Bryan Goodwin and John Ristvey

Putting a Little Mystery in Teaching

Teachers can tap students' natural curiosity to generate interesting lessons.

Want to know a simple, surefire way to get kids interested in what you're teaching?

First, think back to your childhood. For kids, the world can be a wonderful, mysterious place. That's why, as any parent knows, children are naturally full of questions: *Why is the sky blue? Why do I dream? Why do birds fly south for the winter?* The list goes on and on.

As children grow up, they start to solve these mysteries and fill their heads with facts. Over time, they may forget the wonder that made things so interesting in the first place. Teachers often find it easy to take a Joe Friday, "just-the-facts, ma'am" approach to teaching. As a result, they blow the suspense for their students by coming right out and telling them the answers to those mysteries, rather than building their interest by posing such questions as, "Have you ever seen a shooting star? What do you suppose that is?"

A few years ago, Robert Cialdini, a psychologist at Arizona State University, wrote an article titled, "What's the secret device for engaging student interest? Hint: The answer is in the title." In his article, Cialdini (2005) recounted his own effort to sift through dozens of science articles in hopes of figuring how he might present complex content to his students in an interesting fashion. What he found was that instead of beginning with a suspense-blowing opening sentence—à la, "In this article, I will present arguments in favor of my theory of XYZ"—engaging science writers take an altogether different approach. They pose such questions as, What are the rings of Saturn made of? Rock or ice? Then they build suspense about their topic—arguments in favor of rock and ice—before finally resolving the mystery at the end of the article. (The answer, in this case, is both.)

Teachers can do the same thing in their classrooms. Instead of coming right out and providing students with the answers, they can build suspense, piquing students' natural curiosity. Teachers can guide students, revealing one interesting plot twist after another, to the key knowledge or insight they want their students to learn. To illustrate, here are a few

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brief examples drawn from classroom materials and lesson plans that McREL, a nonprofit education research and development organization, has developed for NASA to help bring the science of unmanned space missions into schools and classrooms.

What's in That Comet?

Everyone has seen photographs of comets—those brilliant celestial balls of fuzzy light with a tail that appear periodically (e.g., 75 years in the case of the perhaps-most-famous comet, Halley's), glowing brighter and brighter as they approach the Sun before fading as they return into the recesses of the solar system. But what exactly is a comet? What makes them glow? What's in that long tail? And so the mystery begins.

Now comes the fun part of this lesson: students engage in hands-on sleuthing to figure out the composition of a comet. In an adaptation of the classic Halloween game in which students feel "brains" (Jell-o) or "eyeballs" (grapes), students reach their hands into a series of "Comet mystery boxes" to feel a variety of materials that represent the materials in a comet: dirt and dust, ice, and a potato (to represent the hard, irregularly shaped nucleus of the comet). Students then play detective, recording their observations and speculating in groups about the composition of a comet.

You can find this lesson online at http://stardustnext.jpl.nasa.gov/education/pdfs/Comet_Mystery_Box_TeacherGuide.pdf.

A Visitor From Outer Space?

Teachers can create another backyard mystery about meteorites. Students may be startled to learn that all around them, perhaps even in their own backyards, are visitors from outer space. Like the aliens in many sci-fi movies that disguise themselves as humans, those extraterrestrials—meteorites—can appear to the untrained eye to be ordinary Earth rocks. So how can they tell the difference?

Through an online interactive simulation developed for NASA's Dawn mission (http://dawn.jpl.nasa.gov/Meteorite/index.asp), students learn the telltale characteristics of meteorites (e.g., presence of a shiny metal, attraction to magnets, density greater than most earth rocks) and use these to distinguish meteorites from "meteor-wrongs"—Earth rocks that may have some of the properties of meteorites.

To Boldly Go

Mathematics teachers can get into the mystery act too. Math formulas are, themselves, solutions to what were once mysteries, such as how to calculate the area of a circle or the length of the hypotenuse of a right triangle. It's easy to overlook this insight and leave students working problems without knowing what mystery they're trying to solve—which can feel like dusting for fingerprints without knowing what crime was committed.

One real-life puzzle that requires sophisticated mathematics is how to navigate a spacecraft to meet up with an object in space, where there are no road maps, landmarks, or mile makers to guide the way. In Extreme Navigation, a lesson plan developed in conjunction with NASA's Stardust-NExT mission (http://stardustnext.jpl.nasa.gov/education/index.html), students take on the roles of a navigation team, a spacecraft, a comet, the Earth, and the Sun to simulate how NASA mission planners guide a spacecraft to rendezvous with a comet, which is not unlike trying to hit one speeding bullet with another speeding bullet. In a large area, such as a soccer field, students use string to mark off and simulate the orbit of a comet as well as the trajectory of a spacecraft launched from Earth. After experimenting a few times with various speeds and timing, students develop formulas for calculating the necessary speed of the spacecraft as well as when the objects will meet in outer space.

Tapping Students' Curiosity

Researcher John Medina (2008) noted that as a species, human beings are naturally curious

problemsolvers. Exploring and solving mysteries appear to be hardwired into the human brain, perhaps as a survival mechanism—those early humans who failed to take in important information about their environment, such as which berries to eat and which to leave be, were, no doubt, less likely to pass on their genes.

Medina, who teaches at the University of Washington School of Medicine, noted that one of the great strengths of medical schools is that students must solve real-life mysteries (e.g., Your patient is presenting with symptoms X, Y, and Z. What might his condition be?) "This model," wrote Medina (2008), "provides the single most natural harness for the exploratory instincts of the human species I have ever encountered" (p. 276).

McREL author and long-time science educator Anne Tweed (2009) also encourages science teachers to "think about the many ways to use the wonder, mystery, and investigations that are part of science to develop students' intrinsic motivation" (p. 160). In short, posing mysteries is not just a gimmicky way to increase the entertainment value of a lesson; it taps into students' innate human desire to explore and learn about their environments.

So as your teachers plan their next lessons, ask them, What's the mystery here? **PL**

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Bryan Goodwin *(bgoodwin@mcrel.org) is the vice president of communications and marketing at McREL. He is a coauthor of* The Future of Schooling: Educating America in 2020 *(2010, Solution Tree Press and McREL).*

John Ristvey *is a senior director at McREL.*