

PREPUBLICATION RESEARCH

National Geographic Science

National Geographic School Publishing

2007–2009

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OUR COMMITMENT TO RESEARCH

National Geographic School Publishing (NGSP) recognizes the importance of gathering scientific research evidence to support educators in making decisions about instructional programs.

NGSP programs are designed to meet national content standards and requirements for student mastery of skills. The most current scientific research base for content and pedagogy defines the foundation for instructional elements and methods used in our programs. NGSP enlists highly respected experts and researchers in the field as program authors to ensure that our products meet high standards and best practices for both content and instruction.

Additionally, program development is guided by extensive market research to ensure that program components and instructional strategies meet the needs of educators who will be using them in their classrooms. Prepublication field-testing is conducted to gather qualitative and early quantitative data in support of a program's usability and effectiveness in the classroom.

Once a program is published, rigorous scientific research studies are conducted by third-party evaluators to gather quantitative evidence of a program's effectiveness. Ongoing implementation studies ensure that educators are successful in using NGSP programs to the full benefit, ensuring that content standards and skills are thoroughly taught by teachers and mastered by students using NGSP materials.

NATIONAL GEOGRAPHIC SCIENCE

Prepublication Research

This report provides a summary of prepublication research related to *National Geographic Science*, a new research-based science program for elementary students, published by National Geographic School Publishing, including summaries of the research base used to guide program development, market research conducted with educators, and early evidence of program usability and effectiveness from an implementation field test conducted with teachers and classes during the spring of 2009.

Random-Control Trial Efficacy Study

National Geographic School Publishing contracted a third-party evaluator to conduct a randomized controlled trial research study to evaluate the efficacy of *National Geographic Science* for students in grades K–2 during the 2009–2010 school year, and for students in grades 3–5 during the 2010–2011 school year. The purpose of this study is to evaluate the effectiveness of the materials in helping students attain science content and inquiry skills as well as enhance their reading ability. The study will also assess teachers' implementation of the elementary Science program. The efficacy study will employ a cluster randomized trial design, with approximately 1000 students, in order to measure the impact of these materials on student performance in science and reading. Results from the first phase of this efficacy study will be available in the summer of 2010.

PROGRAM OVERVIEW

National Geographic Science is a balanced program that brings science learning to life through the lens of National Geographic while meeting Kindergarten through Fifth Grade Science Standards for Life, Earth, and Physical Science. *National Geographic Science* is currently available for kindergarten through grade two; grades three through five will be available in 2010.

National Geographic Science builds science skills and habits of mind with a balance between inquiry and text-based models for science instruction. Hands-on activities addressing four levels of inquiry (explore, directed, guided, and open) provide students a solid introduction to science concepts and skills while preparing them for life-long inquiry. Extensive photographs and introductory videos from National Geographic explorers and scientists engage students as they learn science skills and standards. Students use an open-ended Science Notebook to further their understanding and organize their work in science.

National Geographic Science provides opportunities for students to engage in meaningful learning of core science concepts that enables them to create their own understanding of the natural world. Each unit focuses on three Big Ideas and leveled texts to provide equal access to instructional concepts. The program provides multiple experiences with each topic to encourage in-depth experiences for students.

National Geographic Science also incorporates literacy best practices to build academic vocabulary, develop reading comprehension strategies (preview and predict, monitor and fix up, make inferences, and sum up), and strengthen writing in a variety of nonfiction genres (narrative nonfiction, expository, procedural, and persuasive).

RESEARCH BASE

The National Science Education Standards call for more than “science as process,” in which students learn such skills as observing, inferring, and experimenting. Inquiry is central to science learning. When engaging in inquiry, students describe objects and events, ask questions, construct explanations, test those explanations against current scientific knowledge, and communicate their ideas to others (Center for Science, Mathematics, and Engineering Education, 1996).

Life-long Inquiry

The teaching and learning of scientific inquiry is viewed as an essential component of all current K-12 science curricula. In particular, the National Science Education Standards (National Science Education Standards, 1996) state that students should understand and be able to conduct a scientific investigation. The Benchmarks for Science Literacy (AAAS, 1993) advocates an in-depth understanding of scientific inquiry and the assumptions inherent to the process (Lederman, 2009). Many classroom environments do not include explicit attention to the teaching and learning of scientific inquiry or systematic assessment of students’ learning with respect to aspects of scientific inquiry (Lederman, 2009).

National Geographic Science responds to this need by providing students with relevant hands-on activities and preparing them for life-long inquiry. *National Geographic Science* covers four levels of inquiry:

- Explore – activities build background knowledge for the unit
- Directed – teacher provides direct guidance throughout a science activity
- Guided – students are able to manipulate variables independently from teacher direction
- Open – students choose a question to investigate and take full responsibility for all aspects of the investigation

The Nature of Science

Teaching the nature of science helps students develop accurate views of what science is, including the types of questions science can answer, how science differs from other disciplines, and the strengths and limitations of scientific knowledge (Bell, 2008). Current science education reform efforts focus on scientific literacy as a principal goal and framework for instruction. *National Geographic Science* integrates science content, science process skills, and the nature of science in ways that promote accurate understandings of science. The program uses engaging text, pictures, and activities to encourage students to “think like scientists” as they learn standards-based science content (Bell, 2009).

Science notebooks are a critical component of *National Geographic Science*, allowing students a place to document their scientific experiences in ways they think are important. In addition, consistency in recording information in their science notebooks adds more rigor for students, as they consider how the recorded information accents their thoughts (Butler & Nesbit, 2008).

Scientific Literacy

In *National Geographic Science*, informational text works in tandem with rich inquiry experiences to build children’s understanding of big ideas in science. Experience with informational text is also important to literacy development. Most literacy standards documents and assessments expect that children can read and write informational text successfully by fourth grade or earlier. For example, informational text items comprise fifty percent of the 2009 National Assessment of Educational Progress (NAEP) fourth grade assessment (National Assessment Governing Board, 2007). *National Geographic Science* features a broad range of informational text including: narrative nonfiction, expository, procedural, and persuasive.

National Geographic Science is designed to teach all elementary students regardless of their reading level and contains the necessary components for motivating and engaging students so their proficiency in science improves and success becomes their norm (Butler, 2009). For example, carefully leveled books in each *National Geographic Science* unit address the literacy needs of a range of readers.

Today’s students need to develop scientific inquiry and literacy skills that will enable them to compete and make choices in an increasingly global environment; *National Geographic Science* meets this need.

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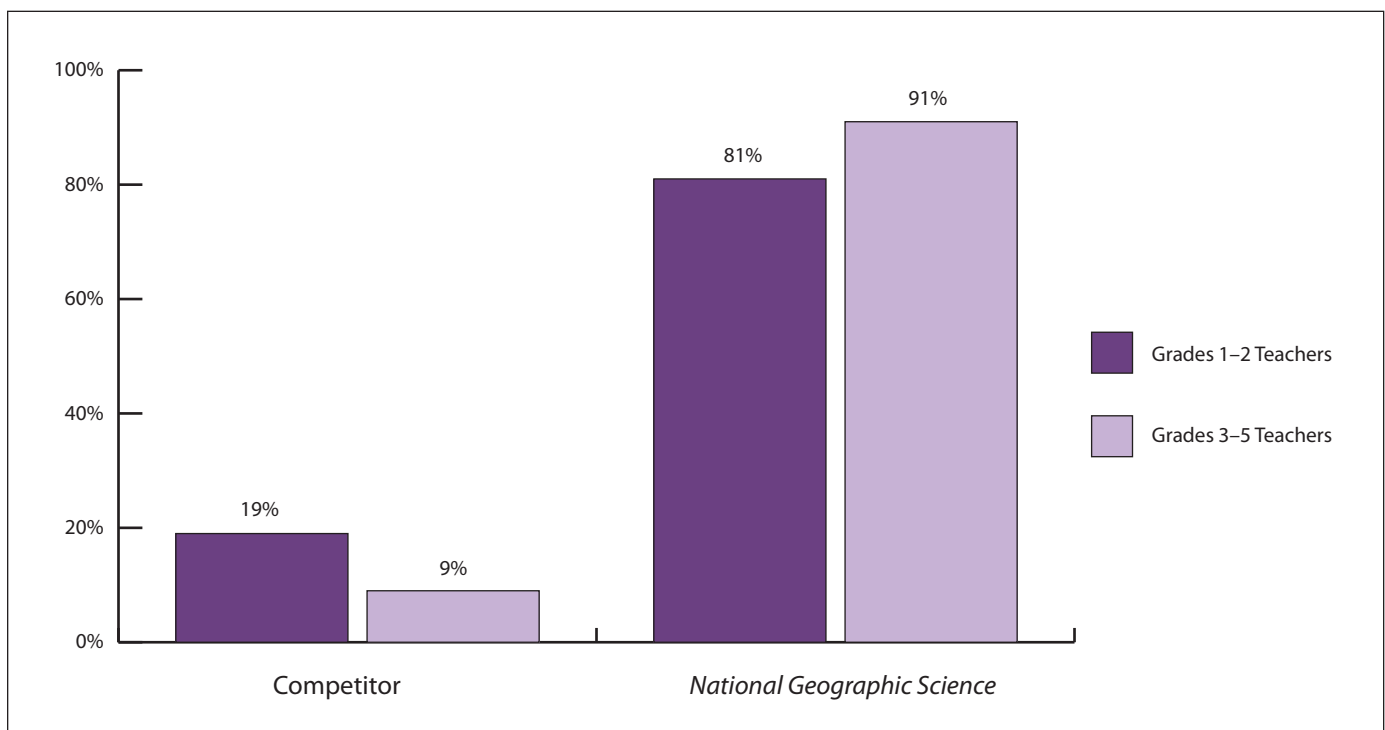
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MARKET RESEARCH

From the spring of 2008 to the summer of 2009, nineteen focus groups of grade one through five teachers and administrators were conducted with *National Geographic Science* in eight cities across the United States. Groups represented a balance of both urban and suburban educators working with diverse socioeconomic student populations.

Focus groups indicated that *National Geographic Science* Inquiry Activities for grades 1–5 were preferred over those from a leading competitor (see Figure 1). Teachers specifically reported that the hands-on and inquiry components of *National Geographic Science* were a primary strength of the program and prepared students for life-long inquiry.

Figure 1. Focus Groups’ Preferred Inquiry Activities (Grades 1-2, 3-5)

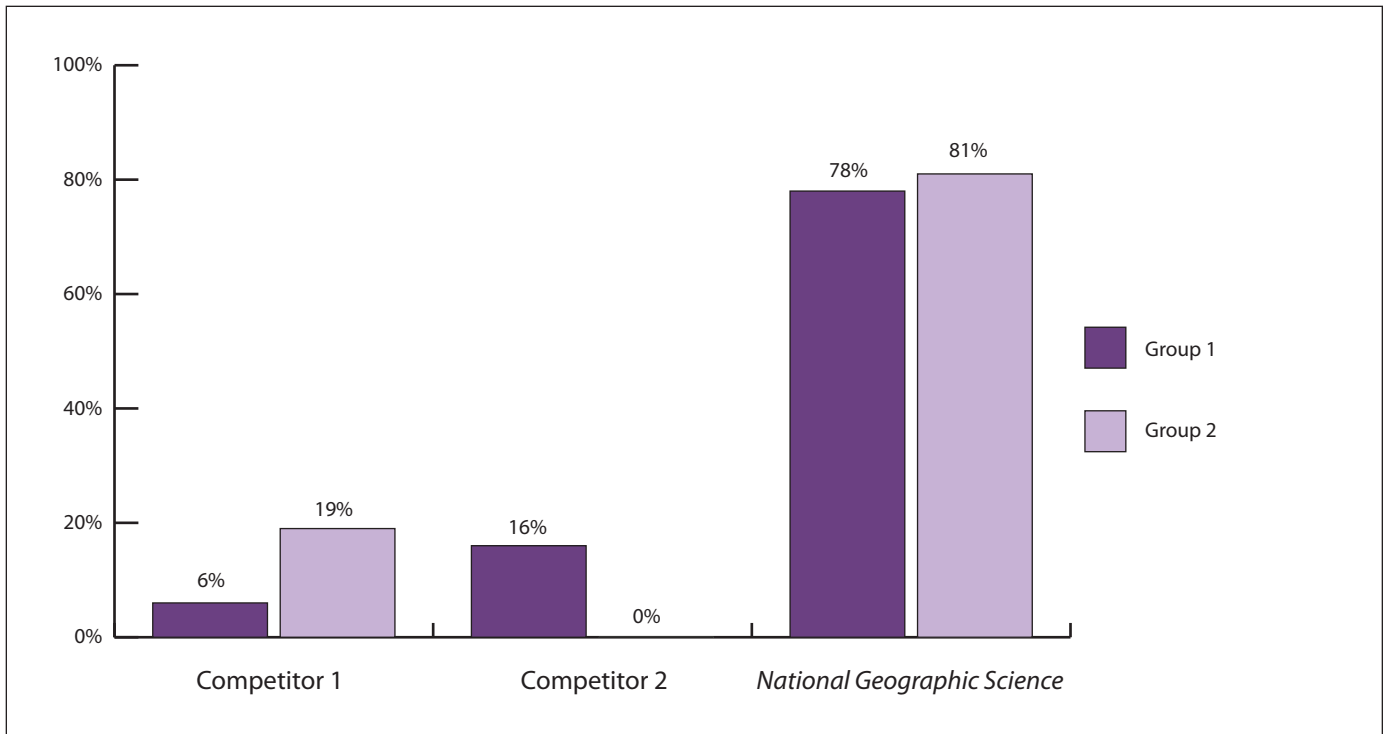


The overall strengths of *National Geographic Science* Inquiry Activities, as identified by focus groups include:

- Clear step-by-step directions with visuals
- Treatment of scientific process vocabulary instruction
- Strong visuals to support engagement
- Science notebook allows for individual experiments and enables students to express understanding in their own words

The *National Geographic Science* Teacher’s Edition was rated “Most Useful” and preferred over the competition by focus groups representing Grade 1–5 teachers (see Figure 2).

Figure 2. Focus Groups' Preferred Teacher's Edition



The overall strengths of *National Geographic Science* Teacher's Edition, as identified by focus groups include:

- Focus on standards
- Hands-on/inquiry component
- Science notebook /writing journal
- Big Ideas Cards /Big Ideas questions
- Different levels of support for gifted students and English language learners (e.g., Spanish cognates, scaffolded instruction, leveled books)
- Vocabulary (e.g. easy to find vocabulary, activities, vocabulary building, leveled words)
- Promotes the nature of science through its visually-embedded vocabulary; vivid, real-world photos; and appealing media

Teachers reported that the cross-curricular connections between science and literacy added to the overall strengths of the program. In addition, *National Geographic Science* was seen as more innovative, engaging, and progressive, as well as both teacher- and child-friendly, compared to competitor programs.

One focus group participant explained, "As soon as I touched *National Geographic Science*, I loved it. Explorer Greg Marshall* is a big part of the reason why I like it. It has good key vocabulary and vocabulary building. I like the fact that it emphasizes reading together and having the children read aloud or alone." (New York City, administrator). [*National Geographic Explorers (e.g. Greg Marshall) introduce units through video clips and bring a real-world, science connection to the classroom.]

Overall results of the focus groups indicate that *National Geographic Science* content, student activities, and Teachers' Editions were highly preferred over those of leading competitors.

NATIONAL GEOGRAPHIC SCIENCE PREPUBLICATION FIELD TEST

During the spring of 2009, first and second grade teachers at John C. Coonley Elementary School, a public school in Chicago, Illinois, implemented one complete unit of *National Geographic Science*. The purpose of this field test was to gather initial information related to usability and effectiveness of the new science program for elementary students, published by National Geographic School Publishing.

Field Test Specifics

Teachers followed the instructional plan and program pacing guidelines to implement the complete range of print materials, hands-on Inquiry Activities, and assessments for Habitats, a unit that aligns with standards and the spring curriculum for these grade levels. Classes used the new program for about three to four hours per week for approximately four to six weeks in April and May, 2009. Each class was provided with a complete set of materials for the unit, including hands-on activity kits. Teachers implemented the program as fully as possible during the time they would typically devote to science instruction with their students. Teachers also completed a survey at the end of the study.

The following information summarizes data gathered during site visit observations, teacher and student interviews, and from a survey completed by teachers at the end of implementation.

Summary of Findings

Teachers and classes involved in the field test had a highly favorable response to *National Geographic Science* materials, instruction, and activities. Teachers reported that students learned the concepts and mastered the skills of the Habitats unit. All participating teachers indicated they would both use the program again and recommend its use to colleagues. Specifically, teachers reported that *National Geographic Science* provided sufficient structure for teaching, but also included many opportunities for students to work together as scientists to explore and investigate the big ideas they were learning. Additionally, teachers reported that their students remained motivated and interested in using the materials throughout the instructional flow of the unit. Teachers also indicated that the literacy opportunities included as part of the program strengthened the overall impact of their science instruction with students.

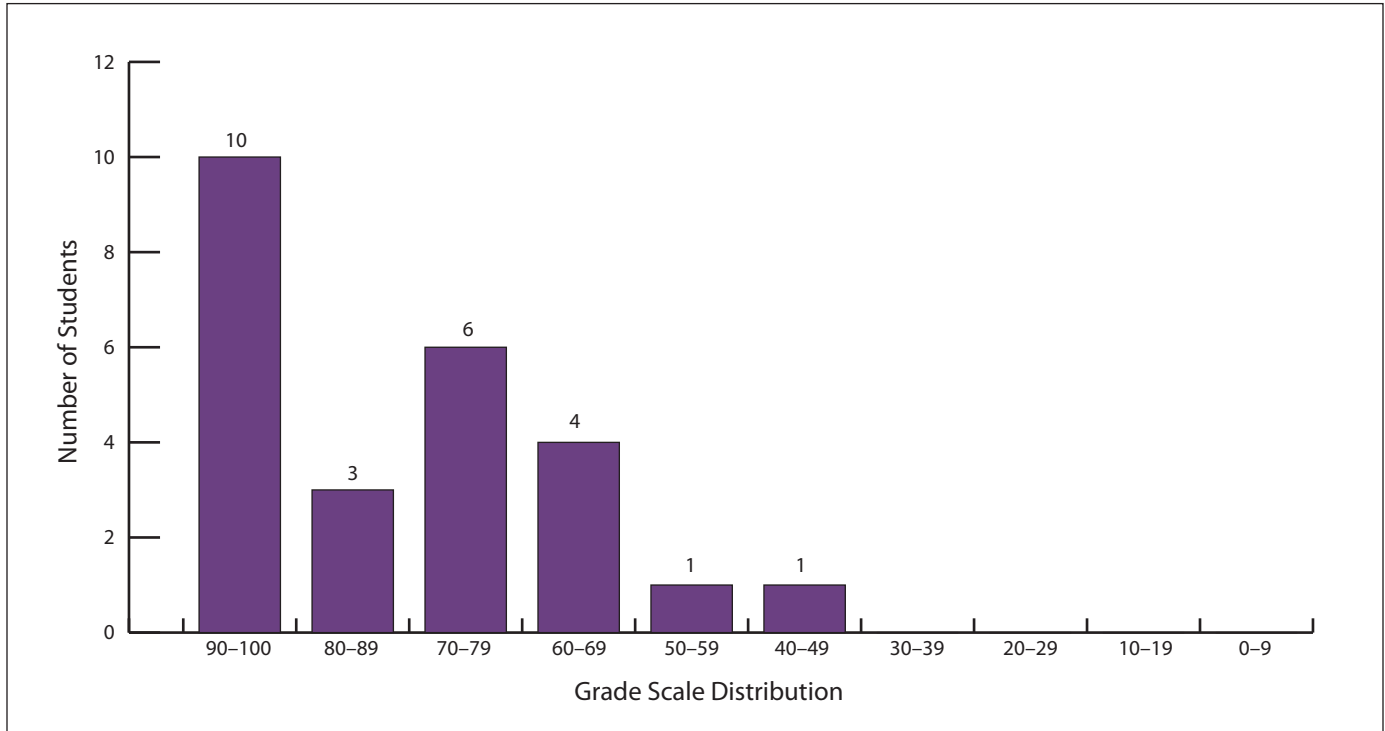
Standards-based Skills and Concepts

Teachers reported that *National Geographic Science* helped their students learn the concepts and consequently master the skills in the Habitats unit. Materials were found to be engaging and helped students connect with the standards effectively. Students generally demonstrated mastery of the standards, as measured by the chapter and unit assessments.

Teachers reported that the Explorer Video at the beginning of the unit piqued students' curiosity – they wanted to know more about Habitats. Students recognized the high quality of the compelling visuals within the *National Geographic Science* program and enjoyed looking at the real photographs and learning new things from what they saw. During a classroom visit, many students identified their favorite photograph and were able to use it to explain content-based details during a class discussion.

Students took the Unit Test for Habitats. A second grade teacher was impressed with the overall performance of her students on this measure, noting that it was a well-designed assessment with a nice mix of questions assessing the content and concepts of this unit (see Figure 3).

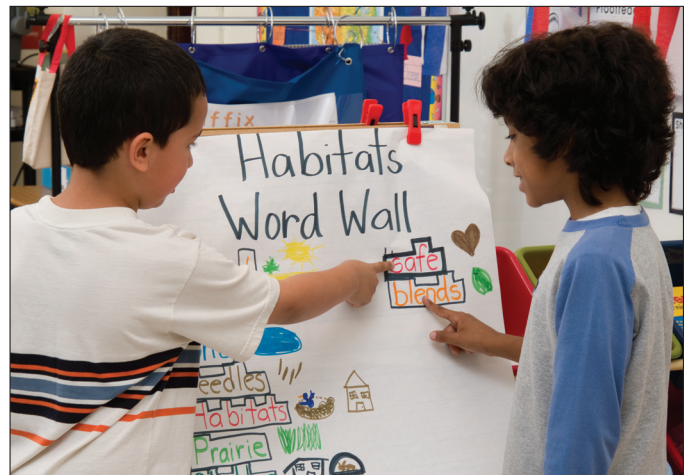
Figure 3. Habitats Unit Test Second Grade Class Summary



Nonfiction Reading Strategies and Skills

Teachers reported that the science books were great “teaching” books for nonfiction literacy skills. One teacher indicated that the layout of content and graphics on a page provided a great resource to teach nonfiction text features and reading strategies. Another teacher indicated that the texts were very well leveled and extremely engaging, making it easier for her students to master nonfiction reading strategies. A third teacher noted that the nonfiction narrative of *National Geographic Science* dovetails well with lessons in the school’s writing workshop program. Teachers felt that the vocabulary words were appropriate and helped students build deeper understanding of science concepts presented (see Image 1).

Image 1. Students Study Science Vocabulary



Scientific Inquiry Skills and the Nature of Science

Teachers reported that *National Geographic Science* helped students raise questions and led to deeper thinking. Teachers noted that the Big Ideas Book and the Become an Expert Books provided opportunities for students to gain insight on topics that most of them had not had experience with while also increasing their curiosity about plants, animals, and habitats (see Images 2 and 3). Teachers cited that class discussion during the “Expert Group” question/answer sessions as evidence of increased student knowledge and curiosity (see Image 4).

Image 2. Student Reading the Big Ideas Book



Image 3. Expert Group’s Concept Map

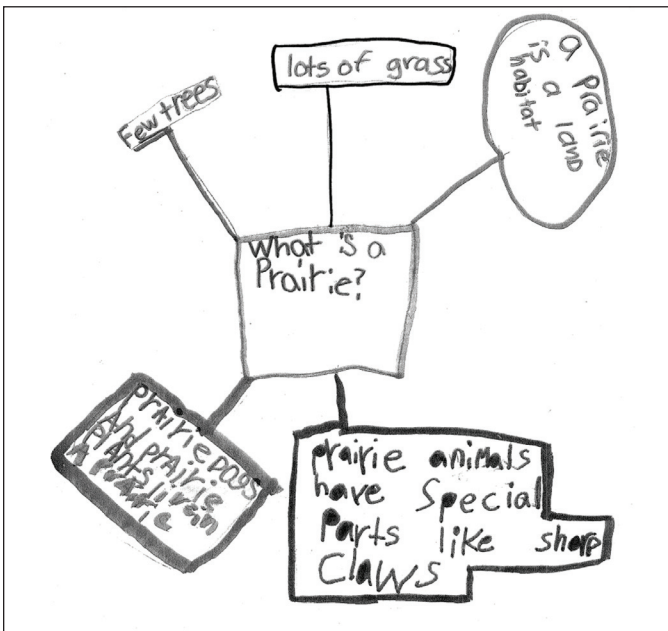


Image 4. Expert Group Students Sharing with the Class



All teachers indicated that their students enjoyed learning through group work and exploration during the hands-on activities. One class especially liked the sorting activity. Another teacher reported that students were able to design their own inquiry experiments with guidance and could design a fair test (testable question) on their own once the problem was defined. Teachers reported that their students responded well to the use of the science notebook to record their findings and interpretation of the hands-on activities and their own open inquiry experiments. (See Image 5).

Image 5. Scan of Student's Science Notebook, Mealworm Chart

Comment	Day 1	Day 2
	x11	11
Oat bran	11	

I predict that the mealworms will like Oat bran more

Overall Program Strengths / Teacher Testimonials

Field test teachers identified strengths of the *National Geographic Science* program for students at their grade level.

Overall Program Strengths

“I would absolutely use this program again! I enjoyed using the materials and so did my students; I would definitely recommend it to others.”

“I would definitely recommend this program. Unlike other science programs, this program provided structure but also opportunities for students to work together as scientists to explore and investigate, and also incorporated literacy opportunities which many science programs do not.”

Inquiry

“The inquiry activities expose kids to important procedures for scientific exploration.”

“Student interest in the materials is high.”

Nature of Science

“The greatest strength to me is that *National Geographic Science* seems more comprehensive in its approach than other programs.”

“Unlike other science programs, this program provided structure but also opportunities for students to work together as scientists to explore and investigate. This program also incorporated literacy opportunities, which many science programs do not.”

Scientific Literacy

“*National Geographic Science* is interdisciplinary, it allows students to enjoy nonfiction texts, and it provides opportunities for students to explore different Big Ideas topics.”

“I like the way the three Big Ideas for a unit are repeated in the Big Ideas Book and in the Become an Expert Books.”

“The materials are extremely engaging; they address a wide range of standards and are accessible to a range of students.”

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