

A PLACE CALLED HOME

GRADES 3–6

CLAUDIA FOWLER

OVERVIEW:

Man has built incredible structures over time but nothing can compare to the detail and complexity that is found in the natural world of architecture. In this lesson, students will examine some animal architecture constructed by birds and bees and will learn how man has been inspired by the work of these two species.

- large mixing bowl
- large mixing spoon

ITV SERIES:

Dr. Dad's PH³: Architecture

LEARNING OBJECTIVES

The students will be able to:

- list three types of bird nests
- name two American architects whose designs have been influenced by animal architecture
- build an adobe structure
- discuss the function of homes in the animal world

MATERIALS

PER CLASS:

- pictures and/or examples of various nests
- Master copy of pentagon and hexagon

PER GROUP OF 4 STUDENTS:

- Adobe direction sheet
- several empty boxes such as large kitchen matchboxes
- water
- straw (broken into small pieces)
- sand
- dirt

PRE-VIEWING ACTIVITIES

The ability of an animal to build a structure is usually the result of either an innate behavior or a learned behavior. Those animals that are born knowing how to build a particular structure are said to exhibit an “innate behavior” while those who build by watching others build are said to exhibit a “learned behavior.” In some cases, only one member of the male and female pair will build; in other cases, both sexes contribute to the construction. NOTE: You can point out to students that they have to **learn** to ride a bicycle but the act of blinking their eyes is an **innate** behavior, one that they are born knowing how to do.

One of the most obvious forms of animal architecture is the nest. As far as diversity goes, there are almost as many different nests as there are animals! Insects, fish, reptiles and mammals build nests, but probably the champion nest builders are the birds! NOTE: Try to have several examples of nests to show to students. In the first video segment, students will be shown several of the basic types of nest, including a woven nest, open cup nest and an excavated nest. Next, students will have the opportunity to discuss the structure of a bee hive and will follow-up with the influence that the bee's hexagonal cone had on the designs of Frank Lloyd Wright.

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FOCUS FOR VIEWING

Students should be in small groups. To give them a specific responsibility while viewing the first segment, ask that each group try to determine similarities between the types of animal homes seen on the video and common manmade structures with which they are familiar.

VIEWING ACTIVITIES

Start the video from the beginning and play until Olivia says, “Hey Dad, What is that hairy looking thing?” **Pause** in order to give students the opportunity to discuss and list some types of bird nests with which they are familiar. At this point, ask students, “What is the function of a nest?” Do all birds use a nest for the same purposes?” (protection, to lay eggs, raise young, warmth, etc.) **Start** the video and play until the end of the segment on birds. **Pause.** Have students compare their list of types of nests to those on the video in order to assess their knowledge. Next, tell students that they will be looking at a bee hive. Review with students the structure of the bee hierarchy and instruct them to be thinking (within their groups) about the following questions: 1) are all of the bees are equal partners in the colony? (No, the queen lays eggs, the drones mate with the female, and the workers build, keep the hive clean, take care of the developing young, etc.) 2) the term “worker bee” is sometimes used to describe an individual who does all of the work in an office, etc. Explain. 3) what is the shape of the honey comb? (six sided). **Resume** viewing the video in order to allow students to view the segment on the bees. **Pause** at the end of the bee segment. Discuss the three questions posed previously. Ask students if they can determine why the 6 sided honeycomb is more efficient in storage of honey than a 4 sided cell or even a round cell. Let students draw out on paper and group several cells together in order to illustrate the point. (The 6 sided structure allows for maximum storage space.) Ask students if they see any benefit to humans in construction. Ask

if they would like to have their bedroom with six sides (corners) rather than the traditional four. Point out that Frank Lloyd Wright studied bees and it was from his observations of the honeycomb that he built one of his most famous homes.

POST-VIEWING ACTIVITIES

Ask students, “Why do animals build homes?” Their responses should include some of the following: 1) to avoid enemies 2) to catch food, 3) to store food, 4) to escape temperature and 5) to raise their young. Have students name several different types of animals and the primary use of their home. (ex: spiders spin webs to trap prey; prairie dogs excavate tunnels for coolness as well as escaping prey...) Compare these reasons to why humans build homes.

Ask students to recall the type of architecture seen by the Native Americans in the Southwestern U.S. The Anasazi built cliff dwellings on “south-facing walls” so that their homes would stay cool during the day. Their homes were built into the natural contours of the canyon walls like the bank swallows build their homes on the sides of cliffs.

Adobe, which is a mixture of earth, straw, clay and water, can be molded into blocks and used for construction. Have students make an adobe house, using the directions on the following page.

ACTION PLAN

As an outside project, have students research some of the earlier types of homes built in various countries, i.e. by nomads, Eskimos, etc. and build a model of one particular type. Have students report back to the class.

Provide students with a copy of the hexagon and pentagon shapes. Instruct them to trace the shapes at least 20 times onto construction paper or other stiffer paper. Cut out the shapes and, using tape, construct

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a soccer ball. (hint: each pentagon should be surrounded by 5 hexagons) Challenge students to come up with other three-dimensional structures based upon the pentagon and hexagon shapes.

EXTENSIONS

Buckminster Fuller's geodesic dome has greatly influenced design in this century. Domed stadiums, playground equipment and homes can all be found that incorporate this very stable shape. Have students explore the strength of the dome shape. Invite a guest speaker with a background in civil engineering or architecture to meet with the class and explain the geodesic dome.

MATHEMATICS:

Have students look for various mathematical shapes in nature and in construction. For example, the triangle is a very stable shape in nature and in construction.

HISTORY/GEOGRAPHY:

Explore the building of various structures which were constructed many years ago, without modern-day materials and machinery. These could include the Great Wall of China, the pyramids, the catacombs of Rome, for example.

MULTICULTURAL EDUCATION/ART:

Some of the Native Americans patterned their pottery after the potter wasps. Research the art of this period and how the pottery was made.

ARCHITECTURE/CULTURE:

Find out more about how Frank Lloyd Wright and Buckminster Fuller were influenced by nature.

ADOBE HOUSE DIRECTIONS:

In a mixing bowl, mix 3 cups of dirt with enough water to moisten. Add handfuls of sand and straw until you get a stiff mixture. Using the empty match boxes as a mold, pour the mixture into the box. Dry in a warm place for about 10 days to 2 weeks.

Remove the paper from around one of the blocks and drop it. If it breaks, this means that it still has some water in it and must dry for a few more days. Re-test after several more days, if needed. Stack the blocks to build a small structure.

QUESTIONS:

- How do you think that an adobe builder got the blocks to stay together?
- Would rain be a problem? Why or why not?