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INTEGRATION With INTEGRITY

Maximize your instructional time and meet the needs of beginning English learners and all students.

By Lisa Nyberg and Susan McCloskey

Read! Read! Read! In first grade, language arts are such a driving force; and yet, we know the students love science and art! How can we integrate the subjects, maintain the integrity of each subject area, and authentically assess the students? The key is to maximize your instruction time and integrate with integrity.

We—a first-grade teacher and part-time faculty member for early childhood language arts methods and a university science and technology methods professor and former elementary teacher—did just that as we introduced a literacy-filled unit on insects to our first-grade students, most of whom were beginning English learners. We chose the topic of insects because our students were always asking us questions about the insects they observed on the

playground. We knew insects were a natural area of interest for our students, but successful integration can occur with *any* topic. With thought and planning, you can integrate science, language arts, and visual-arts teaching techniques to maximize your instructional time and meet the needs of beginning English learners and *all* students.

Expanding Language Arts

Language arts instruction is often the cornerstone of first grade. At many schools, ours included, teachers are required to spend specific amounts of time each day on language arts. Luckily, language arts skills encompass much more than reading and writing alone. According to Tompkins (1998) there are six different language arts: listening, viewing, reading, writing, visual representations, and talking. To make the most of our instructional time in language arts, we decided to incorporate science skills and content during "language arts" time. Our plan was to construct a series of lessons based on books and other resources that coupled language arts skills with science skills of observation, comparison, categorization, application, analysis, and communication.

To support language acquisition, both the English language and the second language of "science," we would use the technique of *visual scaffolding*—providing images in a variety of forms (e.g., live insects, models, illustrations), which is particularly effective with beginning English learners as it helps students make lasting connections to new concepts. Through the technique of visual scaffolding we provided various images coupled with academic language (e.g., *insect*, *spider*, etc.).

Initial Explorations

To help the students learn about the responsibility of taking an animal from its natural habitat, we read aloud the book *The Salamander Room* (Mazer 1994). The students learned about habitats and the needs of animals.

Real insects were the catalyst for the unit. Supervised students collected all sorts of real insects into the classroom from the playground—beetles, ants, and even a cockroach! The insect guests were placed in "bug boxes," clear plastic containers. The containers had magnifiers so the students could view the insect from the top, bottom, or side. We said the insect could stay for the day, but it had to be returned to the place on the playground or field where it was found so "the insect could go home."

This prompted a discussion about the care and safety of live animals in the classroom. We talked about what types of insects they could bring into the classroom. One student found a bumblebee. We taught the students the song "Baby Bumblebee" so they understood that some insects sting. Teachers should always let parents know that they need to inform the school of any serious bee (or wasp) sting allergies. That should occur before any activity where students study insects. In any school, there are a few children who have severe allergies to bee stings. Instruct students to "ask a teacher first" before handling any insects; a good suggestion is to create a poster of "do not touch" insects that could sting or bite and make sure students know how to identify them.

The first graders also witnessed the metamorphosis of live butterflies. They observed the changes from caterpillar to chrysalis to adult butterfly. When the butterflies emerged, the students learned how to observe the butterflies in a butterfly tent. The children crawled into the tent and picked up carnation flowers placed around the feeders, which were filled with a sugar-water solution. The butterflies would land on the flowers and the students picked up the flowers to examine them closely. Many students had butterflies land on them. They were so excited, but they were gentle and respectful. When raising butterflies in the classroom, order from a reputable breeder and check state laws before releasing any.

Lesson One: *Insect* Read Aloud

Our first lesson was to teach the physical characteristics of an insect. The students were listening and viewing as we shared *Insects* (Bernard 2001). *Insects* showed students beautiful images of numbered body parts and legs and introduced the term *insect*. We pointed to each body part while repeating its name "one"… head… "two"… thorax… "three" abdomen…. The students counted along. The six legs were also counted: "An insect has three body parts and six legs." The students learned that insects have some physical characteristics that are the same (number of body parts and legs) and some that are different (e.g., color, size: big or small, wings or not, etc.). For an insect to be an insect it needed three body parts and six legs, so students were called up to count the body parts and legs of other illustrations to see if they were insects.

Lesson Two: *Spiders Are Not Insects* Read Aloud

In the second lesson, we continued to refine the students' understandings of the characteristics of insects with a T-chart and another interactive read

aloud, this time of the book *Spiders Are Not Insects* (Fowler 1996). Together we analyzed the illustrations and discussed the contents of the book. Students made observations and then documented the characteristics of insects and spiders on the chart. In addition to other differences, students noticed that spiders make silk, crawl, have hair, and do not have wings.

Afterward, we created a Venn diagram of insects and spiders to compare the similarities and differences between the two groups. Based on what they had discovered from the two read alouds, students could identify the physical characteristics of insects and that insects and spiders have some things in common (i.e., both groups are small, eat, lay eggs, and are animals).

Lesson Three: Insect or Not? Game Show

The next week, we presented a PowerPoint game show we developed called "Insect or Not?" This was a very effective lesson to engage reluctant learners. The teachers posed as game show hosts in search of contestants to look at the images projected on the screen. Students were to determine whether the projected image was an insect or not. Students were provided encouragement, extra wait time, and, if needed, allowed to request help from a friend in the audience.

The students were all quiet, wiggly bodies with shy smiles waiting to come up front. With a giant image (e.g., ant, butterfly, black widow spider, slug, etc.) looming behind them on the screen, the student would usually offer a very brief verbal response like, "Insect." We would say, "How do you know?" He or she would count the body parts and legs as evidence (categorizing/communicating/viewing/talking). When the picture of a centipede came up on the screen (to sighs and groans), we *all* helped to count the body parts and legs!

Lesson Four: Creepy Crawler Categorization

Next, students were challenged to communicate their understandings by categorizing "creepy crawlers" even further. They were given a double T-chart with the categories "insects," "spiders," and "*not* an insect or spider." Students were directed to use the resources in the classroom to find as many images of different creatures as possible to categorize on their chart. When they found an illustration that fit a certain category, they were to read the caption to find the name. The students could share information, but they each had to create their own data sheet. English learners could point to the pictures, count the legs and body parts, and point to the data sheet category and write the name.

The data sheet provided visual scaffolding by providing columns with the categories, the physical characteristics of the category, and a line drawing as an example. The students were becoming more independent as they moved from guided practice to partner practice to independent practice. The students had to use their powers of observation to count the body parts and legs of the insect and then search in the picture caption for the name of the "creepy crawler."

Lesson Five: Scientific Drawing

Inspired by a *Science and Children* article, "Drawing on Student Understanding" (Stein, McNair, and Butcher 2001), we worked to teach students how to create a scientific drawing that reflected an understanding of physical characteristics, position, proportion, form, and function. We modeled scientific drawing by teaching the students how to make observations to look for the lines and shapes in the object, to see how the parts fit together, and to notice details of form and function.

We began by holding up a grasshopper puppet that was used at the very beginning of the unit. Next to the puppet was a diagram of a grasshopper. Together, the class identified where the body parts were in the puppet model and where they were in the corresponding diagram. This helped the students understand the position of the body parts on the three-dimensional and two-dimensional visual representations. This distinction is important when scaffolding a concept visually. Sometimes we assume students can translate these representations, but the concrete to abstract distinction needs to be taught.

After clipping the diagram onto an easel with paper, we initiated the following exchange:

Teacher: We are going to draw like scientists today. Scientists have to observe very carefully. Let's look carefully at this diagram. Let's start with the head. What is the shape?" (looking closely at the diagram and allowing for wait time).

Student: A circle.

Teacher: A circle. Is it round like a ball or squished? (gesturing pressing her hands together like squishing a ball)

Student: Squished.

The teacher models drawing the "squished" circle. After the head is drawn, she draws the students' attention to the thorax. What is the shape of the thorax? How big is the thorax? Is it bigger or smaller than the head? About how many heads long is it? How does the thorax connect to the head?

After all of the body parts are drawn, the details are added. The legs connect to which body part? The thorax. Where on the thorax? The front? The middle? The back?

Finally, the little details in the diagram (e.g., the position of the eyes, wings, etc.; the lines that segment the thorax; the tiny details on the wings and legs) are pointed out to students.

Next, students combined their language arts, science, and art skills to create visual representations of insects of their choice that amazed us! The quality of the work products after the demonstration rivaled work done by intermediate students. Afterward, the teachers interviewed the students about their pictures so they could communicate their understanding of the insects' physical characteristics. Once again we were reminded to never underestimate the power of primary students. Never, ever underestimate the potential of English learners! Initially, beginning English learners may not be as verbal as other students, but provided with opportunities to show what they know, the results can be inspiring.

Lesson Six: Physical Characteristics Through Sculpture

After completing their two-dimensional drawings, students decided to venture into three dimensions and create imaginative insect sculptures with clay and pipe cleaners. Students were allowed creative license, but the insects had to be anatomically correct. The product had to have three body parts and six legs (in the correct position), and it needed to resemble a specific insect.

Assessment

When assessing student understanding, we often focus on end-of-the-year high-stakes tests, but assessment happens every day formally and informally. Assessment can look like a T-chart, a Venn diagram, a drawing, a sculpture, or a model. Assessment can sound like an interview about an illustration or sculpture or a "game show contestant" proving whether an image is an insect or not.

Science concepts can be integrated and assessed in an authentic manner. Scientists communicate their understanding as they create drawings, diagrams, and models. If assessments are thoughtfully designed and integrated with instructional integrity, student work products will reflect a deeper level of understanding, and all students can show what they know. Assessment can be fun and developmentally age-appropriate. Students and teachers can be drawn to assessment by experiencing the art and science of integration. ■

Connecting to the Standards

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

Content Standards Grades K–4

Unifying Concepts and Processes:

- Evidence, models, and explanation
- Form and function

Standard C: Life Science

- The characteristics of organisms

Assessment Standards

Standard C:

The technical quality of the data collected is well matched to the decisions and actions taken on the basis of their interpretation.

Standard D:

Assessment practices must be fair.

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

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Mazer, A. 1994. *The salamander room*. New York: Alfred A. Knopf.

Stein, M., S. McNair, and J. Butcher. 2001. Drawing on student understanding. *Science and Children* 38(4): 18–22.

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Internet Resources

Insect Lore
www.insectlore.com

Let's Talk About Insects
www.urbanext.uiuc.edu/insects