Fish Aquariums at School

Aquariums in school classrooms are a great way for kids to learn about fish and biology — and they're fun too!

By Karen Randall

When my son, Robbie, entered kindergarten, I noticed there were several small aquariums located throughout his building. These aquariums are well maintained, but they are what I consider "typical" schoolroom tanks, with colored gravel, a few mismatched tetras or a couple of baby goldfish.

There is, mind you, nothing wrong with that sort of tank. It can be enjoyable to look at, and the children learn to care for the small creatures in their charge. But there is so much more that a classroom tank can offer! With the help of Rena Swyers, Robbie's teacher, we set up a tank that is more than a classroom decoration, and more than a lesson in pet care. It's a growing, vibrant slice of nature — a place for children to discover and observe.

Because the class was starting their year with a study of South America, it seemed fitting that we should set up a tank with a South American theme. This is not, strictly speaking, a biotope tank, but a theme tank. We took liberties with plant selections in order to have a beautiful and colorful display, and while most of the fish are South American in origin, they would not necessarily be found together in the wild.

Although we wanted to show how plants and animals complement and help each other, we had other goals for the tank. We wanted to be able to show the children a number of different types of animals and let them see how form and function are related.

The aquarium we chose was a 29-gallon tank that was 30 inches long. The tank is big enough to be quite stable as an aquatic environment, and to allow for a nice selection of fish. At the same time, it's small enough to be serviced easily by "bucket brigade" from the janitor's closet down the hall. The tank is situated so that it can be observed from three sides by children walking by or sitting at a nearby table, and by people in the hallway.

In a class with older children, and with children who spend more than half a day at school, I would have loved to have the children involved in the actual setup of the tank. In this case, however, the age of the children was 3 to 6 years old, so Mrs. Swyers and I decided it was better to set the tank up ourselves after school. The children would be allowed to participate in stocking the tank, and in feeding the fish. Also, with older children I would have liked to see them involved in regular maintenance as well.

We wanted a fully planted tank, so good lighting was essential. In this case, light was provided by three 20-watt, full-spectrum fluorescent tubes.

The substrate consisted of a 2-inch layer of gravel mixed with laterite and a small amount of top soil, which was covered with another inch of plain washed gravel. The filter we chose was an oversized outside power filter that would ensure good water quality in case of accidental overfeeding or other mishaps.

Carbon dioxide is provided to the tank via a yeast reactor that is kept under the tank. While we could have done without the supplemental carbon dioxide, we would have been much more restricted as to the variety of plant species we could have used.

Because of the age of the children involved, we chose a trace element supplement for the plants that need only be dosed with water changes rather than one that needs daily application. Trace element supplements contain substances that can be toxic if ingested, and we felt they were better handled by an adult only.

Plants for the tank included a black Amazon (Echinodorus amazonicus), Java fern (Microsorum pteropus), Myriophyllum mattogrossense, water wisteria (Hygrophila difformis), water sprite (Ceratopteris thalictroides), Cryptocoryne wendtii (red) and Lilaeopsis braziliensis.

The tank was fully planted at setup, and left to settle in for a week before any fish were added. After the first week, we introduced a Siamese algae eater and three Otocinclus for algae control.

Already we had lots to talk about with the kids. We explained that although the Siamese algae eater came from Asia, not

South America — he had been included to help keep algae under control. We also were able to compare two different species of fish that superficially looked quite similar. They were both colored very much the same way — grayish on top, a black stripe and white underneath — but look at the way their fins are arranged! The Siamese algae eater is built for mid-water swimming, while the Otocinclus is meant for life up against a surface. The Siamese algae eater "chews" algae off plant surfaces, while the Otocinclus rasp it off with their sucking mouths.

Next we added a butterfly Peckoltia. Again, the children were asked to observe the differences and similarities between the fish.

By now the children were getting excited, and several wanted to bring fish in for the tank. While we certainly wanted to encourage this interest, we also wanted to avoid a mishmash of fish that wouldn't fit into our carefully planned community.

A solution was found at our local aquarium shop. It was agreed that they would give us a discount on the fish purchased for the tank, and would guide the children in making appropriate choices. One child brought in a group of cardinal tetras, another picked out four different species of Corydoras. And a third brought in a group of hatchet fish.

All of these fish show strong schooling behavior if kept in groups of adequate size. The children are able to watch this behavior, and contrast the lifestyles and body shapes of bottom-dwelling, mid-water and top-swimming fish.

To help the children learn about the different fish in the tank, we prepared line drawings of each species, and a short overview of each fish explaining where the fish came from, interesting behaviors, and anything else we thought it likely the children might ask about. Mrs. Swyers planned to put these all together for the children in book form later in the year when the children did a unit on fish.

The tank has matured into a thing of beauty, and plants are harvested to share with other tanks in the school. Not only has the tank become a focal point in this classroom, but it has kindled an interest in natural aquariums in other areas of the school system.

I've had a long conversation with the elementary school science director about putting tanks in classrooms in the elementary school building, as well as more classrooms in the Early Childhood Center. There is talk afoot of the possibility of putting a tank in the Intructional Media Center (what we called the library when I was in school!) as well.

There are many more things older children can learn from classroom aquariums. The possibilities for hands-on learning include water chemistry, testing pH and other water parameters, and learning how to balance the carbonate buffering system. They can practice their math skills figuring volumes, percentages and dosing of various products used in the aquarium. In addition, they can watch the response of plants when carbon dioxide is added to the tank, and see with their own eyes plants contributing oxygen to the environment.

By careful monitoring and observation, they can experience first hand the effects of eutrophication that we see in so many lakes and ponds. An aquarium becomes an extensive learning tool, as well as being fun.

If you have the opportunity to help out with an aquarium in your local school system, put some serious thought into it. Not only is it a way to contribute to your community and your child's education, but I think you will find that the personal rewards are great as well!

Inexpensive Carbon Dioxide
Generally speaking, the photosynthesis of aquarium plants is limited by the availability of carbon dioxide in the water. Carbon dioxide supplementation need not be complicated or expensive, and gives plants an amazing boost in a tank with even moderate amounts of light (approximately 2 watts per gallon).

You can spend a lot of money for sophisticated carbon dioxide systems for aquariums, or you can use a yeast reactor. There are many variations on the yeast reactor theme, so feel free to improvise. To get you started, here's one method that has worked well for lots of people:

Start with a plastic juice bottle of approximately 2 liters in size. Make a hole in the cap just large enough for a piece of air line tubing. This can be done either with an electric drill, or by holding a nail over a hot burner with a pair of pliers until it is hot enough to melt through the plastic cap. The hole should be small enough that it takes some effort to pull the tubing through the hole with a pair of pliers. This will insure a tight leak-proof fit. For added insurance, you can glue the tubing in place with a hot glue gun. The tubing should just come through the cap, but not go far enough into the bottle that it will come in contact with the liquid below.

Using a funnel, place 2 cups of sugar and 1 teaspoon of yeast in the bottle. Then fill the bottle with lukewarm (not hot!) water to approximately the height where the neck narrows. Shake to mix, and then screw the cap on. Insert the other end of the air line tubing into the tank water. To ensure efficient distribution of the carbon dioxide in the aquarium, the ideal location for the yeast reactor air line tubing is inside the uplift tube of a power filter. Sometimes it is necessary to cut a hole in the intake strainer with a pair of scissors so the the tubing will fit.

Until the liquid in the pop bottle has thoroughly cooled, keep the bottle higher than the tank to prevent back siphoning into the bottle. After the mixture has cooled to room temperature, it's usually safe to put the bottle beside or beneath the tank. Some people like to use a carbon dioxide-resistant check valve to totally avoid the possibility of back siphoning.

Within 24 hours your yeast reactor should be producing enough carbon dioxide to make a noticeable difference in a tank of between 20 and 30 gallons. If your tank is larger, you may have to run more than one yeast reactor in series (using a gang valve to collect the output of all the bottles into one piece of air line tubing going to the tank). If your tank is smaller, you may need to reduce the amount of yeast and/or add a little baking soda to slow the production of carbon dioxide. In all cases, but particularly if you have a very small tank or very soft water, check the pH frequently to make sure it isn't dropping to dangerously low levels.

Depending on the tap water chemistry and the warmth of the room, you should find that the yeast reactor keeps producing a fairly good amount of carbon dioxide for about two to four weeks. At that point, you can revive the mixture by pouring out half the liquid and replacing it with another cup of sugar and filling it up with water again. If you let the reactor go for too long and the liquid has a strong alcohol smell when you open it up, or if it has completely ceased producing bubbles, there is probably a high enough level of alcohol to kill off the yeast. If this happens, simply empty and rinse the bottle, and start again.