text. Confirm or redirect their responses if necessary.

READ & DISCUSS

Reinforce comprehension of the material presented in the article by leading a class discussion based on the following questions.

- What is an invention contest?
- According to the article, how can you find a good invention contest to enter?
- Why is presentation a key factor during an invention completion?
- What are some reasons that people become inventors?

CONCEPT/SKILL FOCUS: Sequence and Process

INSTRUCT: Review the information on pages 7 and 8, in addition to the "Think It" text box. Elicit from the students that there is a specific process that most inventors must follow in order to meet with success. Distribute the *Read, Set, Invent!* graphic organizer and instruct the class to refer back to the article and to properly sequence and explain each step. Their finished work will tell the story of the invention process.

ASSESS: Circulate as students are working on the graphic organizer and discuss the information in the article. Direct students having difficulty with the sequencing process to reread the text. Collect the organizer when completed to further evaluate understanding of this skill and to review their answer to the question in the Think Tank.

EXTEND

Science This article provides students with various ways that they can find science contests that are inclusive of their age group. Have students work with a partner to generate a list of such competitions. Allow time for pairs of students to share their findings and compile a master list that can be distributed to all of the classes on their grade level.

Sequencing

Ready, Set, Invent!

Put the steps of the invention process listed below in the correct order on the chart and then write a sentence to explain the purpose of each step.

Research **Launch** **Prototype** **Observe** **Brainstorm** **Test & Tweak**

Steps	Explanation
STEP 1 _____	
STEP 2 _____	
STEP 3 _____	
STEP 4 _____	
STEP 5 _____	
STEP 6 _____	

THINK TANK: Choose any step of the process and imagine that the inventor omits (skips) it. On the back of your paper explain why the invention will most likely be unsuccessful.

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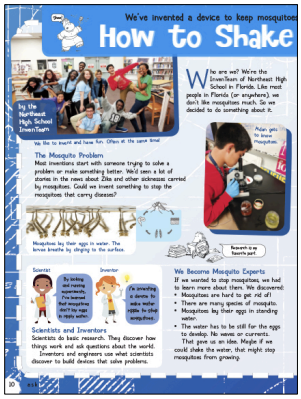
How to Shake Up a Mosquito

pp. 10–13, Expository Nonfiction

Buzz through this article and learn how a young team of inventors are attempting to solve the mosquito problem. Students will examine the steps and strategies that the InvenTeam utilized along their invention journey.

Lexile Score: ~650



RESOURCES

- The Mosquito Bite Blues

OBJECTIVES

- Students will learn how the InvenTeam is attempting to solve the mosquito problem.
- Students will identify the structure-and-function relationship.
- Students will develop "How-to" presentations.

KEY VOCABULARY

- ***current* (p. 10)** a body of water moving in a definite direction
- ***patent* (p. 15)** a government license that grants the sole right to exclude others from making or selling an invention
- ***shaft* (p. 11)** a long, narrow part or section forming a handle

ENGAGE

Conversation Question: How are ideas transformed into inventions?

Lead a discussion that examines the positive and negative aspects of nature. Generate a list on the board (T-chart). Focus on "negatives," and mention bugs/pests if a student didn't already provide that response. Question the class about possible solutions to the negatives.

INTRODUCE VOCABULARY

Review the key terms and definitions with the class. Guide students to notice that each word belongs in a different part of the alphabet. (Beginning: A–I, Middle: J–R, End: S–Z) Have them write these headings at the top of their paper and put each word in the correct category. As a post-reading activity, have students add other words from the article to their list in the correct columns.

READ & DISCUSS

Read aloud the following questions prior to reading the text. Advise students to note where in the article those answers are found. Discuss responses to the questions as a post-reading activity.

- What problem was the InvenTeam trying to solve?
- Explain the different solutions that the InvenTeam tested and tweaked.
- How did the InvenTeam acquire money to fund their project?
- What future improvements does the InvenTeam have planned for their Mosquito Shaker?

CONCEPT/SKILL FOCUS: Structure and Function

INSTRUCT: Distribute the graphic organizer, *The Mosquito Bite Blues*, and tell the students that they are going to create a detailed record of the structure and function of the material used to create the Mosquito Shaker studied in the article. Direct them to read the article with a partner and to highlight relevant information before they begin working on their chart.

ASSESS: Examine the information listed on the students' charts. Evaluate the thoroughness and accuracy of their written statements. If errors are noted, guide students to return to the text to make corrections.

EXTEND

Language Arts Review with students that "How to Shake Up a Mosquito" focuses on how high school students in Florida concentrated their efforts to combat a real-world problem: mosquitoes. Assign the students the task of developing a "How-to" presentation that they will share with the class. (Examples: How to draw a dragon, How to build a fort, etc.) Remind them that the goal is that their classmates should be able to follow their steps and attain a certain outcome.

The Mosquito Bite Blues

Refer to the article "How to Shake Up a Mosquito" to study the function of the structures listed below. Be sure your answers focus on the structures as they pertain to the Mosquito Shaker.

Structure (Material)	Function (How was it important to the invention?)
motor	
solar panels	
computer board "Aruduino"	
3D printer	
sensors	
weights magnets springs	

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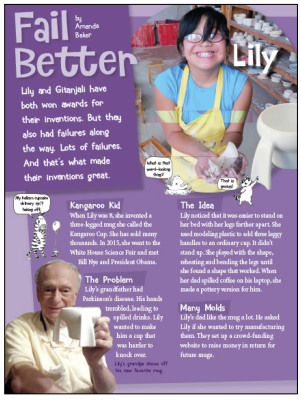
Fail Better

pp. 24–27, Expository Nonfiction

"If at first you don't succeed, try and try again," is the motto of the two young inventors featured in this article. Students will be inspired by the determination of Lily and Gitanjali and learn how failure can ultimately lead to success.

Lexile Score: ~750



RESOURCES

- The Kangaroo Kid and the Water Wizard

OBJECTIVES

- Students will learn how the failures of two young inventors eventually led to their successes.
- Students will obtain information from a nonfiction science text.
- Students will rename famous inventors using the literary device of alliteration.

KEY VOCABULARY

- ***device* (p. 26)** a thing made or adapted for a particular purpose
- ***manufacturing* (p. 24)** the making of products on a large scale using machinery
- ***mentor* (p. 27)** an experienced and trusted advisor or guide

ENGAGE

Conversation Question: How are ideas transformed into inventions?

Ask the class about goals that they have set and how they have achieved (or are trying to achieve) them. As students share their responses, guide them to notice how "practice" is an important element of everyone's success. Introduce the article by informing students that they will be reading about two young inventors whose determination led to amazing achievements.

INTRODUCE VOCABULARY

Post and discuss the key vocabulary words and definitions. Ask the students to reflect on these words as they relate to the theme of this month's issue of ASK (inventions). Challenge the students to write one "super sentence" using all three words.

READ & DISCUSS

Pose the following questions to the class to facilitate meaningful discussion relevant to the article's main idea.

- What motivated Lily to make the very first Kangaroo Cup?
- Why did the design of the cup need to change as her material changed from pottery to plastic?
- How did Gitanjali become the youngest winner of the Discovery 3M Young Scientist Challenge?
- How did Gitanjali overcome her problem of being rejected for testing at big labs?

CONCEPT/SKILL FOCUS: Obtaining Information

INSTRUCT: This article contains detailed information about the invention process of young Lily and Gitanjali. Distribute the graphic organizer, *The Kangaroo Kid and the Water Wizard*, and allow students to work with a partner to collect relevant facts about the inventor/invention. They will record and share their findings.

ASSESS: Be available to help remedial students reread the article and complete their charts. Collect *The Kangaroo Kid and the Water Wizard* from all students when finished to further evaluate understanding.

EXTEND

Language Arts Review the literary device of alliteration (the repetition of sounds/letters in two or more neighboring words or syllables). Mention that the author of this article renames Lily (Kangaroo Kid) and Gitanjali (Water Wizard) based on their inventions. Explain that alliteration gives phrases a lyrical, poetic quality that is pleasing to the ear. Ask students to read through this issue of ASK, as well as other magazines and the internet, and to rename other famous inventors and inventions. Example: Edison's Electrical Event.

The Kangaroo Kid and the Water Wizard

Use information from the article, "Fail Better," to record information about the two young inventors.

Obtain Information	**Lily** (Kangaroo Kid)	**Gitanjali** (Water Wizard)
What did they invent?		
Why did they invent it?		
Obstacles/Failures		
Contests/Successes		
What's Next?		