Research and Philosophy

Introduction

Interactive Science © 2011 is a standards-based, next-generation, middle grades science program for Grades 6–8. The program utilizes essential best practices in science instruction, featuring the Understanding by Design instructional model, the 5E Learning Cycle, and reading and writing strategies for different content areas.

Interactive Science features flexible options for teaching and learning in three instructional paths: text, inquiry, and digital. Students interact with the instruction by using an innovative write-in student edition. Students also interact with inquiry-based, hands-on labs, and activities by using Lab Zone resources and kit materials. They can also interact online at My Science Online, which features a robust array of interactive science content and videos.

Understanding by Design

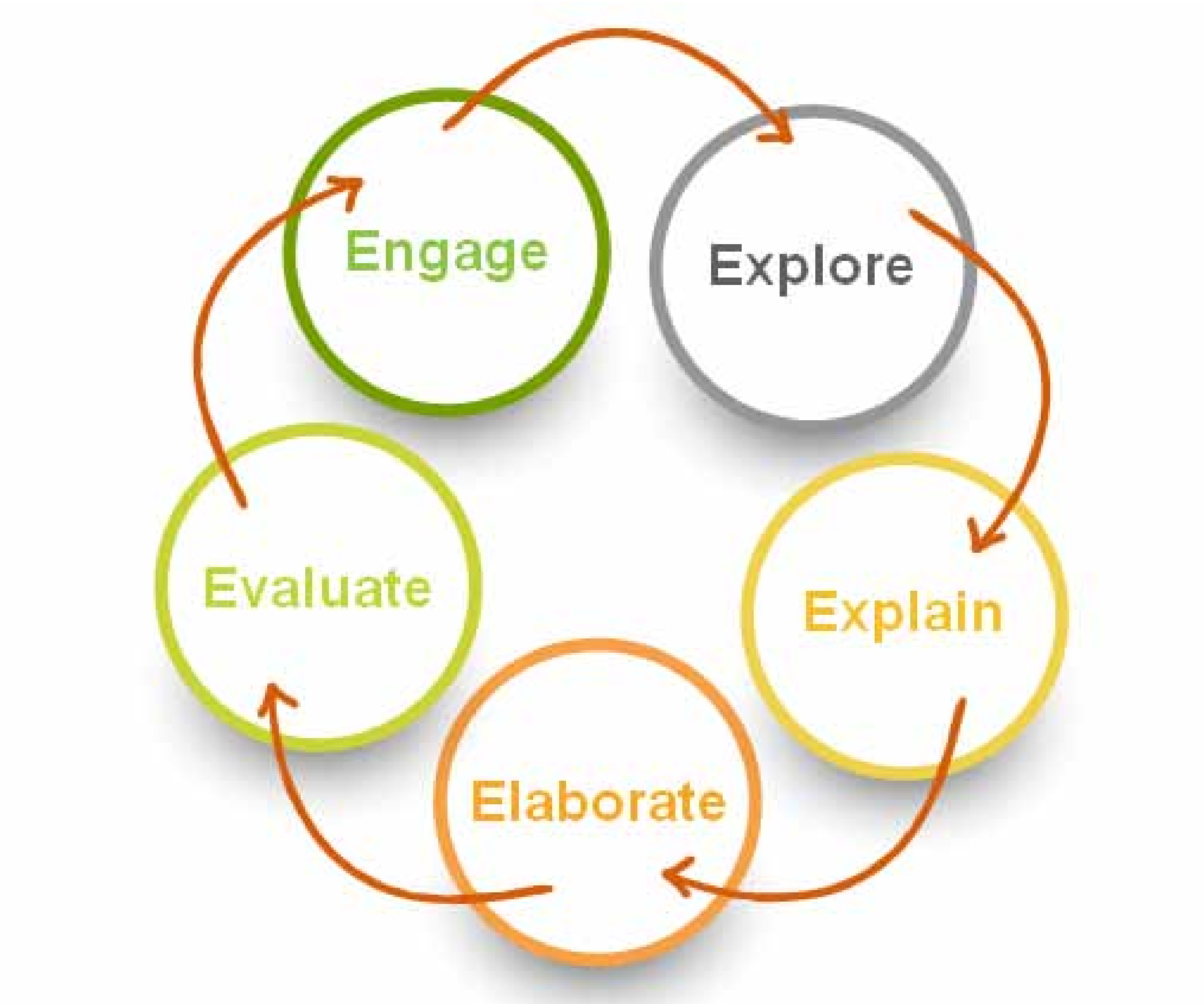
Understanding by Design (UbD) is a research-based way of thinking about the design of curriculum, instruction, and assessment. The UbD framework is described in detail in the book *Understanding by Design* by Grant Wiggins and Jay McTighe. Grant Wiggins, one of the book's coauthors, has worked with Savvas to incorporate his unique instructional philosophy across all academic disciplines and is also one of the lead authors of the *Interactive Science* program.

The goal of UbD is to develop a deep understanding of important ideas through focusing on the Big Ideas of the program. UbD provides a way to move from simply covering the curriculum to ensuring understanding. This is done through a process of learning that provides students with opportunities to investigate, explore, test, and verify important concepts. It really boils down to helping students learn how to transfer knowledge. To learn more about UbD, be sure to watch the tutorial on the Savvas SuccessNet Web site.

The Five E Learning Cycle

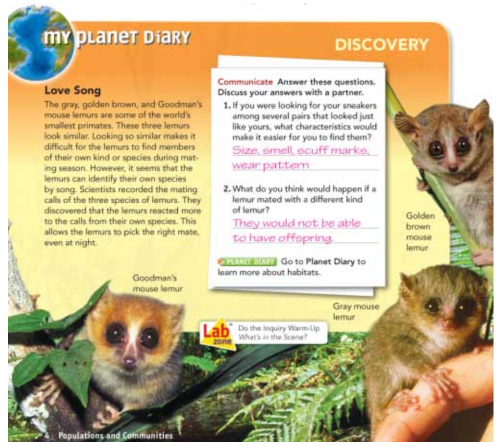
Interactive Science also aligns with the 5E Learning Cycle. This model, which originated with the Biological Science Curriculum Study (BSCS), is a best practice that is widely used in the development of science curricula.

The content and activities in every lesson are organized to guide students and teachers through the Engage, Explore, Explain, Elaborate, and Evaluate cycles. The 5E Learning Cycle is integrated throughout the program. This approach fosters inquiry-based learning and allows students to use and build upon prior knowledge and experience to construct meaning.



The Interactive Science Approach to the 5E Learning Cycle

<table>
<tr><td></td><td>Description</td><td>Program Examples</td></tr>
<tr><td>Engage</td><td>Engage students by introducing a topic and an activity to activate prior knowledge.</td><td>



my planet Diary

DISCOVERY

Love Song

The gray, golden brown, and Goodman's mouse lemurs are some of the world's smallest primates. These three lemurs look similar. Looking so similar makes it difficult for the lemurs to find members of their own kind or species during mating season. However, it seems that the lemurs can identify their own species by song. Scientists recorded the mating calls of the three species of lemurs. They discovered that the lemurs reacted more to the calls from their own species. This allows the lemurs to pick the right mate, even at night.

Communicate Answer these questions. Discuss your answers with a partner.

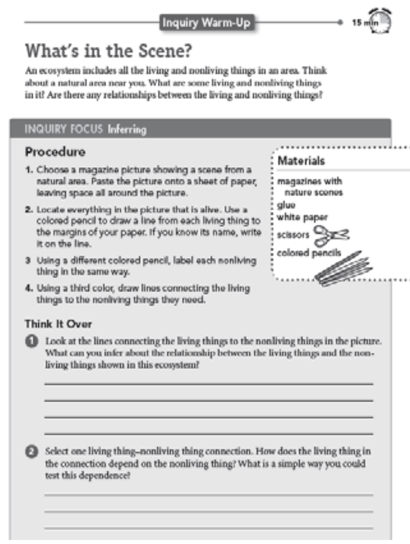
1. If you were looking for your sneakers among several pairs that looked just like yours, what characteristics would make it easier for you to find them?
Size, smell, scuff marks, wear pattern

2. What do you think would happen if a lemur mated with a different kind of lemur?
They would not be able to have offspring.

PLANET DIARY Go to Planet Diary to learn more about habitats.

4 Populations and Communities

My Planet Diary introduces the topic *Living Things and Their Environment.* This activity includes an engaging story, and a set of questions that help students begin to set purpose, and activate prior knowledge.</td></tr>
<tr><td>Explore</td><td>Introduce activities to encourage students to begin investigate and explore the topic.</td><td>



Inquiry Warm-Up 15 min

What's in the Scene?

An ecosystem includes all the living and nonliving things in an area. Think about a natural area near you. What are some living and nonliving things in it? Are there any relationships between the living and nonliving things?

INQUIRY FOCUS Inferring

Procedure

1. Choose a magazine picture showing a scene from a natural area. Paste the picture onto a sheet of paper, leaving space all around the picture.
2. Locate everything in the picture that is alive. Use a colored pencil to draw a line from each living thing to the margins of your paper. If you know its name, write it on the line.
3 Using a different colored pencil, label each nonliving thing in the same way.
4. Using a third color, draw lines connecting the living things to the nonliving things they need.

Materials

magazines with nature scenes
glue
white paper
scissors
colored pencils

Think It Over

1 Look at the lines connecting the living things to the nonliving things in the picture. What can you infer about the relationship between the living things and the nonliving things shown in this ecosystem?

2 Select one living thing–nonliving thing connection. How does the living thing in the connection depend on the nonliving thing? What is a simple way you could test this dependence?

For this particular lesson, the Explore stage involves an activity (called an *Inquiry Warm-Up*. In this activity, students identify living and non-living things in a picture of an ecosystem.</td></tr>
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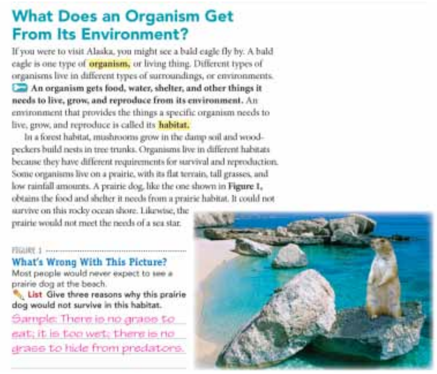
<td>Explain</td>
<td>Teach key concepts and vocabulary and have students explain their understanding.</td>
<td>
What Does an Organism Get From Its Environment?
If you were to visit Alaska, you might see a bald eagle fly by. A bald eagle is one type of organism, or living thing. Different types of organisms live in different types of surroundings, or environments. An organism gets food, water, shelter, and other things it needs to live, grow, and reproduce from its environment. An environment that provides the things a specific organism needs to live, grow, and reproduce is called its habitat.
In a forest habitat, mushrooms grow in the damp soil and woodpeckers build nests in tree trunks. Organisms live in different habitats because they have different requirements for survival and reproduction. Some organisms live on a prairie, with its flat terrain, tall grasses, and low rainfall amounts. A prairie dog, like the one shown in Figure 1, obtains the food and shelter it needs from a prairie habitat. It could not survive on this rocky ocean shore. Likewise, the prairie would not meet the needs of a sea star.
FIGURE 1
What's Wrong With This Picture?
Most people would never expect to see a prairie dog at the beach.
List Give three reasons why this prairie dog would not survive in this habitat.
Sample: There is no grass to eat; it is too wet; there is no grass to hide from predators.
Students will read to learn more about a key concept. The key concept is identified by locating the key icon, and key vocabulary terms are identified by yellow highlighting. The lesson notes in the margins of the teacher's edition help the teacher clarify misconceptions, demonstrate a key concept, or provide a range of learning activities. Students explain their current understanding of the key concepts by responding to the activities in their write-in student edition.</td>
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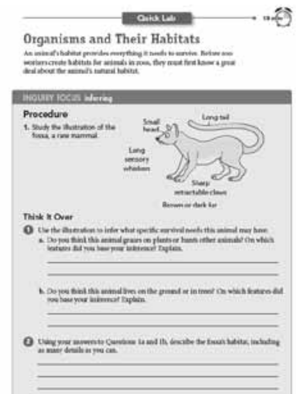
<td>Elaborate</td>
<td>Encourage students to participate in activities that build on what they have learned and extend their thinking about a key concept.</td>
<td>
Quick Lab
Organisms and Their Habitats
Procedure
Small head
Long tail
Long sensory whiskers
Think It Over
In this Quick Lab activity, students will study a picture of an animal. Using what they observe and what they have learned about the key concept, they will make inferences about the animal's environment and survival needs.</td>
</tr>
<tr>
<td>Evaluate</td>
<td>Have students assess their understanding of the key concept.</td>
<td>
Lab zone Do the Quick Lab Organisms and Their Habitats.
Assess Your Understanding
got it?
O I get it! Now I know that an organism's environment provides food, water, and shelter for the organism to live, grow, and reproduce.
O I need extra help with See TE note.
Go to my science coach online for help with this subject.
The Assess Your Understanding activity appears after the student learns about a key concept. Students identify what they know about the concept. Students can also indicate their need for additional help.</td>
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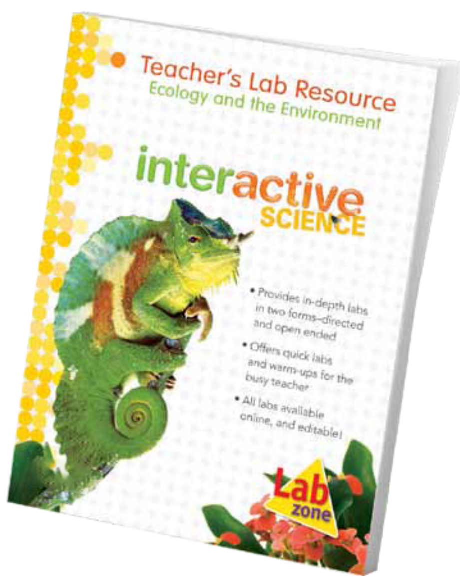
Write-in Student Edition

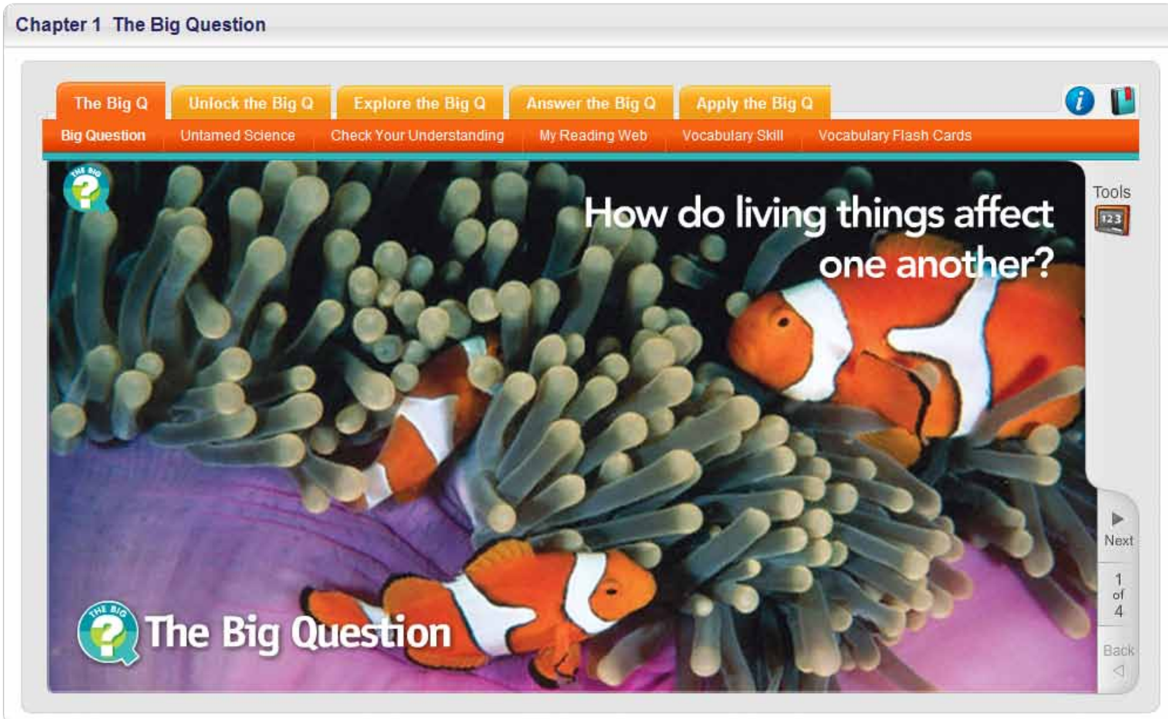
The *Interactive Science* write-in student edition provides students with a sense of ownership of their own learning. Students can record their understanding of key concepts, actively interact with the text, and communicate their need for clarification of concepts. Reading and writing strategies and practice are built in to the student editions. Metacognitive prompts are integrated into the design of the lessons—helping students to actively think about what they know and identify what they need to understand. Self-assessment is an important tool for students to use to monitor their understanding. Each key concept is followed by a Got It! self-assessment. Based on their response, students may venture online for further practice at My Science Coach. If they use My Reading Web, they can also access online Lexile leveled text passages that are written at an appropriate reading level for their ability.

Inquiry



The LabZone icon appears throughout the text and indicates a program inquiry activity. These activities are contained in the Teacher's Lab Resource. The lab activities require different levels of inquiry. In addition to Inquiry Warm-Ups and Quick Labs, lab activities feature options for conducting experiments in an open inquiry or directed inquiry. Direct inquiry supplies the students with the lab procedures. Whereas open inquiry requires students to plan, design, and implement their own procedures, record evidence, and share their findings.

Digital Path



While some science programs offer digital components that are static, such as digital e-books, *Interactive Science* comes with an interactive and engaging digital path. The digital path allows the students to view informative videos, interact with art, participate in virtual labs, and monitor their own progress. Many activities provide students with immediate feedback. Teachers can assign entire lessons, or strategically choose the components that students can experience online. Monitoring student progress is easy. Teachers can view quiz scores, evaluate open-ended questions, and assign additional practice. Using Success Tracker, the teacher may assign each student a diagnostic test. As a result of students' individual responses, the system can automatically assign students remedial learning content. Teachers may use the Success Tracker reports to show mastery of key concepts or deficiencies.

Research

During the spring of 2009, PRES Associates, Inc., a planning, research, and evaluation company, conducted a pilot study of the program. The pilot included 435 middle grade students and 7 teachers. This study used three of the *Interactive Science* modules. Researchers determined positive changes in regard to the following areas:

- Increased student interest and engagement in science
- Increased student ownership and pride
- Increased the students' application of science
- Increased student performance in other academic areas
- Improved monitoring of science learning
- Improved student organizational skills
- Increased projections of student performance on state assessments and future science courses
- Improved teacher performance and lesson preparedness

When the *Interactive Science* program was compared to the science texts that the participants are currently using, teachers said that *Interactive Science* was easier to use, that it increased the students' level of ownership, and that it provided the information and resources needed to teach science effectively.

In a comparison of pre- and posttests, the researchers identified significant growth in understanding for students who studied the Earthquake and Populations and Communities chapters. Students demonstrated growth across all demographic groups. Students who participated in the inquiry path outperformed students who experienced a blended learning approach.

Program Authors

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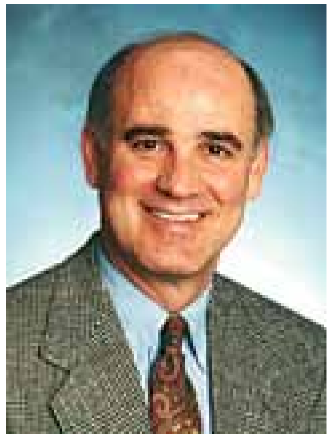
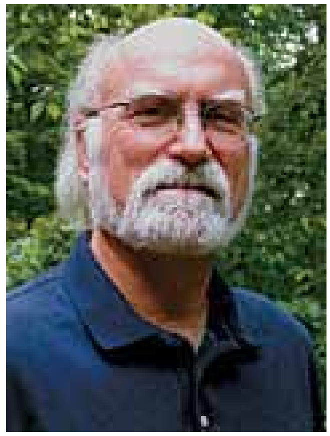
Zipporah Miller, M.A.Ed. Associate Executive Director for Professional Programs and Conferences National Science Teachers Association Arlington, Virginia		Zipporah Miller, former K–12 science supervisor and STEM coordinator for the Prince George's County Public School District in Maryland, is NSTA's associate executive director for professional programs and conferences. She has overseen curriculum development and staff training for more than 150 district science coordinators. Miller's commitment to providing high-quality professional development and resources to science educators and administrators nationwide has made her a respected leader in the science community.

Michael J. Padilla, Ph.D. Associate Dean and Director Eugene P. Moore School of Education Clemson University Clemson, South Carolina		A former middle school teacher and a leader in middle school science education, Dr. Michael Padilla has served as president of the National Science Teachers Association and as a writer of the National Science Education Standards. He is professor of science education at Clemson University. As lead author of the *Science Explorer* series, Dr. Padilla has inspired the team in developing a program that promotes student inquiry and meets the needs of today's student.
Kathryn Thornton, Ph.D. Associate Dean of Engineering and Applied Science University of Virginia Charlottesville, Virginia		Selected by NASA in May 1984, Dr. Thornton is a veteran of four space flights. She has logged over 975 hours in space, including more than 21 hours of extravehicular activity. As an author on the Scott Foresman Science series, Dr. Thornton's enthusiasm for science has inspired teachers around the globe. Dr. Thornton is currently the Associate Dean for Graduate Programs in the University of Virginia School of Engineering and Applied Science.

Grant Wiggins, Ed.D. President of Authentic Education Hopewell, New Jersey		Award-winning coauthor (Wiggins and McTighe) on the highly successful curriculum textbook, *Understanding by Design*, published by ASCD, Grant Wiggins is one of the most influential educational reformers today. Dr. Wiggins consults with schools, districts and state education departments on a variety of reform matters; organizes conferences and workshops; and develops print materials and Web resources on curricular change. Dr. Wiggins is the President of Authentic Education in Hopewell, New Jersey.
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Your Students The Main Authors		These authors have been highly involved in studying science for a number of years. They have been making observations, inferences and predictions, and really figuring out how the world of science works and communicating their findings to others. Among other things, they have been called curious, innovative experts in their field, and we think they'll be very influential in your classroom.

Review

This guide discussed the program philosophy and research behind *Interactive Science*. For more information about the *Interactive Science* program, be sure to look at the *Interactive Science* Program Guide or visit the tutorials that are available on this Web site.