Crazy About

CRAYFISH

Using crayfish to teach habitats, adaptations, and inquiry

By Anna Endreny

What breathes and eats in water, dramatically clamps down on students' pencils, carries eggs that hatch to produce many offspring, excites students tremendously, does not die easily and stink up a classroom, and—most importantly—is able to teach students about habitats, adaptations, and inquiry investigations? The answer: crayfish.

Crayfish, also known as *crawfish* or *crawdads*, are easy to keep in the classroom, and with patience and luck, your students will observe the complete life cycle of the crayfish. They will also learn about aquatic animals and habitats and get to conduct inquiry experiments about animal behavior. My third-grade students loved learning about and caring for these animals. I encourage you to consider crayfish observations in the classroom for the enriching learning they provide.

Home for Crayfish

Before I brought any crayfish into the classroom, students learned about habitats so they could identify the different elements in a habitat that an animal may need to survive, such as plants, animals, water, air, sunlight, and soil. You can use your social studies curriculum to introduce students to different habitats, such as deserts, mountains, and oceans. Part of our third-grade social studies curriculum involves learning about different natural locations, and we aligned our study of crayfish with a study of rivers. We discussed local rivers, their surrounding culture, and the types of animals and plants in them, which included crayfish.

In addition to this social studies connection, I took the students outside to look at a habitat within a hula hoop. After placing the hula hoop on the ground, students listed all of the plants, animals, rocks, and other various items within the hoop. We discussed which items were living and which were nonliving. The students had interesting debates about this. For example, when one of the students felt that something was living because it moved, another student replied, "But, a cloud moves and it is not living." As a class we then came up with additional criterion for living and nonliving. For example, living things "eat" (obtain nutrients in some way) and grow; they also respond to their environment, breathe (or take in oxygen in some manner), excrete, and reproduce.

Once students were comfortable with the idea of habitats, I told students that they would be working in groups and observing crayfish in the classroom. Next, using internet and print resources, each group of students researched crayfish care and then designed a habitat for their crayfish using materials that I supplied—small plastic shoeboxes, rocks, plastic pots, plants (*Elodea*), and water. Students spent about one hour researching and designing their crayfish habitat and about 30 minutes actually putting it together. When each group's habitat was complete, I gave them a crayfish to observe.

Addressing Misconceptions

Several misconceptions surfaced in the course of the study. At the beginning of the unit, the students thought of food sources for animals as prepackaged food from the supermarket, not real plant and animal sources. The cat food we fed the crayfish in their artificial habitats reinforced this misconception. Thus, it was important to discuss the food sources that are available to crayfish in their natural habitat, such as fish, insects, and other crayfish, as well as plants. Students read crayfish resources to learn about their behaviors in their natural habitats (see Resources).

Another misconception was that students did not identify "air" as a necessary part of habitats, especially if the habitat was aquatic. To help them understand this, I encouraged students to observe the bubbles in the water and to hypothesize what is in the bubbles and where they come from. Students guessed that the bubbles were related to crayfish breathing, but they weren't sure what was inside the bubbles. I explained that oxygen is dissolved in water, and crayfish breathe in oxygen and breathe out carbon dioxide, as do animals on land. The carbon dioxide is in the bubbles.

The book resources we used also reinforced this knowledge. By the end of the unit, the students were regularly identifying plants, animals, water, and air as parts of different animal's habitats.

Structures and Functions

The students observed the crayfish, drew them, and made predictions about the functions of the crayfish's various structures. With their curiosity now piqued, students returned to their resources to learn the crayfish structure's names and functions. Soon they were correctly labeling their illustrations of crayfish and using terms appropriately in discussion.

At first, students did not understand that a structure's design often reflects or suggests its function. Having students describe the function of each structure and then asking questions about how the structure's shape might help with its function enabled students to connect the two concepts—*How does the shape of their claws help them catch prey? How does the shape and structure of their legs help them walk around rocks?*

The structure-to-function connection was especially evident to students when describing the female crayfish structures. The female has an *egg pore* and *swimmerets* on the bottom of her tail. Students observed that the swimmerets are designed like a basket to hold their eggs close to their body for protection. As one student explained, "the female has more swimmerets; if an egg falls, it would be caught by another one of these swimmerets."

Students also observed another adaptation—crayfish molting. In order to grow, crayfish need to shed their hard exoskeleton and expose a soft exoskeleton underneath. It took about two days for the exoskeleton to become hard. Students left the exoskeletons in the water because through their research students had learned that crayfish sometimes eat their exoskeleton for extra calcium.

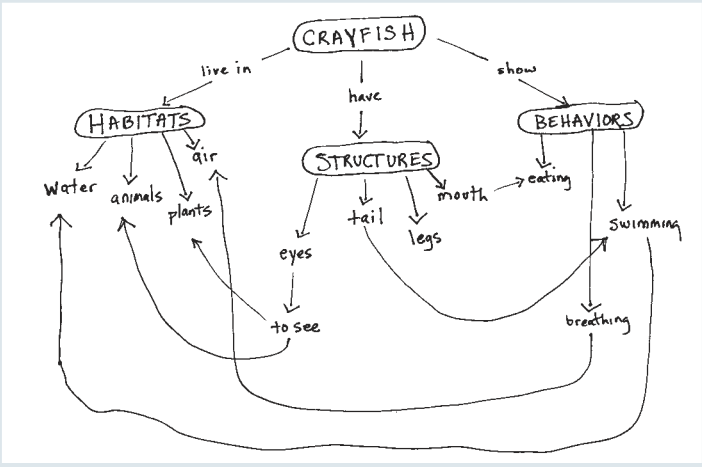
Crayfish Inquiries

As students continued to observe the crayfish, they had lots of questions. *What colors do crayfish like? Do crayfish like music? Why do crayfish lift their pincers?* After recording students' questions on a large flip chart, we sorted the questions into categories—testable questions and those that were best answered by other means such as observing the crayfish or researching the work of other scientists (i.e., the library, scientific journals, etc).

Most of the testable questions had to do with behav-

Figure 1.

Crayfish concept map.



iors (i.e., *What type of food do crayfish prefer? Does water temperature affect their activity level? Are crayfish more active in the light or dark?*). We then discussed the idea of variables and controls and refined some of our questions. Then, each group picked a question to answer through an investigation. For example, to answer the question *Do certain noises make crayfish raise their pincers?*, students might design an experiment around variables of either different volumes or different types of noises to see if this influences them raising their pincers.

The class critiqued each group's experiment design before proceeding. I stressed that feedback is necessary to create a good and fair test. After students incorporated suggested changes from their classmates and received teacher approval, they were allowed to carry out their experiment. The results of their experiments were summarized in posters that were presented to the class.

Assessment Ways

For assessment, I reviewed students' labeled drawings of crayfish and their habitats. I also evaluated students' journals and presentations and considered conversations I had with the students.

Students completed concept maps several times throughout the unit (Figure 1). To teach the concept mapping skill, I first explained the "parts" of a concept map, including concepts, linking words, and putting the most important things higher in the concept map. Then, we reviewed a teacher-made concept map together.

As students became comfortable with the process, they did concepts maps on their own, drawing concept maps for different animals of their choice. For example, next to a drawing of an animal and its habitat, students created a concept map including structures (body parts), behaviors, and habitat. Concept maps were graded using the rubric in Figure 2.

Crayfish Kudos

Crayfish are exciting animals that will teach your students about aquatic habitats, animal adaptations, and life cycles. They can be kept in your classroom with

Figure 2.

Rubric for concept map.

Objective	3—complex understanding	2—understands but needs more connections	1—beginning to understand
Student identifies that an animal's behavior has functions that help it live in a particular habitat.	Student identifies a behavior, connects it to a function, and connects this function to a particular feature of the habitat.	Student connects behavior to function but not to habitat.	Student identifies behavior only.
Student identifies that an animal has structures that help it live in a particular habitat.	Student identifies a structure, connects it to a function, and connects this function to a particular feature of the habitat.	Student connects structure to function but not to habitat.	Student identifies structure only.
Student identifies the parts of a habitat that an animal needs to live: food from plants and other animals, water, and air.	Student identifies four of the four items.	Student identifies two to three of the four items.	Student identifies one of the four items.

Crayfish Care

Crayfish can be obtained from biological supply companies (see Internet Resources). I ordered enough crayfish so that each group of four students could observe their own crayfish. Plan to keep your crayfish for several months, as it may take six weeks or more for eggs to hatch.

When you have completed classroom investigations, do not release crayfish into any bodies of water unless they came from them. They may not be native to your region and could cause harm to a local river. You could keep the crayfish as a classroom pet, thus ensuring opportunities to view the crayfish molt and reproduce. Crayfish live for several years, so you could also continue this project with other classes.

Keeping crayfish in the classroom is relatively easy as long as you have space for two large (10-gallon capacity) plastic boxes, about the size of large kitty litter pans. The containers should be filled with 3–4 cm of water that has sat out for a couple of days in order to remove the chlorine. You can also use distilled water. Crayfish survive at room temperature (65–77°F/18–25°C); however, they are able to tolerate temperatures colder and warmer than this range.

I also brought in shoebox-size plastic containers so that the crayfish could be separated for feeding and observation by groups of students at their desks.

In addition to water, *Elodea,* a common aquatic plant found in pet stores, should be placed in the containers. This provides food and shelter for the crayfish. The crayfish are fed a one square piece of dry cat food daily (about one cm in diameter) when they are in separate containers. It takes them at least 30 minutes to consume this food; do not be concerned if on certain days they do not eat it at all.

I had great success with my crayfish living throughout the unit. All five of the other third-grade teachers in the school also had success and some of their crayfish even reproduced! When this happens, the mother will carry an egg sac close to her body. Eggs will often hatch unexpectedly and a large number of baby crayfish will be in the water. The babies may eat each other, so make sure that there are plenty of places for the babies to hide such as plants, rocks, plastic objects. Instead of cat food, feed them a pinch of ground-up fish flakes.

Crayfish are a safe animal for students to work with as long as they follow safety rules for holding the crayfish (from behind on the *carapace,* or shell) so that they don't get pinched. **Students should wash hands before and after handling crayfish.** Not all children will feel comfortable handling the crayfish. If a child does not want to handle the crayfish, he or she will be able to complete meaningful observations without touching the crayfish. They can also observe while other children hold the crayfish.

Finally, it is also important that you talk with the students about respecting animal life in the classroom before the unit begins. A teacher could do this by having the students help define "respect." This could include examples such as do not touch the crayfish except to hold and observe, do not poke the crayfish, do not yell and scream around the crayfish, do not put unapproved things into the crayfish water. My students never had a problem following these rules, probably because this is an activity in which they were all eager to participate.

relative ease and working with them will be a memorable experience for all your students. I started teaching this unit seven years ago. The first year I taught it from a kit, then each year added on some additional components where I saw opportunities and needs. You can start simple with just observations the first year and then incorporate more inquiry as you get more comfortable with the unit. I guarantee working with crayfish will definitely be a highlight of the school year for your students. ■

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Resources

Grimm, P.W. 2001. *Crayfish*. Minneapolis, MN: Lerner Publications.

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

Pohl, K. 1987. *Crayfish*. Chicago, IL: Raintree.

Schaefer, L.M. 2002. *Crayfish*. Portsmouth, NH: Heinemann.

Internet

Carolina Biological Supply
www.carolina.com

FOSSWeb: Crayfish
http://lhsfoss.org/fossweb/teachers/materials/plantanimal/crayfish.html

International Association of Astacology
http://147.72.68.29/crayfish/IAA

Connecting to the Standards

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

Content Standards
Grades K–4
Standard A: Science as Inquiry
- Abilities necessary to do scientific inquiry

Standard C: Life Science
- The characteristics of organisms
- Life cycles of organisms
- Organisms and environments