



SMITHSONIAN



MAKER
LAB
OUTDOORS



TEACHER'S GUIDE

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Reading Is
Fundamental
RIF.org



Note to Educators:

Maker Lab: Outdoors invites students to learn about the natural world by becoming makers. Instructions are provided for "25 Super Cool Projects" that students can create to demonstrate scientific phenomena and conduct research on the world around them. Introducing students to the wonders of science and the natural world through their own projects can provide inspiration for years of further scientific study.

The book's 25 projects are grouped into four categories: Nature Watch (7 projects), World of Weather (5 projects), Water Power (5 projects), and Earth and Sky (8 projects). Each project includes an introduction to the topic, an explanation of the scientific phenomena involved, instructions for completing the project, an evaluation of the time commitment and difficulty level, and a brief discussion of real-world applications.

Within the scope of this book, there should be something to interest every student. The projects presented (typically in four to six pages) provide students with opportunities to explore such diverse STEAM topics as plants, animals, weather, geology, navigation, water, and even ice cream!

Large, colorful pages with plenty of blank space, clear headings, labeled sidebars, and numbered instructions will appeal to students accustomed to reading information on a screen. Instructions for each project include a brief introductory paragraph followed by images of required materials rather than a simple list. Each step is also clearly illustrated with pictures of a student completing the project.

As students read the book, have them keep a list of projects they are especially interested in completing, noting why this is the case and what they hope to discover. You may then choose to follow your students' interest while aligning the projects you choose to complete as a class with grade-level standards. This book is recommended for students in grades 3-7.

Lesson Plan

For additional resources go to RIF's Literacy Central (www.rif.org/DK). There you'll find word lists, puzzles, games, and other resources.

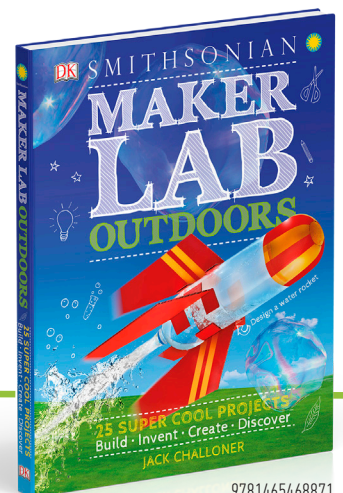
Discussion Questions

Pre-Reading Questions:

What is a makerspace? Can a science lab be a makerspace? Can a science lab be outdoors? What kinds of scientific experiments might you conduct outdoors? Try to think of some examples of activities you might conduct in school, and then name some real-world examples of scientists who work outside.

Reading:

Make the book available for students to read in the classroom. Once all students have had time to examine the book, discuss the post-reading questions below and give students the opportunity to look at the book again to answer them.



Post-Reading Questions:

- 1 Why is it important to conduct scientific research outside? What different types of science concepts and topics are best studied outside? What types of knowledge can we gain outside that we couldn't learn from working in a lab? Find quotes from the book to support your answer. (CCSS.ELA-LITERACY.RI.3.1, CCSS.ELA-LITERACY.RI.4.1, CCSS.ELA-LITERACY.RI.5.1, CCSS.ELA-LITERACY.RST.6-8.1)
- 2 What are some of the challenges faced when studying science outside? How can some of the projects in this book help you to overcome those? Find quotes from the book to support your answer. (CCSS.ELA-LITERACY.RI.3.1, CCSS.ELA-LITERACY.RI.4.1, CCSS.ELA-LITERACY.RI.5.1, CCSS.ELA-LITERACY.RST.6-8.1)
- 3 Find examples from the book about some of the challenges our natural world faces today. How can completing the related projects help you to better understand what is going on in our world? How can you be part of the solution and inspire others to help, too? (CCSS.ELA-LITERACY.RI.3.3, CCSS.ELA-LITERACY.RI.4.3, CCSS.ELA-LITERACY.RI.5.3, NGSS-5-ESS2-1)
- 4 Name some concepts in the book that were new to you. Explain these concepts, using vocabulary words and quotes from the book, and explain why these concepts are important to the natural world and to life on earth. (CCSS.ELA-LITERACY.RI.3.1, CCSS.ELA-LITERACY.RI.3.3, CCSS.ELA-LITERACY.RI.3.4, CCSS.ELA-LITERACY.RI.4.1, CCSS.ELA-LITERACY.RI.4.3, CCSS.ELA-LITERACY.RI.4.4, CCSS.ELA-LITERACY.RI.5.1, CCSS.ELA-LITERACY.RI.5.3, CCSS.ELA-LITERACY.RI.5.4, CCSS.ELA-LITERACY.RST.6-8.1, CCSS.ELA-LITERACY.RST.6-8.4)
- 5 Look at the four parts of this book: Nature Watch, World of Weather, Water Power, and Earth and Sky. Which of the four is most interesting to you? Which one do you think is most important for humans to understand? Answer these questions and discuss how each of these topics affects your daily life. (CCSS.ELA-LITERACY.RI.3.3, CCSS.ELA-LITERACY.RI.4.3, CCSS.ELA-LITERACY.RI.5.3, CCSS.ELA-LITERACY.RST.6-8.5)
- 6 Each project includes a "How It Works" section and a "Real-World Science" section. Why is it important to understand the scientific concepts and the real-world applications of each project? How does learning about the real-world applications help you to understand the goal of each project? (CCSS.ELA-LITERACY.RI.3.5, CCSS.ELA-LITERACY.RI.4.7, CCSS.ELA-LITERACY.RI.5.3, CCSS.ELA-LITERACY.RST.6-8.5)
- 7 The projects in this book contain detailed step-by-step instructions along with clear images of a person completing each step. What do the images add to your understanding of the process? (CCSS.ELA-LITERACY.RI.3.7, CCSS.ELA-LITERACY.RI.4.7, CCSS.ELA-LITERACY.RST.6-8.7)
- 8 When you look at each project, where do your eyes go first for information? Discuss how the design of the book, including different fonts and text sizes, sidebars, headings, use of color, and images, affects how you read the book and what information you identify as important. (CCSS.ELA-LITERACY.RI.3.5, CCSS.ELA-LITERACY.RI.3.7, CCSS.ELA-LITERACY.RI.4.7, CCSS.ELA-LITERACY.RST.6-8.7)
- 9 Which of the projects in this book would you most like to complete? Make a plan for completing this project, including where you will access materials, where and when you will complete the project, whether you will need help, and how you will record and share your results. (CCSS.ELA-LITERACY.RI.3.3, CCSS.ELA-LITERACY.RI.3.6, CCSS.ELA-LITERACY.RI.4.3, CCSS.ELA-LITERACY.RI.5.3, CCSS.ELA-LITERACY.RST.6-8.3)



Cross-Curricular Activities (Review and Assessment):

1 Writing Activity (Essay): Careers in STEAM

Have students look at the table of contents and choose one of the four categories (Nature Watch, World of Weather, Water Power, or Earth and Sky). Ask students to use print and online resources to write an essay based on the category they choose. The essay should include a summary of why scientific study in this category is important for human life, what types of scientists (biologists, geologists, etc.) contribute to this field, and a discussion of a career in this field that students are interested in pursuing.

Note to Educators on NGSS Alignment: *Maker Lab: Outdoors* includes projects in various STEAM categories, some of which will match the NGSS for your grade level better than others. You may choose to direct students to those projects that best match your grade-level NGSS.

(CCSS.ELA-LITERACY.W.3.2, CCSS.ELA-LITERACY.W.3.8)

(CCSS.ELA-LITERACY.W.4.2, CCSS.ELA-LITERACY.W.4.8)

(CCSS.ELA-LITERACY.W.5.2, CCSS.ELA-LITERACY.W.5.8)

(CCSS.ELA-LITERACY.WHST.6-8.2, CCSS.ELA-LITERACY.WHST.6-8.8)

2 Data-Gathering Activity: What's the Weather?

Place a rain gauge and a thermometer in an outdoor location accessible to students. Provide students with a data-collection chart with four columns: day, time, rainfall, and temperature. At around the same time each day, collect this information from your rain gauge and thermometer and have students record it in their charts each day for a week. Compare your results with data on precipitation, temperature, and high and low air pressure collected at a local weather station. Compare both results with averages for your area during the designated time frame. Discuss possible causes for the weather conditions you observed and the impact that the weather conditions you observed had on your local community.

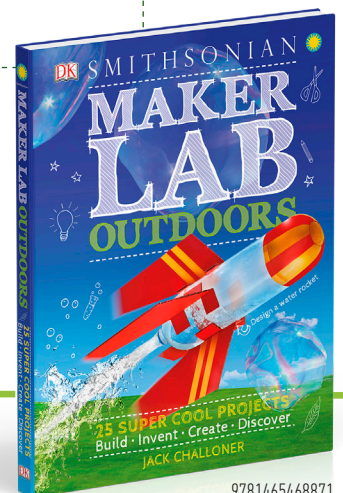
Day	Time	Rainfall	Temperature
Monday			
Tuesday			
Wednesday			
Thursday			
Friday			

CCSS Alignment:

(CCSS.ELA-LITERACY.RI.3.7, CCSS.ELA-LITERACY.RI.4.7,
CCSS.ELA-LITERACY.RI.5.7, CCSS.ELA-LITERACY.RST.6-8.3)

NGSS Alignment:

(3-ESS2-1, 4-ESS2-1, 5-ESS2-1, MS-LS2-1, MS-ESS2-5)



3 Research Activity: The Tools We Use

Many of the projects in this book ask students to make their own version of a tool used for scientific research. Have students choose one of these tools (e.g. periscope, compass, thermometer) and research it using print and online resources. Students should then make 10 note cards with interesting facts about their tool, including how, when, where, why, and by whom it was invented, when it was first used, and how it is still used today or what tool replaced it. Make sure students include a citation for each fact.

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- (CCSS.ELA-LITERACY.W.3.7, CCSS.ELA-LITERACY.W.3.8)
- (CCSS.ELA-LITERACY.W.4.7, CCSS.ELA-LITERACY.W.4.8)
- (CCSS.ELA-LITERACY.W.5.7, CCSS.ELA-LITERACY.W.5.8)
- (CCSS.ELA-LITERACY.WHST.6-8.7, CCSS.ELA-LITERACY.WHST.6-8.8)

4 Multimedia Presentation: Science Show Time!

Have students list 3–5 projects from the book that interest them most. Then assign each student a different project to study. Have the students create slideshow presentations on some element of their project, including what scientific phenomenon the project is designed to demonstrate, real-world applications, effect on human life of this type of science, and 3–5 fun facts. Make sure students include multimedia elements such as images, video clips, and audio clips. (If you have more students than projects listed in the table of contents, allow some students to do the same project, but make sure they focus on different elements.) Have students present their slideshows to the class in a 5-minute oral presentation.

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- (CCSS.ELA-LITERACY.SL.3.4)
- (CCSS.ELA-LITERACY.SL.4.4, CCSS.ELA-LITERACY.SL.4.5)
- (CCSS.ELA-LITERACY.SL.5.4, CCSS.ELA-LITERACY.SL.5.5)
- (CCSS.ELA-LITERACY.SL.6.4, CCSS.ELA-LITERACY.SL.6.5)
- (CCSS.ELA-LITERACY.SL.7.4, CCSS.ELA-LITERACY.SL.7.5)

5 Problem-Solving Scenario (Erosion): Don't Get Washed Away!

Ask students to imagine that a local riverbank is experiencing major erosion. Have students write a plan that includes the causes of the erosion, explains problems caused by the erosion, and suggests solutions to stop or slow the erosion process. Ask students to include a diagram that shows their solution.

CCSS Alignment:

- (CCSS.ELA-LITERACY.W.3.2)
- (CCSS.ELA-LITERACY.W.4.2)
- (CCSS.ELA-LITERACY.W.5.2)
- (CCSS.ELA-LITERACY.WHST.6-8.2)

NGSS Alignment:

- (3-LS4-4, 3-ESS3-1, 4-ESS2-1, 4-ESS3-2, 5-ESS2-1, 3-5-ETS1-1, MS-ESS3-3, MS-ETS1-1, MS-ETS1-2)

