SURVIVAL ADAPTATIONS

Performance Standard 12B/11B.G

Students will apply the processes of technological design to explain interrelationships of adaptations and ecosystem survival accordingly:

- *Knowledge*: Identify the characteristics that enable a living organism to adapt, compete and/or survive in an environment.
- *Application*: Design a habitat model which provides the essential components for its organisms.
- *Communication*: Explain how the characteristics of a habitat relate to the functional and structural characteristics of its organisms.

Procedures

1. ***In order to know and apply concepts that describe how living things interact with each other and with their environment (12B) and the concepts, principles and processes of technological design (11B),*** students should experience sufficient learning opportunities to develop the following:
   - Identify the basic biotic and chemical survival components for the habitats of certain organisms as success criteria.
   - Identify the specific adaptations of specific organisms as additional variables for survival.
   - Design an artificial habitat for an organism which replicates its home habitat components.
   - Propose logical sequence of steps and necessary materials for design construction.
   - Predict proportional scale for actual parameters and materials.
   - Compare characteristics from actual habitat to model habitat.
   - Display habitat model and explain design parameters to insure organism survival.

   Note to teacher: This activity relates to knowledge associated with standard 12B, while addressing the performance descriptors for stage G within standard 11B. This activity is taken from the Project WILD Aquatic, K-12 Curriculum and Activity Guide, through permission of the Illinois Department of Natural Resources. More information about this resource is available through: Office of Land Management & Education, #1 Natural Resource Way, Springfield, IL 62702, Phone: 217/524-4126, Randy Wiseman, *rwiseman@dnrmail.state.il.us*
2. Have students review and discuss the assessment task and how the rubric will be used to evaluate their work.
3. The premise of this activity is the design of the habitat for selected aquatic organisms for a new zoo. The major purpose of the activity is to recognize and appreciate the complex life requirements of aquatic wildlife by focusing on the artificial habitat conditions of zoos and aquaria.
4. Teams of 2-4 students will select one of the following animals (by random drawing): trout, shark, goldfish, sturgeon, sea otter, largemouth bass, water strider, beaver, diving beetle, killer whale, penguin, sea turtle, alligator, Siamese fighting fish, frog and oyster. Each team will be responsible for designing an artificial habitat in which their animal could successfully live. Students should research resources to determine the life requirements of each creature and the characteristics of the natural habitat of the animal. Each team is to design and build a model of the zoo or aquarium habitat that would be suitable for their animal's survival and comfort in captivity. Establish a scale for the exhibits (for example, one inch = five feet for the large animals; actual size for the insects.)
5. Each team will display its model and report a description of the basic biological needs of each animal as well as the description of the natural habitat's characteristics. They should point out how their models meet the animal's needs specifically. They should show conclusions about the minimum necessary components for survival for all of the animals studied.
6. Evaluate each student's work using the Science Rubric as follows and add the scores to determine the performance level:
   - *Knowledge*: The descriptions of the characteristics of organisms that enable them to survive in an environment were complete and correct.
   - *Application*: The zoo habitat designs for their selected animal were plausible and complete.
     Communication: The design and presentation for habitat replication were well-organized, well-detailed, and well-reasoned.

Examples of Student Work not available

Resources

- Copies of the Habitat Background resource
- Science Rubric

Time Requirements

- One class periods for introduction; 2-3 days for habitat modeling and 1 day for class presentations

DESIGNING A HABITAT BACKGROUND

Zoos and aquaria are for the most part artificial habitats. The basic life-giving conditions of food, shelter, air, water and space in a suitable arrangement for animals to survive seem obvious. However, in aquaria, water is a uniquely sensitive part of the habitat. The surrounding envelope of water must meet specific requirements for different aquatic life forms. Slight changes in salinity, pH, dissolved oxygen and the presence of a wide range of pollutants can spell disaster for certain aquatic organisms.

To successfully house aquatic wildlife in zoos and aquaria, careful attention must be paid to the range of conditions that each life form can tolerate. There are also certain physical requirements in terms of the shape and dynamics of the exhibit that must be compatible with each creature. For example, some fish require moving water or currents. Others prefer almost static conditions. Some prefer deep water and other shallow rocky bottoms. Penguins prefer refrigerated settings. the variations are remarkable when one considers designing habitats for microorganisms in pond water and mammoth habitats for killer whales and walruses.

Concern for the physical requirements of animals must go beyond meeting minimum survival needs. Attention is also given to the animals' comfort, creating conditions as similar to those in their natural habitats as possible.

In the growing practices of aquaculture (human cultivation of freshwater organisms) and mariculture (human cultivation of oceanic organisms), research is conducted regarding habitat requirements. Often natural streams, rivers, lakes and even the ocean are used in these enterprises. Attention to water quality and disease control is just as important in these settings as it is in the confined habitats of zoos and aquaria.