Science through Literacy

by Dr. David W Moore

RESEARCH REVIEWS AND COMMENTARIES AGREE that students can develop their science content and literacy learning during inquiry-based instruction (Douglas, Klentschy, Worth, & Binder, 2006; Saul, 2004; Yore, Bisanz, & Hand, 2003). This professional literature supports three fundamentals – three bedrock principles – that underlie the literacy practices embedded in *National Geographic Science*. The principles are (a) Engage learners in rich and varied science texts, (b) Emphasize literacy as a tool for learning, and (c) Teach multiple reading strategies.

Engage Learners in Rich and Varied Science Texts

Texts play an important role in science learning by helping open students' eyes to the natural world and by encouraging and informing their inquiries (Palincsar & Magnusson, 2001). Texts can take students vicariously to places where direct firsthand experiences are not feasible. For instance, a few pages of text can survey Earth's habitats from space, reveal habitats deep below ocean surfaces, and juxtapose prairies, forests, and deserts. Books can bring new light to the shapes and textures of everyday objects as well as to the forces that move such objects. And they can provide insights into scientific callings, highlighting diverse scientists' commitments to systematic observation and interpretation.

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National Geographic Science engages learners in rich and varied texts. Big books present science content and different genres of science writing for whole class utilization. Become an Expert texts are sets of leveled books are perfect for guided reading, and *Explore on Your Own* texts are leveled for independent reading. Notebooks and online resources support scientific inquiries. Students access these informative materials regularly throughout each unit.

Emphasize Literacy As a Tool for Learning

Students develop their science content and literacy learning well when their overall purpose is to learn science (Guthrie & Wigfield, 2000). This means using literacy to develop conceptual knowledge, to seek out relationships among scientific phenomena. It means viewing facts and ideas found in print as facts-in-action and ideas-in-action. It means using print as a tool for investigating and learning about the natural world.

To emphasize literacy as a tool for learning, *National Geographic Science* regularly poses questions like "How do plants and animals depend on each other?" "What can you see in the sky?" and "How do liquids and solids change?" These questions promote conceptual knowledge because they have no single simple answers and they sanction inventive responses. These questions encourage students to share and compare their emerging understandings, to work out with others the meanings they are making of their texts and inquiries.

Realizing the crucial role word knowledge plays in science knowledge (Marzano, 2004), *National Geographic Science* focuses on scientific vocabulary. Analyzing an animal in science differs from analyzing a story in literature, so terms like analyze with particular shades of scientific meaning are highlighted throughout this program. Technical terms like

germinate, offspring, and trait are contextualized by presenting them authentically in a relevant unit on life cycles.

National Geographic Science brings science terminology to life through visuals and learner-friendly explanations. It leads students to actively employ and elaborate such words during scientific investigations and discussions. It presents science vocabulary as a vital and integrated part of scientific knowledge.

Teach Multiple Reading Strategies

Elementary-school students who learn science through literacy are active learners (Baker, 2003). They take charge of texts, use authors' arrangements of ideas as devices for anticipating, comprehending, and retaining the ideas. When texts become confusing, active learners realize this immediately, shift mental gears, and apply appropriate strategies to restore understanding.

Active learners connect textual presentations with personal observations and investigations to generate new understandings. After completing texts, active learners think through the new ideas, frequently talking about them with others and consolidating what they have learned. Active learners are strategic.

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National Geographic Science presents four reading strategies known to benefit learning with text. This set is based on reviews of studies into reading comprehension (National Reading Panel, 2000) and content area learning (Vaughn, Klingner, & Bryant, 2001). By emphasizing the before, during, and after phases of reading, the following strategies comprise a coherent set:

Preview and Predict

- look over the text
- form ideas about how the text is organized and what it says
- confirm ideas about how the text is organized and what it says

Monitor and Fix Up

- think about whether the text is making sense and how it relates to what you know
- identify comprehension problems and clear up the problems

Make Inferences

- use what you know to figure out what is not said or shown directly

Sum Up

- pull together the text's big ideas

Teaching students to use a set of comprehension strategies like these has been shown to improve science content and literacy learning (Reutzel, Smith, & Fawson, 2005). Such instruction focuses on learners orchestrating a repertoire of reading strategies; it involves students in using multiple strategies for understanding science texts.

National Geographic Science provides a highly regarded model of instruction for explicitly teaching students how to apply reading strategies. The model is based on a gradual release of responsibility (Duke & Pearson, 2002), a practice where teachers initially assume all the responsibility for using a particular strategy, then they fade out as students fade in and assume responsibility for using the strategies. This model of instruction contains the following steps:

Describe the Strategy

Explain what the strategy is and when and how to use it.

Model the Strategy

Show students how to use the strategy by talking aloud as you read.

Collaboratively Use the Strategy

Work with students to jointly apply the strategy.

Guide Application of Multiple Strategies

Gradually release responsibility to small groups of students to use the strategy, along with other strategies they have learned.

Support Independent Application of Multiple Strategies

Continue releasing responsibility to students to use strategies they have learned when they are reading on their own.

Finally, literacy in science involves more than reading words on a page; it also involves reading the images used to express scientific ideas and information (Kress, Charalampos, & Ogborn, 2001). Science texts contain numerous photographs, illustrations, diagrams, tables, and charts. And these categories

of images have sub-categories, such as diagrams that can be a cross-section or a flowchart, as well as components, such as photographs that have labels as well as captions. *National Geographic Science* provides instruction in visual literacy throughout each unit, explicitly drawing attention to the purpose, structure, and special features of its textual images.

Closing Word

The rich and varied texts, focus on literacy as a learning tool, and strategy instruction found in *National Geographic Science* provide students meaningful opportunities to develop their science content and literacy learning. It shows students how to learn science through literacy, and how to learn literacy through science.

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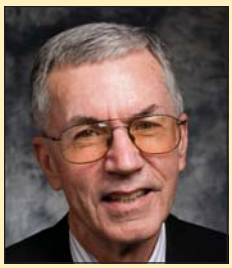

David W. Moore, Ph.D.
Arizona State University

Dr. Moore specializes in literacy instruction across the curriculum. He is currently Professor of Education at Arizona State University.

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