



ILLUSTRATIONS: CHRISTIANE BEAUREGARD

LINK SCIENCE & LITERACY

AND WATCH TEST SCORES SKYROCKET

Science is again at the forefront of U.S. classrooms—more dynamic, engaging, and innovative than ever. One reason: The No Child Left Behind Act mandates that during the 2007 school year, students be assessed in science for the first time. As the tests loom, the discussion of how best to teach science has taken on new urgency.

Linking hands-on science with literacy and the curriculum is growing in appeal, particularly among teachers educated as generalists who feel unprepared to deal with the depth of questions that inquiry and expanded reading can inspire in kids. Bev Grueber, a fourth-grade teacher at North Bend Elementary School in North Bend, Nebraska, is pragmatic about combining the two. “With all the techniques and content you need to teach and your students need to master, you have to integrate everything as much as you can,” she says. Here are four great ways in which teachers have done just that. ►

By Meg Lundstrom



GREAT IDEA #1

Explore Science Fact With Science Fiction

A unit on genetics had Sephali Ray's students jazzed. A seventh-grade science teacher at the New York City Lab School, a public middle- and high-school, Ray didn't stop with the scientific facts. "It's absurd for students to talk about how DNA works without trying to understand its implications for society," says Ray.

She began her lesson with a screening of *Gattaca*, a futuristic movie about a genetically imperfect man. The students also read *Ender's Game*, by Orson Scott Card, in which a boy bred for fighting trains to save the human race.

Ray's students discussed articles on cloning and stem cell research. They did 15 lab experiments. They built a cell with gelatin and candy, examined yeast cells under a microscope, and inserted bacterial DNA into a cell and caused it to glow. The kids then delved passionately into writing their own science fiction, which incorporated many of the ethical issues they had discussed.

Sephali Ray's Favorite Resource: *Science Daybooks* (Great Source Education Group, 2004).

GREAT IDEA #2

Heavenly Science Motivates Non-English Speakers

Judy Carte reached for the sky to help her kindergartners. When monthly writing tests began to frustrate her class of mostly Spanish-speaking children at Miller Elementary School in Tucson, Arizona, Carte turned to her training in FOSS, an inquiry-based, literacy-heavy science program used in her district. She picked up a nonfiction book, *Moon Journals*, at an observatory, and got to work.

Carte asked students' parents to take their children outside for five to 10 minutes every other night to observe the sky. She instructed parents to write down their children's questions and observations about the moon, stars, clouds, and sounds of the night. Parents also had their children copy the words into a journal and, with a white pen on black paper, draw what they saw.

The children listened intently as Carte read aloud fiction and non-fiction books about the sky, then they pored over the illustrations. She encouraged questioning. And she marveled at the progress that seemed accelerated by their time spent writing with the help of a parent.

After the success of the moon lesson and similar projects, "the students understood what a question was, and they knew how to ask questions about the science topic," recalls Carte. "That really impressed me. That's what science is—your questions lead to other questions."

Judy Carte's Favorite Resource: *Moon Journals: Writing, Art, and Inquiry Through Focused Nature Study*, by Joni Chancer and Gina Rester-Zodrow (Heinemann, 1997).





[GREAT IDEA #3] Craft Designer Bugs

After Elaine McWilliams' second-grade class at Maurice Hawk School in Princeton Junction, New Jersey, conducted an intensive study of insects, McWilliams handed out construction paper and went to work. "Draw your own species," she encouraged. "Make sure it's a true insect. Name it, label its parts, and put it in a habitat."

Following her model, the children excitedly drew their own anatomically correct and properly labeled species. Then they took turns explaining their species to the class. "How can it fly when its body is so big and its wings are so small?" one child asked another.

The result: The class created cool designer insects and, in the process, covered the science content, gained skills in following directions, used computers to draw, and practiced working together.

Elaine McWilliams' Favorite Resource: *It's a Good Thing There Are Insects*, by Allan Fowler (Scholastic, 1991).

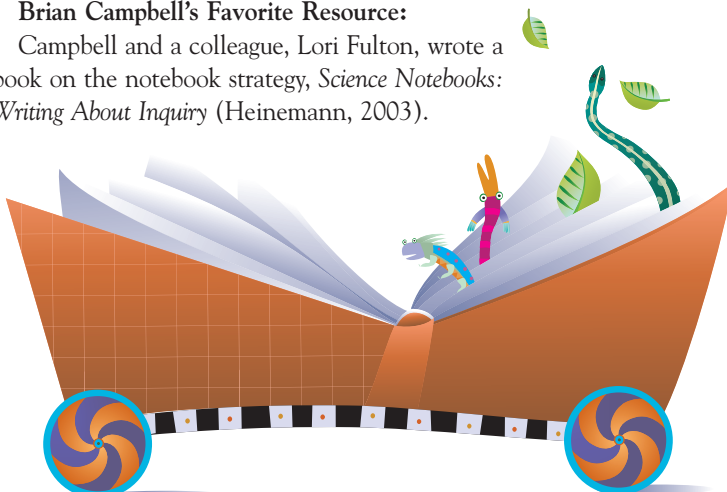
[GREAT IDEA #4] Private Science Notebooks

Brian Campbell's science teaching strategy has had unexpected multi-curricular benefits. Campbell wants his fifth graders at Lummis Elementary School in Las Vegas, Nevada, to take risks in science—just like scientists do. He tells the children that he won't be looking at their science notebooks—not even a peek. "If I collect the notebooks and read them, the audience changes from the student to me, and students become much less likely to experiment with new methods of recording or organizing data," he says.

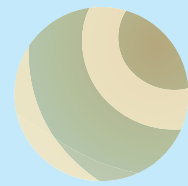
The students' composition books start out blank. The result is that students listen to initial information more closely, take notes more carefully, and observe experiments with more care. "I'm amazed to see the kids using their science note-taking techniques with other subjects, like history," Campbell says. "They don't always have as much to say about colonial times, but they write at great length about what they're doing in science."

Brian Campbell's Favorite Resource:

Campbell and a colleague, Lori Fulton, wrote a book on the notebook strategy, *Science Notebooks: Writing About Inquiry* (Heinemann, 2003).



Science
MAKES KIDS
WANT
to Read



Teachers report that hands-on inquiry intrigues boys who often show little interest in reading fiction but who want to know more about worms and why balls bounce. The focus on reading and writing places girls on a more equal footing in science classes.

Science-literacy is ideal for English language learners, too. "English learners may be quiet as a group—but they get so excited with the scientific discoveries they're making that they're not shy about sharing or asking questions," says Celia Bazan, a teacher with El Centro School District in California. "Before you know it, they're writing and writing and writing, and using the new vocabulary."

About eight out of every 10 students at El Centro are Hispanic and impoverished. Yet the sixth graders with science-literacy training passed California's writing test at twice the

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rate of district children who did not receive science-literacy instruction.

Studies provide proof that literacy and science belong together, says Rowena Douglas, Ph.D., of the National Science Teachers Association. "Not

only is reading critical to the learning of science, science is critical to the learning of reading." Growing evidence shows that test scores go up when science and literacy are matched. A controlled study of 25 Maryland classes, for

example, found that in just four months, third-grade children who were taught a science-literacy curriculum advanced one and a half grade levels in reading comprehension.

"Science immerses children in content that is so interesting and important to them that they want to learn about it, which motivates them to read," says John T. Guthrie, Ph.D., director of the University of Maryland's Literacy Research Center, which conducted the study.

Six Surefire Science Methods

As they worked to link science with literacy in their curriculums, the teachers in the University of Maryland study incorporated these six approaches, based on the Concept-Oriented Reading Instruction (CORI) program created at the university's Literacy Research Center.

- 1. FOCUS ON BIG IDEAS.** Use themes, not factoids. Themes lead children to investigate interlocking concepts.
- 2. USE HANDS-ON EXPERIMENTS.** Make it real. Take a class walk through a wetland, explore a city block, or make a terrarium with a Venus flytrap.
- 3. SUPPLY TRADE BOOKS.** Offer many genres. Use nonfiction books with lavish illustrations and encourage students to use them to form questions and investigate answers. Use literary books such as legends and poems to deepen students' experience.
- 4. PROVIDE CHOICES.** By being able to choose from a short list of options for reading and writing, students feel empowered and motivated.
- 5. ENCOURAGE COLLABORATION.** By working together in groups, kids deepen their knowledge, build skills, and learn to express their thoughts verbally.
- 6. WRITE, WRITE, WRITE EVERY DAY.** In their science journals, students can record observations, drawings, data, and reports. ■

Island left
(rule is 5+ inches from left edge,
8 inches from bottom edge)

Meg Lundstrom is a journalist specializing in education. Her most recent article for *Instructor* was "Media-Savvy Kids" (November/December 2004).