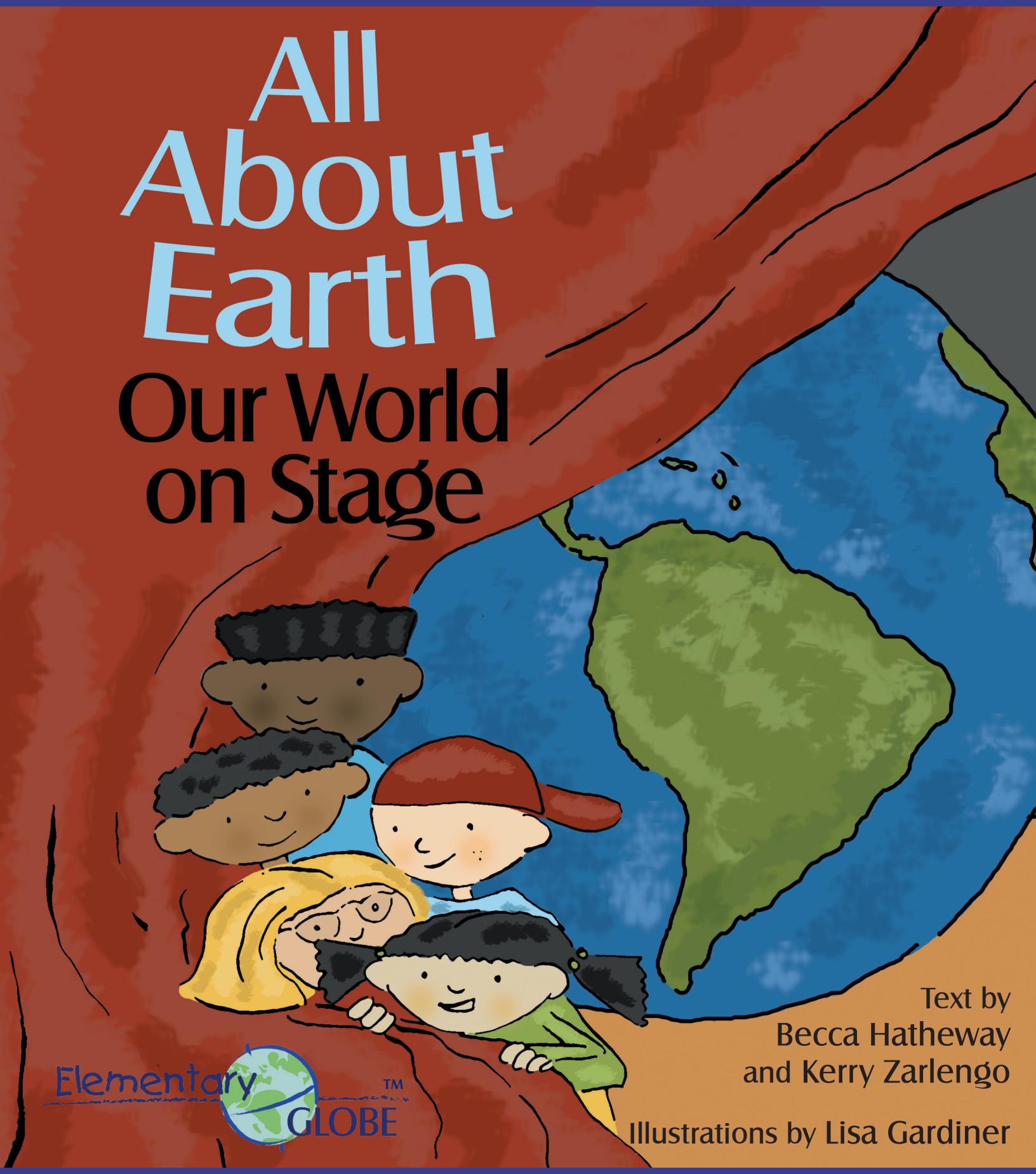
All About Earth

Our World on Stage



Elementary GLOBE™

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All About Earth: Our World on Stage

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As the end of the school year drew near, Ms. Patel's class was practicing a play about the Earth system. They had been learning about the Earth all year long.

The time had finally come for the dress rehearsal for their big play. Ms. Patel was standing in the middle of the room, watching the students try on their costumes, practice their lines, and jump up and down with excitement. Their voices became louder and louder by the minute.

Ms. Patel clapped her hands to get everyone's attention. "I know how excited you all are. You have worked so hard to pull this play together, and it has been so much fun."

She continued, "Up until today you have just been practicing your lines at home, but now you will be able to share them with the rest of the class! Tomorrow you will get to perform this play for the entire school and your families. But we still have a lot of work to do, so let's get started."

Ms. Patel announced, “Please line up so we can go to the auditorium to practice on the stage. Make sure you bring your props, scripts, and all the pieces of your costume with you.”

As the class walked down the hall, Simon commented, “This is so exciting. I have been practicing my lines at home and I am all ready now.”

Anita added, “I have had my lines ready for a long time. Since I have the lead in the play, I wanted to be really prepared.”

Dennis overheard Anita and said, “What are you talking about, Anita? I have many important lines, so I am the lead in the play!”

When the class arrived at the auditorium, the students in the choir went over to the piano with the music teacher. Some of the other children got to work painting scenery. The actors stood on the stage waiting for Ms. Patel. Their mood had changed, and everyone looked upset.

Ms. Patel asked, "What's wrong? You were all so excited back in the classroom."

"Well, we all think we have the lead in the play!" Simon exclaimed. "When I was learning my lines, I thought my part in the play was the most important, but that's what everyone else is saying about their parts, too!"

"Hmm, maybe in order to figure this out we need to hear why each of you think your part is the most important," said Ms. Patel.

"Simon, your role is to represent water," said Ms. Patel. "Please tell us about why water is an important part of the Earth system."

"OK. I am water, and nothing on Earth can live without me," Simon stated, as he walked to the center of the stage. "I fall from the sky as rain and help plants grow. Animals drink me. I help break down materials to make soil. I form clouds and help keep the Earth cool. Besides being rain, I am also snow, hail, and sleet, and I can be found in oceans, lakes, rivers, and other waterways. When I freeze, I become ice."

"Thanks, Simon. That's very good information," said Ms. Patel. "Now let's have someone else talk about their part of the Earth."

Emily stepped in. "I am air. I am what makes wind, so I help move clouds and storms from one place to another so it can rain or snow on Earth. Animals need to breathe me. Some plants use me to scatter their seeds around so they can grow in different places."

"Nice job, Emily. Those are good details about air," said Ms. Patel.

"I'll go next," said Dennis. He walked to the center of the stage. "I am soil. Plants use me as a place to grow. Animals eat the food that grows in me. I also provide homes for critters, and humans use me to build their homes. I am part of mountains and other landforms on Earth."

"Thanks, Dennis," said Ms. Patel. "Those are good facts to consider. Who's next?"

Anita moved to the center of the stage. “Well, I am all living things, plants and animals. Animals either eat plants or other animals. When I die, I become part of the soil. When I am a plant, I help make the air we breathe. I help recycle water around the Earth. See, I am obviously the most important part here!”

"Thanks for sharing that, Anita," said Ms. Patel. "We still need to hear from one more character, the Sun!"

The kids looked puzzled and at the same time asked, "The Sun?"

Simon added, "The Sun isn't even on the Earth!"

Ono stepped in. "I am the Sun and I know I am not on the Earth. But I am still very important. I heat the Earth so that it is warm enough for things to live. I give plants energy so they can grow and become food. I help the water in the oceans become clouds. See how everything is connected?"

Ono added, “Water, air, soil, plants, and animals are all on Earth together. You all need each other! If you think about what everyone has just said, you’ll see you’re all connected. That means no one is the lead in the play!”

Ms. Patel smiled and said, “Very good point, Ono. Each one of you has shown that your part of the Earth system is important. But could any of you exist without the other?”

“No!” they all called out at the same time.

“Wow, Ono, you’re right!” Simon said, “My part of the Earth system depends on all the other parts. But how can we show that in our play?”

"Let me try," said Dennis. "I am soil and I wouldn't exist without everything else. I am made up of plants and animal material and rocks. And water and air help break down those materials to make soil."

"Hey, I have an idea!" exclaimed Anita. "Let's make big arrows that we can move around on the stage. And when we talk about all of these connections, we can put the arrows in between each part of the Earth system to show how everything fits together."

The students used their supplies to make big, bright arrows to use in their play.

"Class, this is wonderful," said Ms. Patel, "You all are working together now, just like all of the parts of the Earth!"

When they had finished making the arrows, Emily said, "Now let's act out how all the parts of the Earth system need each other!"

"Great idea, Emily," said Ms. Patel. "Since you are air, please explain to us how we could use the arrows to show how you are connected to everything else."

"Well, the air keeps storms moving around the Earth. That way it can rain and snow in different places. Animals need to breathe air to live. Plants help make the air that animals breathe. Air helps make soil by breaking down dead plants, animals, and rocks," Emily said as she placed the arrows around the stage. The other kids went to stand in their places.

"What about me?" Ono asked. "Where should the Sun fit in with all these arrows?"

Simon said, "Well, the Sun connects to everything because you provide warmth and energy on Earth, so you need to have special arrows that point toward all the other parts.

"I get it," said Anita. "Now let me make a connection with plants and animals."

"Plants and animals need water to live," Anita continued. "And soil is where plants can grow to become food. Some animals live in the soil, too. Animals need to breathe the air. Air also brings different kinds of weather around the Earth, and animals and plants need rain and snow."

The students used the arrows and moved around the stage to act out these connections. Once again, the Sun was connected to everyone.

"Now I'll share the ways water is connected to all of you," said Simon. "Water has a lot of different forms. As rain, water helps plants grow. In clouds, water blocks sunlight and keeps the Earth cooler. Some animals live on ice."

Anita added, "Some animals also live in water, in rivers, lakes, and oceans. And animals need to drink water to live. Water has many more connections to everything else than I realized!"

"I think we have heard from everyone now," said Ms. Patel. "You have done a wonderful job learning about all of the connections in the Earth system. Are we ready for the play now?"

Dennis said, "Yes, but let's practice one more time. And now we know that everyone has a starring role in this play!"

In the background they heard the chorus singing, "This is how we all connect, all connect, all connect. This is how we all connect, in the Earth system."

Emily exclaimed, "This is going to be great! We are all ready and it sounds like the chorus is ready too!"

On the next night, the seats in the auditorium were filled with family members and other students from the school. Behind the curtain, Ms. Patel's students put on their costumes and gathered their props.

"Places, everyone!" Ms. Patel called out. "It's almost time to start – and remember to have fun!"

The kids in the chorus took their places in the back of the stage. Simon, Anita, Ono, Emily, and Dennis picked up their arrows and moved to the center of the stage.

As the curtain rose, Ms. Patel stood back and thought about the whole school year. She was proud of her students. They had learned about the parts of the Earth system and now they could share this information with others.

The chorus finished singing the Earth Song. Then Dennis spoke the first line of the play, "We are air, water, soil, plants, animals, and the Sun. We all need each other. Together we make up a system called Earth!"

The Earth System Song

Sung to the tune of *London Bridge Is Falling Down*
(Students can add their own verses to reflect the lines from the play. They can also use hand motions while singing.)

Oh, the sun is shining down, shining down, shining down.
Oh, the sun is shining down,
In the Earth system.

Now, the water's going up, going up, going up.
Now, the water's going up,
In the Earth system.

Now, the water's making clouds, making clouds, making clouds.
Now, the water's making clouds,
In the Earth system.

Now, the clouds are making rain, making rain, making rain.
Now, the clouds are making rain,
In the Earth system.

Now, the rain is falling down, falling down, falling down.
Now, the rain is falling down,
In the Earth system.

Now, the soil is getting wet, getting wet, getting wet.
Now, the soil is getting wet,
In the Earth system.

Now, the plants are growing up, growing up, growing up.
Now, the plants are growing up,
In the Earth system.

Now, the animals eat the plants, eat the plants, eat the plants.
Now, the animals eat the plants,
In the Earth system.

Now, the leaves fall off the trees, off the trees, off the trees,
Now, the leaves fall off the trees,
In the Earth system.

Now, the leaves turn into soil, into soil, into soil.
Now, the leaves turn into soil,
In the Earth system.

This is how we all connect, all connect, all connect.
This is how we all connect,
In the Earth system.

Song lyrics by Peggy LeMone
and Susan Gallagher

Teacher's Notes

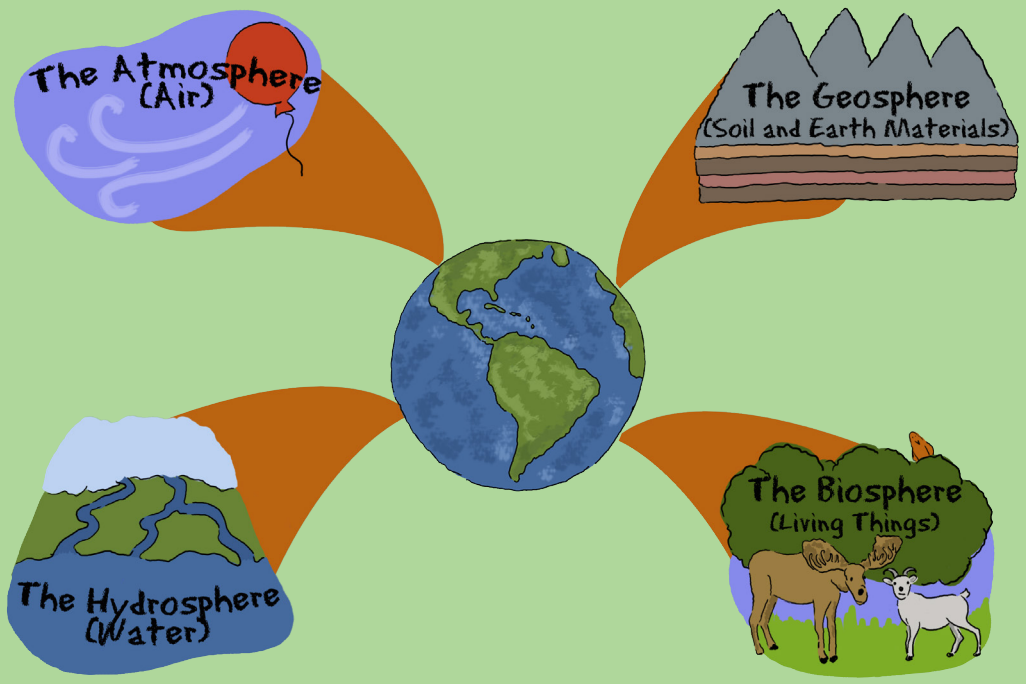
The Earth as a System
When discussing the Earth, scientists often organize it into five "spheres": the atmosphere, hydrosphere, geosphere, cryosphere, and biosphere. These spheres are connected to each other in a complex web of processes. Instead of focusing on the individual parts of the Earth, Earth system scientists use chemistry, biology, and physics to study the cycles that connect these spheres with each other and with the energy from the Sun, which ultimately drives almost all of these processes. This book uses terminology to describe the sphere that is more age appropriate for primary students (grades K-4): air, water, soil, and living things. This book also includes the cryosphere (ice) as a part of the hydrosphere.

The Atmosphere (Air)
The atmosphere consists of the gases in the air and suspended solid and liquid particles called aerosols. It provides oxygen for living things like animals, fungi, and bacteria that need oxygen to survive. It contains carbon dioxide exhaled from, or produced by, living things, which is used by plants and algae to make sugars during photosynthesis. It also contains many other gases, including nitrogen, which is most abundant. The atmosphere filters out most harmful forms of sunlight and traps outgoing heat from Earth's surface. The atmosphere transports heat from the equator to the poles, making the whole planet more livable.

The Hydrosphere (Water)
The ocean, inland water bodies, groundwater, clouds, water vapor, sea ice and glaciers (cryosphere), comprise the hydrosphere. The hydrosphere also includes moisture in the atmosphere that evaporated from lakes and the ocean. The moisture condenses into clouds and falls as precipitation.

The hydrosphere includes water in the oceans, lakes, streams, ponds, underground, ice sheets, glaciers, icebergs, snow, sleet, hail, clouds, and fog. Water continually circulates between the land, ocean, and the atmosphere in what is called the hydrologic cycle, or water cycle.

For more information, see the *GLOBE Teacher's Guide* (www.globe.gov).



The Geosphere (Soil and Other Earth Materials)
The geosphere includes the surface of the Earth including soil, rock, sand, the ocean floor, and the continents. This book concentrates on soil. Soil is a precious natural resource and is so tied to other parts of the Earth system that it is known as the "great integrator." Soil holds nutrients and water, which are used by plants and animals. Soil filters and cleans water that passes through it. Soil can change the chemistry of water and impact the amount that recharges the groundwater or evaporates into the atmosphere. The foods we eat and most of the materials we use for paper, buildings, and clothing depend on soil ffor their production. Soil plays an important role in the amount and types of gases in the atmosphere. It stores and transfers heat, affects the temperature of the atmosphere, and controls the activities of plants, microorganisms, and other organisms living in the soil.

Biosphere (Living Things)
The biosphere includes all of the living things on Earth, including plants, animals, fungi, algae, and bacteria and other microorganisms. The biosphere includes life on land (such as trees, flowers, insects, birds, reptiles, bacteria, and mammals, including humans) and life in the ocean (such as fish, algae, plankton, mollusks and other invertebrates, and marine mammals like whales). Earth system scientists often explore how components of the biosphere are affected by the non-living parts of the planet – such as the timing of when plants "green-up" in the spring as the weather warms and "green down" as weather cools in the autumn.

The GLOBE Program is a hands-on international education and science program that joins students, educators, and scientists from around the world in studying Earth system science (ESS). The core objectives of GLOBE are to improve science education, enhance environmental awareness, and increase understanding of Earth as a system. For more information, please visit www.globe.gov.

Elementary GLOBE is designed to introduce K-4 students to the study of Earth system science (ESS). Elementary GLOBE forms an instructional unit that comprises multiple modules that address ESS and interrelated subjects including aerosols, seasons, soils, water, weather, and climate. Each Elementary GLOBE module contains a science-based storybook, classroom learning activities that complement the science content covered in each book, and teacher's notes. The storybooks explore a component of the Earth system and the associated classroom learning activities provide students with a meaningful introduction to technology, a basic understanding of the methods of inquiry, and connections to mathematics and literacy skills. For more information, please visit www.globe.gov/elementaryglobe

Book and Learning Activity Credits

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It's Showtime!

The kids have been making costumes and practicing lines. Each is playing the role of a different part of the Earth. But the actors all think they have the lead role in the play. Will they ever get along?

Elementary GLOBE™

This storybook is one of several books in the Elementary GLOBE unit. Elementary GLOBE is designed to introduce K-4 students to the study of Earth system science (ESS). The books form an instructional unit that addresses ESS and related subjects including aerosols, weather, water, seasons, soils, and climate. The science content provided in the books serves as a springboard to GLOBE's scientific protocols, and also provides students with a meaningful introduction to technology, a basic understanding of the methods of inquiry, and connections to mathematics and literacy skills. Each book has associated hands-on Learning Activities to support learning exploration. For more information, please visit **www.globe.gov/elementaryglobe.**