



Crazy for Loco Beans.(Column)

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Do you remember your amazement the first time you watched a Mexican jumping bean hop around in the palm of your hand? Investigating "jumping beans" is a unique way to get your students engaged in scientific inquiry. In this month's column, students investigate mystery objects (Mexican jumping bean seed pods) using a multicultural story book and the 5E instructional model.

This Month's Trade Books

Lucas and His Loco Beans: A Bilingual Tale of the Mexican Jumping Bean By Ramona Moreno Winner. Illustrated by Nicole Valesquez (with flip book by Mary McConnell). Brainstorm 3000. 2003. ISBN 0965117413. Grades K-4

Synopsis

Bilingual rhyming text tells the tale of a young boy who learns about the life cycle of the Mexican jumping bean moth from his grandfather. The story is told primarily in English, interspersed with Spanish words and phrases. Note: On pages 15 and 26, the jumping bean moth larva is incorrectly referred to as a "worm." Replace the word "worm" with "larva" as you read the book aloud.

A Monarch Butterfly's Life By John Himmelmann. Children's Press. 2000. ISBN 0516265377. Grades K-4

Synopsis

Concise text and realistic color paintings highlight the migration of a monarch butterfly as she journeys south to Mexico and back again. Simple sentences briefly describe each stage of development in the monarch's life cycle, and italicized words are defined in the glossary.

Curricular Connections

In the activities that follow, Lucas and His Loco Beans is read aloud in order to lead students through a scientific inquiry. We suggest rereading the story at a later time with the purpose of exploring the Spanish language. Students who speak English only can use the story and illustrations to infer the meanings of the Spanish words. This book also provides an opportunity for students who speak Spanish to share their language skills with their classmates and can be a springboard to learning more about Hispanic cultures. The use of bilingual books in the classroom suggests that teachers value other languages and cultures and provides an effective tool for raising all students' awareness of diversity by exposing them to different languages (Ernst-Slavit and Mulhern 2003).

The accompanying activities touch on scientific inquiry and life science standards, as K-3 students explore "mystery objects" and learn about the life cycle of the jumping bean moth and later compare its life cycle to that of another insect found in Mexico, the Monarch butterfly. In the 4-6 student activity, students experiment to see if temperature affects the rate at which the beans "jump."

Mexican jumping beans are actually sections of the seed pods of a Mexican shrub which contain the larvae of a small moth. An article about the jumping bean moth and a list of vendors are attached below. The USDA permits importation of jumping beans into the United States because the moths cannot infest local plant species.

If kept at a cool temperature (above freezing) and soaked in dechlorinated water for a few hours each week, jumping bean seed pods can be easily maintained in the classroom for several months. These activities are best done in late summer or fall when active seed pods are available. Jumping beans are a choking hazard for children under four.

For Grades K-3: Loco Bean O-W-L

Engage: Place a jumping bean seed pod in each student's palm and ask them to sit very still while watching the object for one minute. Do not tell them what the objects are. After a few minutes, the heat from the children's hands will cause the larvae and seed pods to move.

Explore: Give each student a copy of the O-W-L (Observe-Wonder-Learn) chart (click here to download), a hand lens, a ruler, and one seed pod. Have students draw the "mystery objects" and then record observations and measurements. Next, have them list their "wonderings" about the objects. Ask students to share some of their wonderings with the class, and allow them to share their inferences about the identity of the objects. Some students may already be familiar with Mexican jumping beans and will be eager to "spill the beans!"

Explain: Tell students that you have a book to share which may help them solve the mystery. Use paper to hide the cover of the book *Lucas and His Loco Beans* and don't tell students the title of the book! Explain that you want them to make some guesses about what the objects are without seeing the cover or title yet. Older students can write down their inferences about the mystery objects as they get clues from the story. When finished reading, share the cover and the title. Have students explain to a partner what they learned about the objects. From the reading, students will discover that "loco beans" are actually seed pods that contain moth larvae. Explain that the set of stages an animal goes through in its life is called a life cycle. Show students the diagrams on pages 26-29 and talk about each stage in the life cycle of the jumping bean moth. Have students add their learnings from the reading to the "L" column of their O-W-L charts.

Elaborate: Ask students if they can describe the life cycles of other insects, and allow time for sharing. Show them the cover of the book *A Monarch Butterfly's Life*. Ask them to think about how the life cycle of a Monarch butterfly compares to the life cycle of a jumping bean moth as you read the book aloud. After reading, make a Venn diagram on chart paper and discuss similarities and differences of the two life cycles (see Figure 1).

Evaluate: Give students pictures of Monarch butterfly and Mexican jumping bean moth life cycle phases and have them put them in the correct order, or have students create their own labeled drawings in the correct order. Ask students to describe each stage either orally or in written form.

For Grades 4-6: "Loco-Motion"

Engage: Give each student a jumping bean seed pod and have them observe its movements for a few minutes. Tell students that you have a book to share which may help them determine what makes the objects move, then begin reading aloud *Lucas and His Loco Beans*. From the reading, students will discover that "loco beans" are actually seed pods that contain moth larvae. Brainstorm a list of variables that might affect the movement of the seed pods (e.g., light, heat, sound, vibration, etc.). Next, reread page 19, "Your warm body makes them move like crazy," and ask them to brainstorm ways they could test the effect of heat on jumping bean movement.

Explore: Have teams of students design experiments to answer the question, "Do jumping beans move more at warmer temperatures?" Be sure students know that excessive heat or freezing will kill the larvae. One way to test the question would be to count the number of movements on the tabletop in one minute and compare that to the number of movements in the palm of their hands in one minute. Encourage students to control all other variables, to repeat their experiment multiple times, and to organize their data in a table and/or graph. You may want to have students design further experiments on jumping bean movement.

Explain: Have teams share their conclusions using data as evidence to support their explanations. Students should find that jumping bean seed pods move more at warmer temperatures. Ask students to think about some possible reasons for this phenomenon.

Elaborate: Have students read the article titled "The Mexican Jumping Bean" (attached below) to find out what causes the jumping bean larvae to become more active at warmer temperatures. The article also describes the fascinating life cycle of the jumping bean moth.

Evaluate: Teams of students can create posters to share what they learned about Mexican jumping beans. The posters may include data and other information from their experiments, labeled diagrams of the life cycle of the Mexican jumping bean moth, further questions, and any other information they feel is important to include.

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Connecting to the Standards

This article relates to the following National Science Education Standards (NRC 1996):

Content Standards

Grades K-8

Standard A: Science as Inquiry

Abilities necessary to do scientific inquiry

Grades K-4

Standard C: Life Science

The characteristics of organisms

Life cycles of organisms

Organisms and environments

Grades 5-8

Structure and function in living systems

Regulation and behavior

Diversity and adaptations of organisms

Resources

National Research Council (NRC). 1996. National science education standards. Washington, DC: National Academy Press.

Internet

Ernst-Slavit, G., and M. Mulhern. 2003. Bilingual books: Promoting literacy and biliteracy in the second-language and mainstream classroom. *Reading Online* 7(2). www.readingonline.org/articles/art_index.asp?HREF=ernst-slavit/index.html Wayne's Word: An On-line Textbook of Natural History <http://waynesword.palomar.edu/plaug97.htm>

Jumping Bean Vendors

Jumping Beanditos www.jbean.com My Pet Beans www.mypetbeans.com U-Payless.com www.u-payless.com/main.asp

The Mexican Jumping Bean

What is a Jumping Bean?

A Mexican jumping bean is not really a bean. It is part of the seed pod of a shrub found in Mexico. Inside the seed pod lives the larva, or caterpillar, of a small moth. The larva finds everything it needs to stay alive inside the seed pod: food, water, air, and shelter. It gets food by eating the inside of the seed pod. It gets water and air that enter the thin shell of the seed pod. The seed pod also gives the larva protection from weather and predators.

How Does It Get Inside?

In the early summer, a female moth lays her eggs on the flowers of a certain shrub found in the mountains. No other kind of plant will do. When the eggs hatch, the tiny white caterpillars chew their way into the seed pods of the shrub. The seed pods fall to the ground and split into three sections. Each section can contain a single larva. Not all of the sections contain larvae. If they did, there would be no seeds left to grow into Mexican

Jumping Bean plants!

What Makes It Jump?

The larva spins silk to line the inside of its new home. When it gets too hot, it grabs onto the silk and snaps its body to make the seed pod jump and roll. When the larva reaches a cooler spot in the shade, it doesn't move as much. If you could hear the seed pods moving around on the dry ground, you might think they sound like rain drops!

How Does It Become a Moth?

The larva spends the summer and fall eating and moving around inside its seed pod. It chews a tiny flap in the seed pod called an exit hole. As winter approaches, it begins to spin more silk until it is covered with a soft cocoon. The larva begins to go through many changes. It is now called a pupa. The pupa slowly turns into an adult moth. These changes are known as metamorphosis. The following summer, the adult moth hatches out of the cocoon and squeezes through the exit hole it made months earlier. Soon it will find a mate, lay eggs, die, and the cycle will begin again.

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