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INSTRUCTIONAL PRACTICE

Safely Caring for Animals during Inquiry Investigations: Exploring Microecosystems

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"Science is a process of discovering and exploring the natural world. Exploration occurs in the classroom, laboratory or in the field. As part of your science class, you will be doing many activities and investigations that will involve the use of various materials, equipment, and chemicals…" (NSTA, 2010). Safety is always of utmost importance in an inquiry based science program and special safety rules and cautions apply when students keep and use animals in their classes.

Students' interactions with living things are important to monitor carefully because students likely don't know as much about animals as the teacher. All student interactions with animals in the classroom must be supervised. Without careful supervision, students could hurt an animal or an animal could hurt students. Furthermore, students should not remove animals from their enclosures; the teacher should do this to reduce the chances of harming or stressing any of the animals utilized in science investigations.

Space and privacy are very important factors to consider when live animals are part of students' investigations. Animals should be provided spaces that are appropriate for that species, such as a cage or aquarium, and the necessary materials within their environments for certain critters to hide. Most animals that are appropriate for classroom explorations tend to hide more than not during the day so they should be provided the environment to do so. The lack of privacy can drastically increase stress for some animals, which can be fatal sometimes.

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If preserved animals are part of an investigation, perhaps for dissections, doing so safely involves caution because of the chemicals used to preserve specimens. Proper handling of preserved specimens includes protection with latex gloves and possibly wearing facemasks. If using preserved organisms is unacceptable in a science program, safe alternatives to preserved specimens are plastic or rubber models. Of course, students directly observing once-living specimens can have profound effects on students; but safety concerns for humane treatment to animals may override the decision to use preserved specimens.

Sick animals can, potentially, pass their disease to humans depending upon the infection. Students should not touch, or in any way interact, with a sick animal; nor should they touch the droppings. Only the teacher should handle sick animals and then only if necessary and while wearing gloves. Disease-causing organisms should be kept in locked enclosures where only the teacher has access. If an animal is very sick, the teacher should consider taking it to a vet. If medication is required, of course the teacher should administer the dosage.

Some spiders and snakes produce venom, which can pose serious dangers to humans if bitten. If the teacher is going to display such creatures, extreme caution must be exercised; for example, securely locked cages may be displayed for the students but cages must be kept in a secure location where only the teacher has access.

The legalities of displaying and keeping animals in the classroom are extremely important to teachers, administrators, parents, and the school district. In addition to safety considerations for all involved, laws exist that are designed to protect animals, especially those on endangered lists. Perhaps special permits are required for keeping or experimenting with certain animals. It is the responsibility of the teacher and administrators to know and follow the laws and procedures for safely and humanely including animals in the school curriculum. Students can learn a great deal working directly with animals but their investigations must be done safely and humanely.

Applying Safety Guidelines during an Investigation

Let's do an investigation that includes the use of animals and identify places where safety guidelines apply. The following investigation represents open-ended inquiry with minimal structure, as compared to a learning cycle (Marek, 2009; Marek and Cavallo, 1997), which is structured inquiry. This long-term activity uses animals and is designed to allow students to set up a special biological system and to discover a variety of concepts associated with or inherent in an aquatic microecosystem.

Engage students in the investigation with the question: what is a microecosystem? Students likely hold various understandings and misunderstandings of a microecosystem and these will become apparent

while discussing the engagement question. An *ecosystem is an environment plus the associated organisms* so a microecosystem is a small environment. For our investigation, we will build and observe a type of a fresh water "aquarium". [Related concepts associated with microecosystems will be discussed and developed throughout this long-term investigation. The *names* of some of these *concepts* include: *pollution, producers, consumers, decomposers, decomposition, ecosystem, balanced ecosystem, biotic and abiotic factors, death and dying if fish or other animals or plants die.*]

After setting up and observing this aquatic microecosystem for several weeks, students will participate in discussions led by the teacher and guided by the central question, what concepts and skills did you learn from building, observing and safely maintaining a microecosystem? The concepts should be identified and developed, or described, during these class discussions.

Let's Get Started

The materials needed per group of 2-3 students are a) one gallon, plastic or glass container, which has been carefully cleaned; b) sand or soil; c) tap water aged at least one day; d) various aquatic plants and animals which can be collected from area ponds, lakes, or purchased from a pet store; and e) light source. Examine the safety guidelines described previously and insert the appropriate safety rules in the materials list and in the following procedures. In other words, apply what your learned from reading the guidelines for safely caring for animals used in the classroom.

Place about an inch of soil on the bottom of a clean, one-gallon container. Add tap water to the container and fill to about one inch from the top of the container. Let the water set or "age" for at least one day. [Why do we need to age the tap water?] Collect an assortment of aquatic plants and animals from a pond or purchase them from a pet shop. Add a variety of each to the microecosystem, cover, and place near a light source.

Observe your microecosystem daily and record changes. Prepare data sheets to make observations for several weeks. Continue observations and recordings as long as needed for students to experience changes in their "special aquaria". After the first couple of weeks, students will record changes when they occur and not necessarily every day. They should draw and color their microecosystem on the first day, the last day, and sometime in between. Encourage the students to carefully maintain thorough notes throughout the open inquiry investigation.

Suggested questions to guide observations and discussions are a) what observations did you make; b) what changes did you observe in your microecosystem; c) what skills did you gain from this investigation; and d) what science concepts did you learn from this investigation? Discussions will occur throughout the investigations or when something special

happens (e.g. newly hatched fish or snails, an animal dies, decomposition of organisms, condensation forming on the top of the microecosystem).

Endnote

Foci of class discussions will vary, of course, depending upon the observed changes in the microecosystems, students' observations and interests, and your (the teacher's) interests and priorities. Keep in mind the fundamental guideline for this unstructured inquiry: what are students learning and when is "enough, enough"!?

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References

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