Thin Skinned Amphibians

Meets 2nd Grade California Science Content Standards –2d, 4a and 4d (see Standards Key)
California Visual Art Standard 2.4 - Create a painting or drawing, using warm or cool colors expressively.
Taking It Further - California Visual Art Standard 2.2 - Demonstrate beginning skill in the use of art media, such as oil pastels, watercolors, and tempera.

Animal to Draw for Art Contest – a salamander or some other amphibian, such as a frog or toad.

Writing prompt for the sentence of the back of the student's drawing – Describe where your amphibian is living.

Lesson Objective – To understand the concept of permeability and how it effects how fast a chemical moves into an animal's body. Amphibians are more readily affected by pollution because of their permeable skin.

Time – 30-40 minutes over the course of 2 days

Background-

Salamanders represent an important part of many balanced, healthy North American ecosystems. There have been many studies using salamanders, and other amphibians, to measure the overall health of the environment. Salamanders can act as a warning of environmental problems because their bodies are very sensitive to manmade pollutants.

Salamanders, like all amphibians, have skin that is thinner than the skin of other animals. This allows for a high level of oxygen to exchange with the blood vessels that are close to the surface of the skin. This is called "permeable skin". Amphibian skin is much more permeable than other vertebrates such as birds, mammals or reptiles. It is one of the reasons some amphibians face declining populations and possible extinction.

Many amphibians use this characteristic to their advantage; amphibians that live in drier habitats can absorb moisture into their bodies from the soil. Many amphibians also use their permeable skin to help them breathe; oxygen can easily pass through the skin of an amphibian. Some salamanders are so efficient at breathing through their skin that they do not have lungs!

These characteristics also make it very easy for harmful chemicals to pass into the animal's body. Toxic chemicals found in rainwater, ponds, rivers, and creeks may kill amphibians by contaminating their bodies. Reptiles are not as susceptible to these chemicals because their scaly skin is much less permeable.

For this activity, you will be using hard-boiled eggs to show how amphibians are susceptible to pollution because of their permeable skin, much like an egg without a shell. The peeled egg, representing an amphibian, will absorb more water and the food coloring will travel further into this egg. This represents water pollution seeping into an amphibian's body.

The shell of the egg acts like a mammal or reptiles' skin. It is less permeable and therefore acts as a barrier to the water and food coloring. The water will not penetrate into the shelled egg as far as it will for the peeled egg.

Vocabulary:

Permeable - having openings that liquids (or gasses) can pass through
Metamorphosis – in amphibians, the process of changing from a tadpole into an adult

Materials –

- Hard boiled eggs (prepared prior to the class)
- Food coloring (dark colors work best)
- Measuring tapes (or you can use string and rulers)
- Clear cups
- Water
- Knife

Directions – This activity can be done in small groups or as a whole class demonstration. If done in small groups, each group will need two hard boiled eggs; if done as a whole class, you will just need two hard boiled eggs total.

Day #1:

1. Begin the activity by discussing the function of skin with the group. Why is skin important for mammals? (Protects body, heat regulation) Then discuss how an amphibian's skin is very different because it is more permeable, which can be helpful and harmful at the same time.
2. This could be done by the teacher in front of the class, otherwise divide the class into small groups. Each group should receive for the experiment:
    a. 2 hard boiled eggs
    b. 2 clear cups filled with water
    c. Food coloring
3. Instruct the groups to peel one of the hard-boiled eggs (carefully).
4. Put each egg in a cup and label each cup with "peeled" or "un-peeled."
5. Add at least 20 drops of dye to each cup and stir gently (again, dark colors work best).
6. Let the eggs rest in the water for **AT LEAST** 24 hours.
7. Have the students make predictions about what is going to happen to the two eggs. Which one will absorb more food coloring? Why?

Day #2

8. Have the groups return to their eggs and cups. Remove both eggs from the cups.
9. Gently peel the egg that still has a shell.
10. Gently cut each egg in half (from top to bottom, through the yolk).
11. Using rulers or measuring tape, measure how far into the egg the food coloring has moved.
12. Have the students write down observations about the experiment: What do they see?
13. Wondering what to do with the left-over eggs? Although you probably don't want to use these eggs in egg salad (since they have been touched) – use them for compost! By composting these used eggs instead of placing them in the trash bin, you are ensuring that the eggs don't end up in a landfill.

Questions for discussion –

If the food color was pollution, what animal do you think would be more affected by water pollution, a frog or lizard? Why?
What does this experiment tell you about the susceptibility of amphibians to water pollution? What types of pollution might affect amphibians? What is the source of the pollution?

Resources –

"The Salamander Room" by Anne Mazer
"Big Night for Salamanders" by Sarah Marwil Lamstein
http://animaldiversity.ummz.umich.edu/site/accounts/information/Ambystoma_tigrinum.html

http://www.californiaherps.com/salamanders/pages/a.californiense.html

Taking it Further – From the egg activity, collect the students' measurements to do a math lesson (e.g. calculate the average measurement of how far the dye moved into the eggs). Additionally, compare and contrast a frog's life cycle to that of a salamander. Discuss metamorphosis and, if needed, find a diagram on the internet to show your students.

Conservation Action – Salamanders and other amphibians require clean water; make sure you don't pollute storm drains or pour harsh chemicals down the drains in your home. Tell your parents not to flush old medication down the toilet, they can get into the ecosystem and harm amphibians.

Source - http://www.aza.org