
NATIONAL GEOGRAPHIC LEARNING
CENGAGE
Grades K–5
English and Spanish
NATIONAL GEOGRAPHIC LEARNING
Exploring
Science
Master 100% of the NGSS

NATIONAL GEOGRAPHIC LEARNING

Exploring Science

English and Spanish

"I have watched my students grow in their learning of science and the joy of thinking outside the box. The program is amazing."

—KARINA C., MARYLAND

Built for the Next Generation Science Standards

NEXT GENERATION SCIENCE STANDARDS For States, By States

What are the Next Generation Science Standards (NGSS)?

The NGSS were created by science educators and science organizations to update content knowledge and to incorporate practices of science. The NGSS resulted in several important shifts in the way science is taught:

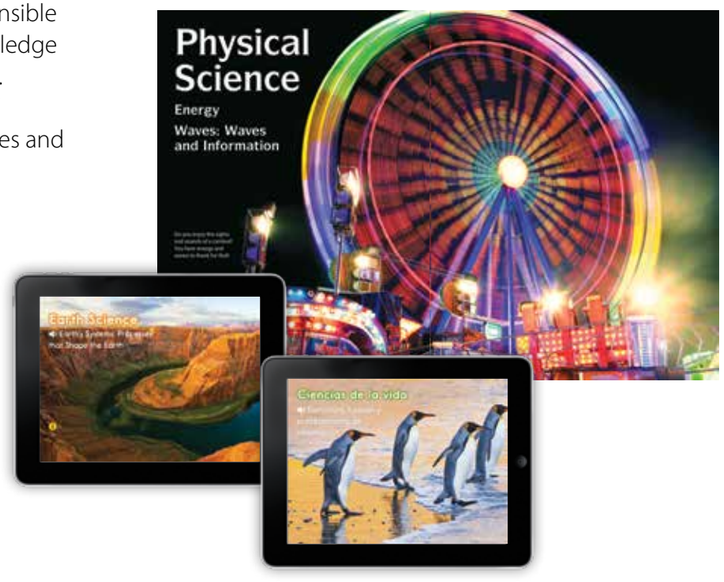
- » Shift towards the doing of science, rather than only the knowledge of science facts
- » Shift to include engineering design at all grade levels
- » Shift towards fewer standards per grade, but each covered at greater depth

How does this change how teachers will teach science?

NGSS instruction incorporates a "3-Dimensional Learning" approach where teachers are responsible for preparing students to apply science knowledge through hands-on Performance Expectations. Teachers now need to integrate core ideas of science with Science and Engineering Practices and Crosscutting Concepts.

How does *Exploring Science* help teachers make these changes?

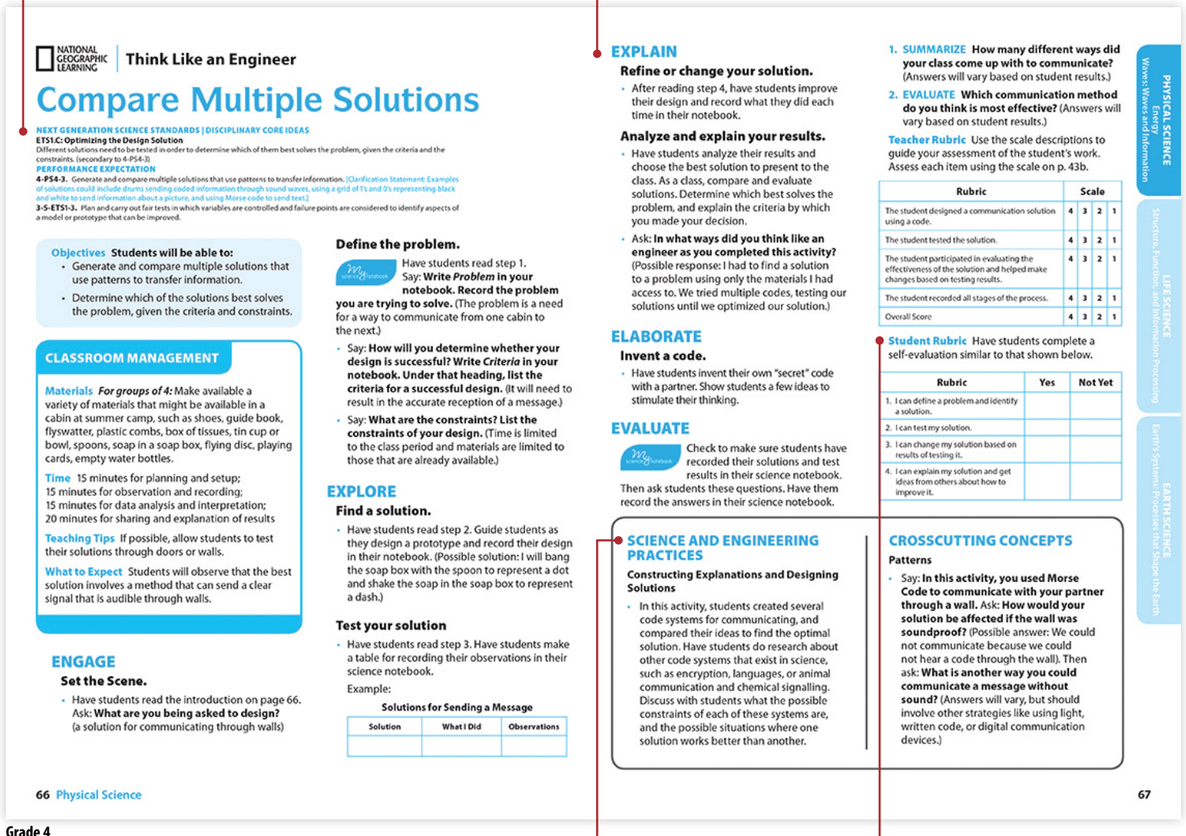
- » Introduce Disciplinary Core Ideas through compelling text and imagery
- » Provide hands-on practice in applying the Disciplinary Core Ideas with Investigate activities
- » Assess the Performance Expectations with hands-on Science and Engineering Practices and the integration of Crosscutting Concepts



Teachers are provided with all of the support needed to implement and assess the NGSS. Help students master the Performance Expectations through a consistent 5E lesson model providing in-depth NGSS instruction and assessment with Engage, Explore, Explain, Elaborate, and Evaluate activities.

NGSS printed on every page

5E model for every lesson



NATIONAL GEOGRAPHIC LEARNING | Think Like an Engineer

Compare Multiple Solutions

NEXT GENERATION SCIENCE STANDARDS | DISCIPLINARY CORE IDEAS

ETS1.C: Optimizing the Design Solution
Different solutions need to be tested in order to determine which of them best solves the problem, given the criteria and the constraints. (secondary to 4-PS4-3)

PERFORMANCE EXPECTATION

4-PS4-3. Generate and compare multiple solutions that use patterns to transfer information. [Clarification Statement: Examples of solutions could include drums sending coded information through sound waves, using a grid of 1's and 0's representing black and white to send information about a picture, and using Morse code to send text.]

3-5-ETS1-3. Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.

Objectives **Students will be able to:**
- Generate and compare multiple solutions that use patterns to transfer information.
- Determine which of the solutions best solves the problem, given the criteria and constraints.

CLASSROOM MANAGEMENT

Materials ***For groups of 4:*** Make available a variety of materials that might be available in a cabin at summer camp, such as shoes, guide book, flyswatter, plastic combs, box of tissues, tin cup or bowl, spoons, soap in a soap box, flying disc, playing cards, empty water bottles.

Time 15 minutes for planning and setup;
15 minutes for observation and recording;
15 minutes for data analysis and interpretation;
20 minutes for sharing and explanation of results

Teaching Tips If possible, allow students to test their solutions through doors or walls.

What to Expect Students will observe that the best solution involves a method that can send a clear signal that is audible through walls.

ENGAGE

Set the Scene.
- Have students read the introduction on page 66. Ask: **What are you being asked to design?** (a solution for communicating through walls)

Define the problem.

My Notebook: Have students read step 1. Say: **Write *Problem* in your notebook. Record the problem you are trying to solve.** (The problem is a need for a way to communicate from one cabin to the next.)
- Say: **How will you determine whether your design is successful? Write *Criteria* in your notebook. Under that heading, list the criteria for a successful design.** (It will need to result in the accurate reception of a message.)
- Say: **What are the constraints? List the constraints of your design.** (Time is limited to the class period and materials are limited to those that are already available.)

EXPLORE

Find a solution.
- Have students read step 2. Guide students as they design a prototype and record their design in their notebook. (Possible solution: I will bang the soap box with the spoon to represent a dot and shake the soap in the soap box to represent a dash.)

Test your solution
- Have students read step 3. Have students make a table for recording their observations in their science notebook.

Example:

Solutions for Sending a Message

Solution	What I Did	Observations

EXPLAIN

Refine or change your solution.
- After reading step 4, have students improve their design and record what they did each time in their notebook.

Analyze and explain your results.
- Have students analyze their results and choose the best solution to present to the class. As a class, compare and evaluate solutions. Determine which best solves the problem, and explain the criteria by which you made your decision.
- Ask: **In what ways did you think like an engineer as you completed this activity?** (Possible response: I had to find a solution to a problem using only the materials I had access to. We tried multiple codes, testing our solutions until we optimized our solution.)

ELABORATE

Invent a code.
- Have students invent their own "secret" code with a partner. Show students a few ideas to stimulate their thinking.

EVALUATE

My Notebook: Check to make sure students have recorded their solutions and test results in their science notebook.

Then ask students these questions. Have them record the answers in their science notebook.

1. **SUMMARIZE** **How many different ways did your class come up with to communicate?** (Answers will vary based on student results.)
2. **EVALUATE** **Which communication method do you think is most effective?** (Answers will vary based on student results.)

Teacher Rubric Use the scale descriptions to guide your assessment of the student's work. Assess each item using the scale on p. 43b.

Rubric	Scale			
The student designed a communication solution using a code.	4	3	2	1
The student tested the solution.	4	3	2	1
The student participated in evaluating the effectiveness of the solution and helped make changes based on testing results.	4	3	2	1
The student recorded all stages of the process.	4	3	2	1
Overall Score	4	3	2	1

Student Rubric Have students complete a self-evaluation similar to that shown below.

Rubric	Yes	Not Yet
1. I can define a problem and identify a solution.		
2. I can test my solution.		
3. I can change my solution based on results of testing it.		
4. I can explain my solution and get ideas from others about how to improve it.		

SCIENCE AND ENGINEERING PRACTICES

Constructing Explanations and Designing Solutions
- In this activity, students created several code systems for communicating, and compared their ideas to find the optimal solution. Have students do research about other code systems that exist in science, such as encryption, languages, or animal communication and chemical signalling. Discuss with students what the possible constraints of each of these systems are, and the possible situations where one solution works better than another.

CROSSCUTTING CONCEPTS

Patterns
- Say: **In this activity, you used Morse Code to communicate with your partner through a wall.** Ask: **How would your solution be affected if the wall was soundproof?** (Possible answer: We could not communicate because we could not hear a code through the wall). Then ask: **What is another way you could communicate a message without sound?** (Answers will vary, but should involve other strategies like using light, written code, or digital communication devices.)

PHYSICAL SCIENCE Energy Waves: Waves and Information

LIFE SCIENCE Structure, Function, and Information Processing

EARTH SCIENCE Earth's Systems: Processes That Shape the Earth

66 Physical Science

67

Grade 4

3-Dimensional Learning integrates all aspects of the NGSS:
- Science and Engineering Practices
- Crosscutting Concepts
- Disciplinary Core Ideas

Assessment opportunities include:
- Teacher and Student rubrics to assess Performance Expectations
- Evaluate sections to asses Disciplinary Core Ideas
- Unit Disciplinary Core Ideas review questions

Hands-on for NGSS and STEM

Exploring Science is designed to prepare students for the rigor of the Performance Expectations in the NGSS allowing teachers to address STEM and the NGSS in one program!

Exploring Science lessons start by introducing Disciplinary Core Ideas, then provides students opportunity to practice applying those ideas through hands-on Investigate activities.

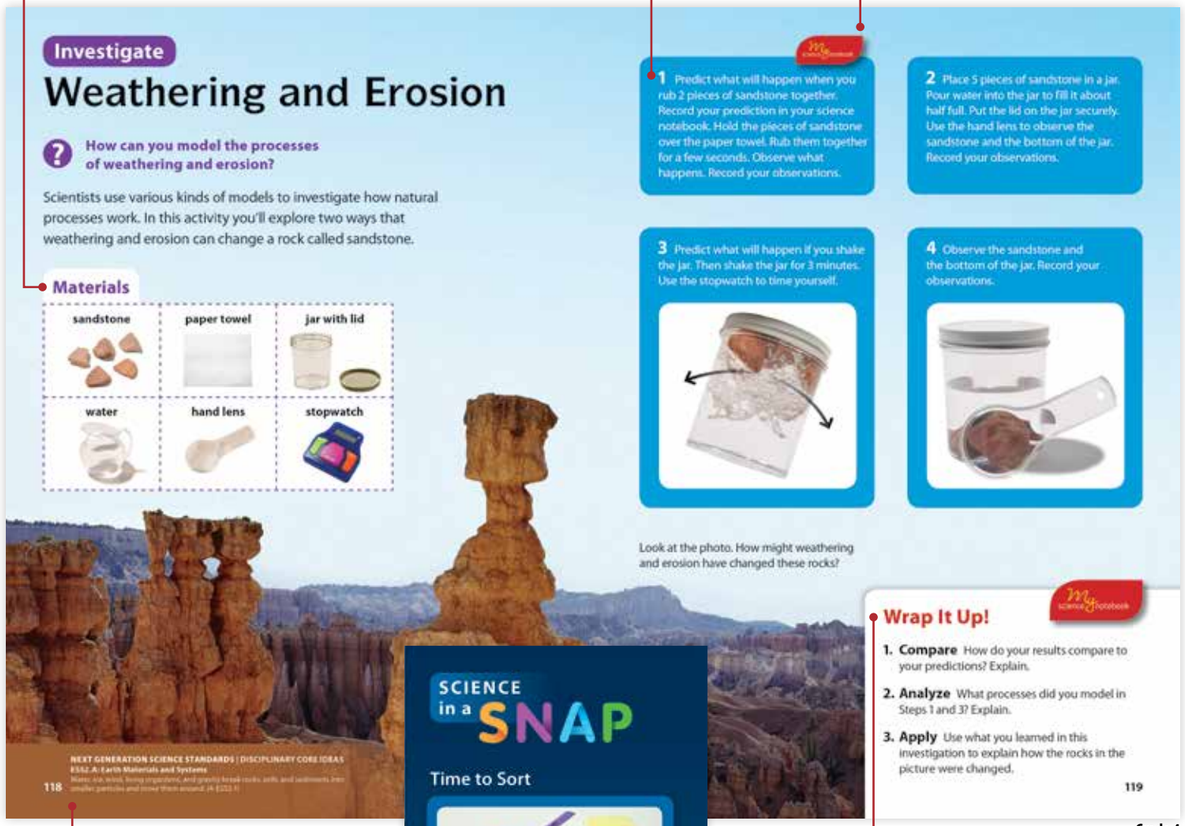
Teachers are provided complete guidance and support for hands-on activities to ensure successful implementation of the NGSS.

Hands-on materials kits are available separately.

Simple materials are easy to obtain and work with

Step by step instructions for students

Students use their own Science Notebooks to record observations and data



NGSS printed on every page

The example shows hands-on practice of the Disciplinary Core Idea

Assessment for every lesson

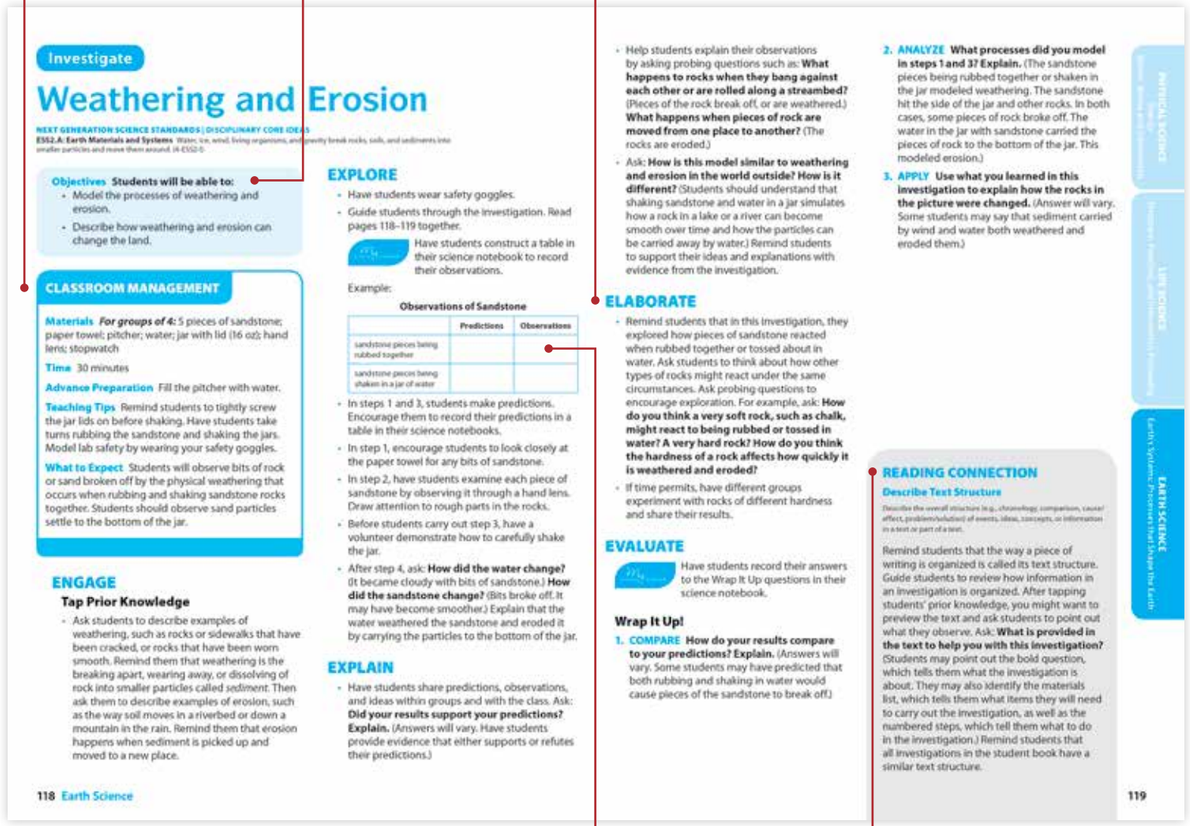
Quick "Science in a Snap" activities engage students and demonstrate Disciplinary Core Idea phenomena

Grade 4

Materials and tips help prepare teachers for hands-on activities

NGSS and lesson objective printed on every page

5E model for every lesson



Data tables provided in Teacher's Guide and as separate Learning Masters for student use

Literacy support for every lesson

"The activities are hands on, engaging, and reach all levels of learners."

—LAURA F., NEW JERSEY

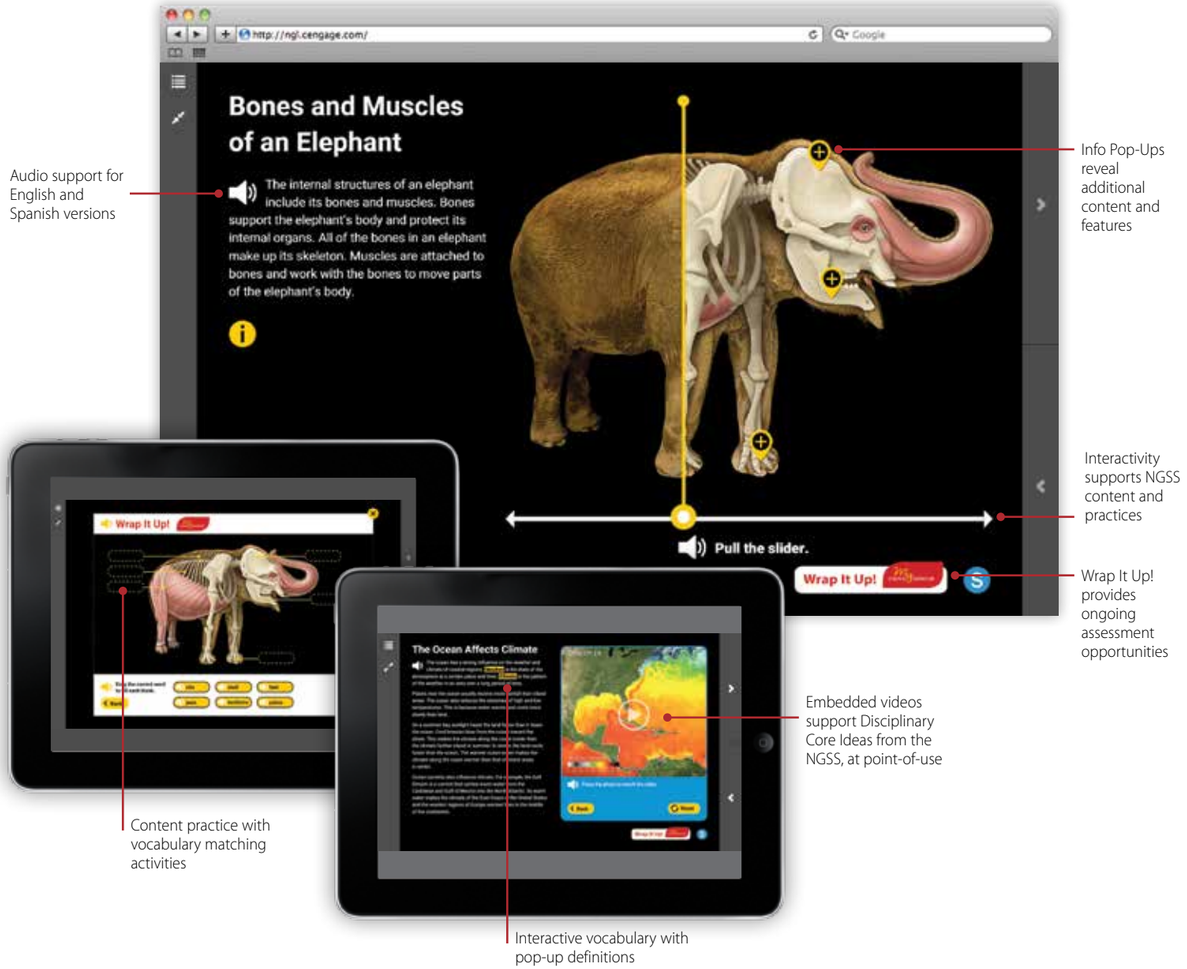
Interactive Technology

English and Spanish

Turn the NGSS into an engaging student experience with the most interactive and powerful digital program available.

Transform student learning with the ***Exploring Science*** Interactive eBook:

- Highly engaging, content-based activities at point-of-use
- Enhanced content with videos, animations, and simulations
- Improve student understanding with interactive content and vocabulary activities



View a sample of the Interactive eBook at: **NGL.Cengage.com/ExploringScienceSample**

Digital Notebook

Exploring Science encourages notebooking for students to record their observations and data, to answer Wrap It Up! lesson questions, to ask their own questions, and to create drawings and writing based on the NGSS.

The digital notebook is another opportunity for students to answer questions and practice the core ideas of the NGSS.

Content Review Activities and Games

Wrap It Up! activities include interactive content review with instant student feedback:

- Matching
- Sequencing / ordering
- Fill in the blank
- Categorizing
- Labeling
- Multiple Choice

Teacher Resources

Learning and Assessment Masters in English and Spanish include:

- Teacher rubrics
- Student rubrics
- Data tables
- Black line masters

ExamView Assessment:

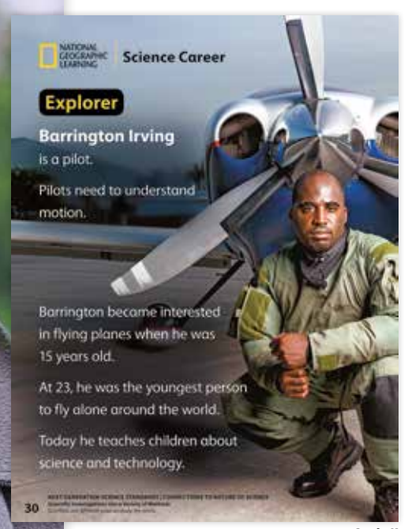
- Create and customize tests based on Disciplinary Core Ideas from the NGSS
- Print or export tests

Online Teacher's Guide

Go into the Field with National Geographic Explorers

Students learn real-world applications of the Disciplinary Core Ideas and practices of the NGSS from National Geographic Explorers and scientists. These diverse individuals model for students how science content and engineering concepts help solve real-world problems.

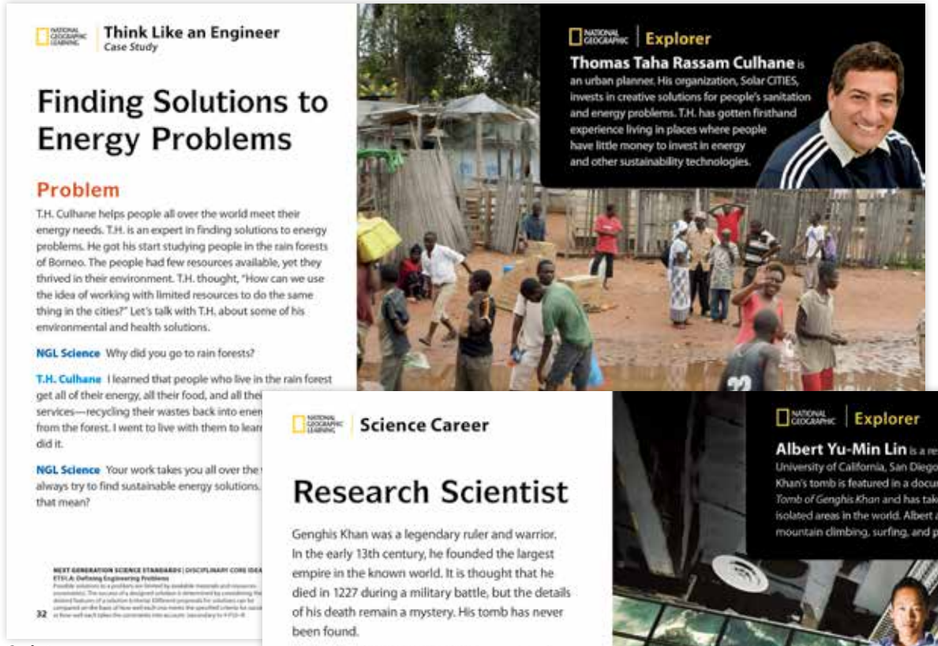
- Inspire students to think and act like real scientists and engineers
- Travel with Explorers to the field through interviews and case study stories
- Learn about exciting careers in science and engineering



Grade K

Grade K

These Explorers are on the cutting edge of their fields, making discoveries and pushing scientific boundaries in order to bring back their inspiring stories to share with students within ***Exploring Science***.



Grade 4

Grade 5

Grade 1

NGSS Content and Literacy Support

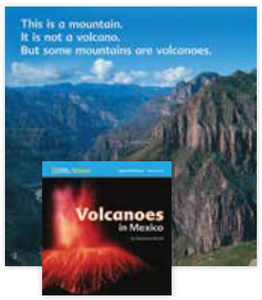
The *Exploring Science through Literacy* program supports *Exploring Science* and the Disciplinary Core Ideas from the NGSS. Multiple reading levels provide core idea content and National Geographic images capture student interest. Online Teacher's Guides support science content and literacy skills in the same lesson.

Grades K–2

Support reading skills development and introduce core ideas in science topics based on the NGSS. All levels available in English and Spanish.

Become an Expert

- Designed for small group reading
- Three reading levels on the same Big Ideas topic
- Groups share and compare what they learn from their title



Explore On Your Own

- Designed for independent reading
- Three reading levels on the same Big Ideas topic
- Further exploration on topics that interest students

Write About Big Books

- Models persuasive writing
- Used as a basis for students to write their own science opinion piece

Grades 3–5

Continue more advanced literacy skills development while engaging with amazing National Geographic images and Explorers who introduce students to real-world science in English and Spanish.

- Designed for whole class or small group reading
- Identical content and images at 3 reading levels per title (Spanish available on-level only)
- Each title contains 3–4 articles written in a variety of genres
- High-interest, student-centered topics

Online Teacher's Guides

Literacy and science content program support.

- Introduce science background and vocabulary
- Combine science content and literacy instruction in one lesson
- Includes ELL support
- Additional writing and research activities increase engagement

Use *Exploring Science through Literacy* to supplement *Exploring Science*

During instruction from *Exploring Science*, use related *Exploring Science through Literacy* titles to extend informational text reading and expand science content knowledge on specific Disciplinary Core Ideas.

Use *Exploring Science* as the basis for Disciplinary Core Idea instruction

Grade 3 Example

LS2.C: Ecosystem Dynamics, Functioning, and Resilience

LS4.D: Biodiversity and Humans

Use *Exploring Science through Literacy* to extend reading on the same topic

Grade 3 Example

Tropical Rain Forest Adventure

"I love science, and I love this book!
I even read it when I'm not supposed to!"

—2ND GRADE STUDENT, MARYLAND

Components

Kindergarten

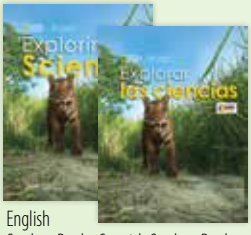
Interactive eBook

Big Books (Life, Earth, and Physical)

Teacher's Guide

Grade 1

Interactive eBook

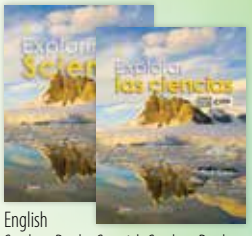


English Student Book
Spanish Student Book

Teacher's Guide

Grade 2

Interactive eBook



English Student Book
Spanish Student Book

Teacher's Guide

Grade 3

Interactive eBook

English Student Book
Spanish Student Book

Teacher's Guide

Grade 4

Interactive eBook

English Student Book
Spanish Student Book

Teacher's Guide

Grade 5

Interactive eBook

English Student Book
Spanish Student Book

Teacher's Guide

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