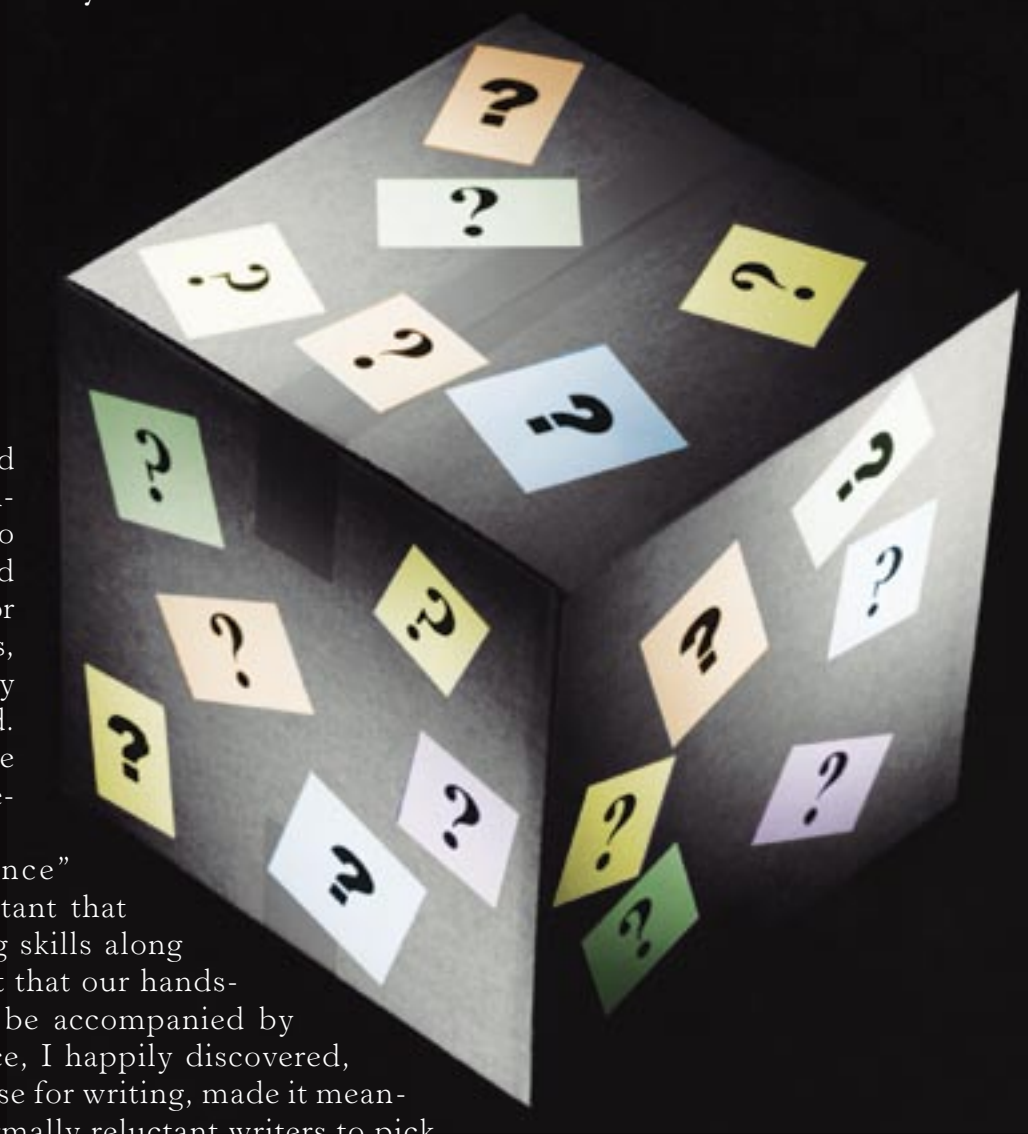
Mystery Box Writing

This fun science/ writing activity helps students develop observation skills while motivating students to write.

By William Straits



My search for integrated writing and science connections began years ago when I was teaching seventh- and eighth-grade science at a school for dyslexic students. Like any class, the interests and abilities of my students were all across the board. However, one characteristic all the students had in common was a reluctance to write.

Although I was the "science" teacher, it was critically important that I help students develop writing skills along with content, so I made a point that our hands-on science experiences would be accompanied by a related writing lesson. Science, I happily discovered, provided students with a purpose for writing, made it meaningful, and motivated these normally reluctant writers to pick up their pens.

One of my favorite science writing activities that grew out of this experience is what I've come to call the "Mystery Box" activity. It can be adapted successfully for use in myriad ways—as part of individual, small group, or whole-class instruction—and at various grade levels from elementary through middle school. (I know, I've almost tried them all!) I encourage you to try it with your students, too.

What's in the Box?

The activity begins when I bring a mystery object or organism into the classroom, hidden in a box. Typically, I select items that will introduce a new unit of study or that relate to the unit we're currently studying. I also sometimes use this as a means for revisiting topics covered earlier in the year. (I notify students when it's a review organism/object; they are otherwise safe to assume that it relates to the day's topic.)

I have used beetles, spiders, screws, and various plants for this activity (see Figure 1 for additional suggestions). I also use models—answering questions as if they were the real thing, but I include a discussion of the use of models in science. For example, after revealing a toy airplane I'll ask, "How is this like a real airplane?" and "How is it different from a real airplane?" and then we'll discuss why scientists often use models to represent objects and processes in science (e.g., "Why did I use a model airplane instead of a real one?").

The activity occurs in two phases. The first phase introduces the organism/object to the students and focuses on science-process skill development. Specific skills applied during the mystery organism/object activity include questioning, predicting, interpreting information, observing and recording observations, and critical thinking.

In the second phase, students complete language arts tasks that relate to the mystery organism/object at a writing center. Specific language arts knowledge and skills can include: comparing and contrasting; identifying parts of speech; and developing concepts through concept map(s) and/or definition diagram(s).

Start With Questions

When the activity begins, students will want to ask very specific questions (e.g., "Is it a soccer ball?" "Is it a kitten?"). In challenging students to determine the contents of the mystery box, I tell students they may ask me three types of questions:

- "Does it ____? / Can it ____? (verbs),"
- "Does it have ____? / Is it a ____? (nouns)," or
- "Is it ____? (adjectives)."

The number of questions between guesses depends on the accuracy of the guesses. If the class seems far from finding the answer, I'll answer several questions before asking for guesses; if they are narrowing in, I'll provide less information between guesses.

These "yes or no" questions help students gather information that will inform their inferences of what is in the mystery box. A typical exchange might be something like this:

- Student 1: "Is it alive?"
  Teacher: "Yes, it is alive."
- Student 2: "Can it move?"
  Teacher: "Yes, it can move."
- Student 3: Does it have six or more legs?"
  Teacher: "No, it doesn't have six or more legs."
- Student 4: "Does it have four legs?"
  Teacher: "No, it doesn't have four legs."
- Student 5: "Wait a minute, does it even have legs?"
  Teacher: "No, it doesn't have legs."
- Students: (groan)
- Student 6: "It's a snake! Is it a snake?"
  Teacher: "No, it's not a snake."
- Students: (more groans)
  Teacher: "Ok, write (draw) what you think the mystery organism is."

Throughout this exchange, students (or I) write the information (e.g., "alive," "can move," "does not have six or more legs," etc.) on one of three pieces of chart paper, listing verbs, nouns, and adjectives each on a separate piece. After students record their guesses, I call on students for more questions, periodically stopping to record new guesses. The number of questions between guesses depends on the accuracy of the guesses. If the class seems far from finding the answer, I'll answer several questions before asking for guesses; if they are narrowing in, I'll provide less information between guesses. Used at the beginning of a unit, this exercise helps

Figure 1.

Ten "get-you-started," never-fail mystery organisms/objects.

Organism/Object	Notes
Mealworm	These are readily available, yet often completely unfamiliar. Useful for introducing life cycles.
Goldfish	Often students will focus on terrestrial animals. This activity is great for introducing young children to aquatic organisms.
Tree seedling	The idea that a tree can fit in the box often doesn't occur to students. This mystery organism segues nicely into lessons on (plant) growth.
Magnet	The classic U-shaped magnets seem to work best initially; you can challenge students by using different shapes.
Model of a volcano	In my experience, students sometimes need a little more direction with Earth and space science topics—be ready to give some hints.
Thermometer	More appropriate with older children, although primary grades can be successful if they know the mystery object is something you use to learn about weather.
Rock	This is a fun one. Because there are so many different types of "rocks," responses sometimes lead students away from the answer. (e.g., "Yes, it is magnetic." (Magnetite), "It is pink." (Rose Quartz), "No, it's not heavy for its size." (Pumice))
Globe	Readily available mystery space science object. A relief, rather than a political one, works best at the science writing center.
Any body part (or model thereof)	Helps students to think of body parts, locations, and functions. Works great as a review—students will identify the mystery organ, bone, facial feature, body part, etc., fairly quickly.
Water	Like rocks, this object can be tricky: It moves—"it must be an animal." It conducts electricity—"it must be made of metal." And, it connects to many topics within the science curriculum.

students to activate relevant prior knowledge and gives me a great idea about what they know about the topic before instruction.

When conducting this activity early in the school year, I usually have to answer between 10–15 questions before students begin making inferences as to what object is in the box. Students usually figure out the object in 45–50 questions total. By the middle of the year, as students' questioning and critical-thinking skills improve, inferences and drawings are made after the first five questions, and the mystery organism/object is found out in just a few minutes, sometimes in as few as 8 or 9 questions. Interestingly, it's been my experience that rather than waning, enthusiasm for this activity grows as students become more adept at using these science process skills.

I Think / I Infer...

As students ask their questions, I periodically ask them to stop and draw or write predictions based on what they know so far:

"I think/infer (I use "think" and "guess" with primary-level students and "infer" with older students) that the mystery organism/object is _____." We learn about inferences using the "Earthlets" chapter of *Picture-Perfect Science Lessons: Using Children's Books to Guide Inquiry* (Ansberry and Morgan 2005).

I also ask, "Are we 100% certain?" Although many students, especially younger ones, will be extremely confident in their responses, none will be absolutely certain. I then point out that scientists can never be 100% certain either—that's why they keep doing science, asking questions, and getting more information." I then ask, "If we want to get a better idea of what the mystery object is, what should we do?" It delights me to hear a class of young scientists reply, "Ask more questions!"

At the end of the questioning phase, the object in the box is revealed, and the list of verbs, nouns, and adjectives collected in the questioning phase is gathered for use in the next phase of the activity—the writing center.

After a bit of practice, students become very adept at asking illuminating questions and honing in on the mystery organism/object. If the class is about to identify the organism/object too quickly (i.e., the word lists are insufficiently developed), I will "outlaw" noun questions, forcing the class to in effect expand their description of the organism/object.

Students, particularly students in upper elementary grades, come to see this outlawing as something to be proud of ("Yeah, we got you Mr. Straits!") and strive to solve the mystery.

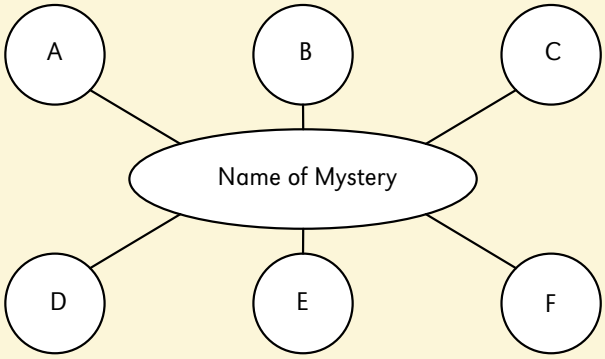
When a class is unable to identify the organism/object within the allotted time, students often analyze questions and answers looking for the information that led them astray. Occasionally, this leads to some great debates. "Do chrysalises move?" "Does water move?" "What color is a chameleon?" Sometimes after revealing an organism/object that had stumped the class, we'll brainstorm questions that the class should've asked. I highly prize this analytical thinking.

The "reveal" brings up an important misconception about the nature of science to address: Scientists are not able to "look into the box" and find an absolute answer, they must always keep asking questions. Cutting the activity short and not revealing the mystery organism/object is a good way to initiate this discussion.

Figure 2.

Suggested writing center activities.

- Create a fictional story using vocabulary lists.
- Write haiku or other poems using vocabulary lists.
- Write "I am a (mystery organism/object)" riddles.
- List as many observations of the organism/object as possible.
- Draw a picture of the organism/object.
- Research organism/object and list 10 facts about it.
- Make a Venn diagram for characteristics of the organisms/objects from the past two weeks.
- Make a concept map(s) for the anatomy/composition or (and) behavior/uses of the organism/object.
- Make a Definition diagram for the organism object:



A. Dictionary definition
B. Important facts from vocabulary lists
C. Examples of the organism/object
D. Your personal definition of the organism/object
E. Important facts you discover on your own
F. Negative definition

Inspired to Write

In the second phase of the activity, small groups of students work independently at a writing center. Like all learning centers, the writing center is a designated area of the classroom where students are provisioned with the needed materials and provided time and prompts to explore a particular topic. Each week we spend 30–45 minutes in "centers." Over the course of the week, students complete five centers, of which a student favorite is the writing center. This arrangement allows me to work with a small group of students each day—addressing specific student needs and allows students opportunities to work independently as well as collaboratively. These opportunities are valuable not just in terms of learning the subject matter, but also in developing decision-making, social, and investigative skills.

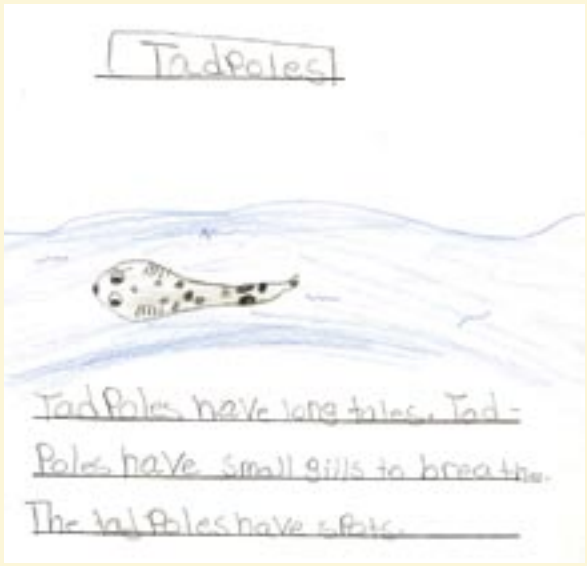
In the writing center, which has chairs and table space for three to five students to work, I typically post the vocabulary lists and place the mystery organism or object. I also provide various materials (e.g., paper, pencils, rulers, crayons, colored pencils, magnifying glasses, diagram templates (Venn, concept map, definition map), and students' previous work (examples of haiku, riddles, etc.). This center becomes a place where students can purposefully apply the various techniques and writing genres we are studying in language arts.

Typically, rather than assigning a specific writing task, I offer students a choice from three or four tasks, including story writing, creating a concept map, and others (see Figure 2). I keep a record of the types of work each student selects and encourage them to try others, either through discussion with the student or by only offering the avoided options.

The student work examples, shown in Figure 3, demonstrate the flexibility of the assignment. Some students embrace the assignment as an opportunity to write creatively, others as a chance to display their understanding of science vocabulary and concepts. Some choose to do both, writing creatively and incorporating science concepts. Subsequently, my assessment of these assignments includes a combination of language arts and science goals. Is the drawing accurate? Are the observations detailed? Does the Haiku follow 3-

Figure 3.

Student examples.



5-3 convention? Do the fictional stories demonstrate creativity? These questions are all equally important as I evaluate student work.

It's No Mystery

I bet many teachers use some kind of "Mystery Box?" activity as a science lesson at some point in the school year. By using it routinely as part of my science lessons and by adding the dimension of incorporating a writing assignment into the experience, I've discovered these activities can greatly develop students' abilities to ask questions, make inferences, and think critically—and to motivate even the most reluctant students to get writing. What a terrific combination!

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William Straits (wstraits@csulb.edu) *is an assistant professor of science education at California State University Long Beach in Long Beach, California.*

Resources

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Connecting to the Standards

This article addresses the following *National Science Education Standards* (NRC 1996):

Program Standards

Standard B: The program of study in science for all students should be developmentally appropriate, interesting, and relevant to students' lives; emphasize student understanding through inquiry; and be connected with other school subjects and is aligned with several content standards.