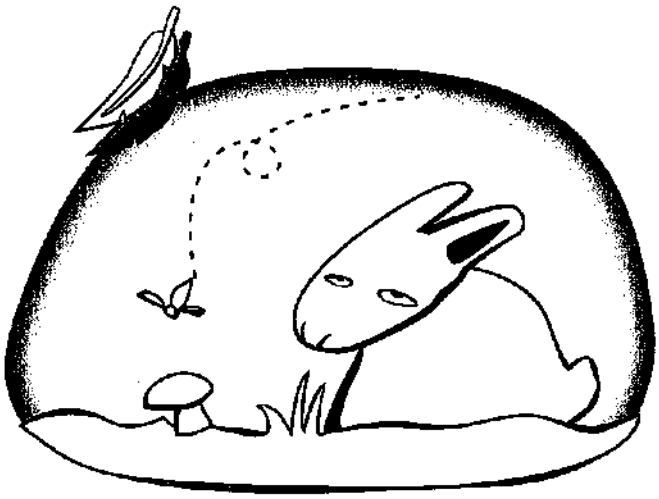
Is It an Animal?

Which of the organisms listed are animals? Put an X next to each organism that is considered to be an animal.

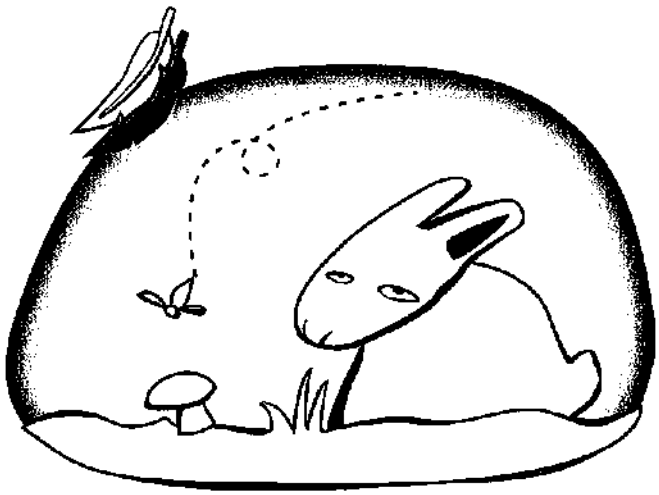


___ cow	___ spider	
___ tree	___ snail	
___ mushroom	___ flower	
___ human	___ monkey	
___ worm	___ beetle	
___ tiger	___ whale	
___ shark	___ frog	___ mold
___ starfish	___ chicken	___ snake

Explain your thinking. Describe the "rule" or reasoning you used to decide if something is an animal.

Is It an Animal?

Teacher Notes



Purpose

The purpose of this assessment probe is to elicit students' ideas about animals. The probe specifically seeks to find out what characteristics students use to determine whether an organism is classified as an animal.

Related Concepts

animals, classification

Explanation

The cow, human, worm, tiger, shark, starfish, spider, snail, monkey, beetle, whale, frog, chicken, and snake are biologically classified as animals. The tree and flower are classified as plants, and the mushroom and mold are classified as fungi. Biological classification at the kingdom level places more emphasis on cellular details (including molecular details), anatomical details (internal and external structures), and embryology than on general appearance or behavior. Animals have body plans and internal structures that enable them to obtain their food from an external source, making them consumers (or heterotrophs). All animals are consumers; however, not all consumers are animals. Animals are multicellular and their cells do not contain cell walls. Their embryonic development starts with a diploid zygote (product of the union of egg and sperm), and a defining characteristic of all animals that differentiates them from other heterotrophs is that they develop from a blastula (this is a complex idea that isn't developed until later in high school or college). The animal kingdom contains a vast variety of life forms,

including diverse examples from phyla such as sponges, coelenterates (e.g., jellyfish), mollusks (e.g., snails), worms, arthropods (e.g., insects), echinoderms (e.g., starfish), and vertebrates (including the classes of fish, amphibians, reptiles, birds, and mammals).

Curricular and Instructional Considerations

Elementary Students

By the time children enter school they are quite familiar with animals (from barnyards, backyards, and zoos and as pets) and have begun to form an operative definition for whether or not something is considered to be an animal. Their ideas are quite concrete and they tend to associate animals with pets or animals kept in a zoo, based on their everyday experiences. Their instruction focuses on a variety of animals and their needs and characteristics. However, students' learning may become quite limited if they focus only on familiar animals, particularly mammals or other vertebrates. This probe is useful in determining what characteristics students initially use to help them decide if a living organism is an animal, based on their familiarity with a variety of animals.

Middle School

In middle school, students begin to develop formal distinctions between plants and animals based on whether plants and animals make their own food and on their internal structures. Animals are considered consumers, but students may fail to recognize that a variety of different types of consumers are also animals. This idea is a grade-level expectation in the national standards. Biological diversity is addressed; however, students may still have a limited view of what an animal is.

High School

Students at this level exhibit a general understanding of taxonomic classification and use hierarchical groupings to understand that seemingly different organisms in different phyla belong to the animal kingdom. This probe is useful in determining whether students revert to their own operative definitions of an animal, even after formal biological instruction in middle or high school.

Administering the Probe

Eliminate any organisms that students are not familiar with. Elementary teachers may want to include pictures with each example. In lower elementary grades, it is helpful to have students complete the top part of the task on their own, followed by individual student interviews or a group discussion, enabling the teacher to more fully capture students' thinking. Teachers may also wish to tailor the list of items to better fit their teaching context. Middle and high school teachers may want to add organisms from all the kingdoms of life. This probe also works well in a group situation, having students vote on whether or not they think an organism is an animal and then discuss their reasons with the class. This probe can also be

used as a card sort. Ask students to work in small groups or pairs to sort cards of the names and/or pictures of organisms into two groups: those that are considered to be animals and those that are not. Observe and listen to students discuss their reasons with their peers as they sort the cards.

Related Ideas in *National Science Education Standards* (NRC 1996)

K–4 The Characteristics of Organisms

- Each plant or animal has different structures that serve different functions in growth, survival, and reproduction. For example, humans have distinct body structures for walking, holding, seeing, and talking.

5–8 Diversity and Adaptations of Organisms

★ Millions of species of animals, plants, and microorganisms are alive today. Although different species might look dissimilar, the unity among organisms becomes apparent from an analysis of internal structures, the similarity of their chemical processes, and the evidence of common ancestry.

9–12 Biological Evolution

- Biological classifications are based on how organisms are related. Organisms are classified into a hierarchy of groups and subgroups based on similarities that reflect their evolutionary relationships.

Related Ideas in *Benchmarks for Science Literacy* (AAAS 1993)

K–2 Diversity of Life

- Some animals (and plants) are alike in the way they look and in the things they do, and others are very different from one another.

3–5 Diversity of Life

★ A great variety of kinds of living things can be sorted into groups in many ways using various features to decide which things belong to which group.

6–8 Diversity of Life

★ One of the most general distinctions among organisms is between plants, which use sunlight to make their own food, and animals, which consume energy-rich foods. Some kinds of organisms, many of them microscopic, cannot be neatly classified as either plants or animals.

Related Research

- People of all ages have a much narrower definition of an animal than biologists. Typically, students think of "animals" as large, terrestrial mammals. Animal qualities commonly include the following: having four legs, being large in size, having fur, making noise, and living on land. A study of 15-year-olds found that 10% identified animals as a biologist would from an assortment of organisms. About half of these

★ Indicates a strong match between the ideas elicited by the probe and a national standard's learning goal.

students identified fish, boy, frog, snail, snake, and whale as animals (Bell 1981).

- Older students often apply more general characteristics that apply to all living things (i.e., respiration and reproducing) to animals (Trowbridge and Mintzes 1985).
- Some students, although they recognize feeding as an attribute, see it as a general characteristic of living things rather than in terms of the heterotrophic nature of the way animals feed (Driver et al. 1994).
- Studies show that preservice elementary teachers, as well as experienced elementary teachers, also hold restricted meanings for the concept of "animal" (Driver et al. 1994). This may affect students' opportunities to learn the scientific view of "animal."
- Humans are often not thought of as animals; rather they are contrasted with animals. Humans, insects, birds, and fish are often thought of as alternatives other than animals, not as subsets of animals (Driver et al. 1994).

Suggestions for Instruction and Assessment

- National standards suggest the study of living organisms begin with those that are most familiar to younger students—those found in their immediate environment. Be careful that this does not limit the child's experience to only vertebrates, particularly mammals. In later years, have students study a variety of animals representing the diversity of animal life.
- When students group organisms as animals, it is important that instruction is geared toward getting students to carefully examine the characteristics to see if they are truly exclusive.
- Instruction related to animals is often focused on a specific organism or organisms (e.g., butterflies or barnyard animals). This may help students develop an understanding of the special characteristics of butterflies or barnyard animals that define them as animals, but students may fail to generalize to other vertebrate and invertebrate classes.
- Encourage students to examine animals carefully. Identify attributes in common, even though the animals may appear to be very different.
- Provide multiple experiences in sorting and classifying animals, emphasizing the characteristics that are consistent with a particular grouping. Introduce students to the hierarchical nature of groupings (e.g., A robin is both a bird and an animal.)
- Explicitly develop the idea that all animals are consumers, but make sure that older students understand that not all consumers are animals (e.g., protists). Use nutrition as the initial way to distinguish animals from plants.
- Help students understand that the way we use words in everyday life may be different from the way words are used in science. Remind them that the word *animal* has a much more precise meaning in science than in everyday language. Be aware that the more commonly used a word is in everyday language, such as *animal*, the more likely students are to revert back to a lay

definition. Once students develop a formal definition of *animal*, challenge them to think of everyday usages of the word that would be limiting. For example, if a sign outside a store says, "No animals allowed," would you be allowed to enter the store?

- Use the interview protocol developed by Charles Barman (Barman et al. 1999) to further examine students' ideas about animals. Combine this with several other types of ways to categorize animals versus non-animals.
- Be aware that accepting humans as animals may be more than a shift in scientific thinking. Some students may have cultural or religious traditions that may make them resistant to considering humans as animals. Teachers can respect these beliefs by balancing the scientific notion that humans are biologically classified in the animal kingdom with the notion that humans are a unique and very special kind of animal.

Related NSTA Science Store Publications and NSTA Journal Articles

Barman, C., N. Barman, K. Berglund, and M. Goldston. 1999. Assessing students' ideas about animals. *Science and Children* (Sept.): 44–49.

Driver, R., A. Squires, P. Rushworth, and V. Wood-Robinson. 1994. *Making sense of secondary science: Research into children's ideas.* London and New York: RoutledgeFalmer.

Keeley, P. 2005. *Science curriculum topic study: Bridging the gap between standards and practice.* Thousand Oaks, CA: Corwin Press.

Stovall, G., and C. Nesbit. 2003. Let's try action research. *Science and Children* (Feb.): 44–48.

Related Curriculum Topic Study Guides

(Keeley 2005)

"Animal Life"

"Biological Classification"

"Biodiversity"

References

American Association for the Advancement of Science (AAAS). 1993. *Benchmarks for science literacy.* New York: Oxford University Press.

Barman, C., N. Barman, K. Berglund, and M. Goldston. 1999. Assessing students' ideas about animals. *Science and Children* (Sept.): 44–49.

Bell, B. 1981. When is an animal not an animal? *Journal of Biological Education* 15 (3): 213–218.

Driver, R., A. Squires, P. Rushworth, and V. Wood-Robinson. 1994. *Making sense of secondary science: Research into children's ideas.* London and New York: RoutledgeFalmer.

Keeley, P. 2005. *Science curriculum topic study: Bridging the gap between standards and practice.* Thousand Oaks, CA: Corwin Press.

National Research Council (NRC). 1996. *National science education standards.* Washington, DC: National Academy Press.

Trowbridge, J., and J. Mintzes. 1985. Students' alternative conceptions of animal classification. *School Science and Mathematics* 85 (4): 304–316.