Learned Behavior

Learning is a change in behavior that occurs as a result of experience. Compared with innate behaviors, learned behaviors are less rigid. Many learned behaviors can be modified to suit changing conditions. For example, drivers may have to change how they drive (a learned behavior) when roads are wet or icy, otherwise they may risk losing control of their vehicle. Because learned behaviors can be modified when the environment changes, they are generally more adaptive than innate behaviors. Species that are more intelligent typically have a greater proportion of behaviors that are learned rather than innate.

Types of Learning

Animals may learn behaviors in a variety of ways. Some ways in which animals learn are relatively simple. Others are very complex. Types of learning include the following:

1. Habituation.
2. Sensitization.
3. Classical conditioning.
4. Operant conditioning.
5. Observational learning.
6. Play.
7. Insight learning.
8. Habituation and Sensitization

1. One of the simplest ways that animals learn is through **habituation.** In this type of learning, animals decrease the frequency of a behavior in response to a repeated stimulus. This occurs when the behavior does not result in some type of benefit or reward. Habituation has been demonstrated to occur in virtually every species of animal. It is adaptive because responding to a stimulus when there is no benefit or reward is a waste of energy. An example of habituation is the behavior of certain species of small songbirds when presented with a stuffed owl or similar "predator." If a stuffed owl is placed in their cage, the birds first respond as though it were a real predator. They act frightened and try to escape. Over time, as the stuffed owl remains in the cage without moving, the birds show less response. They become habituated to the presence of the stuffed owl. A similar example of habituation is when coyotes invade human neighborhoods. They have become habituated to humans in these locations, so they are no longer afraid to approach.

2. **Sensitization** is the opposite of habituation. In sensitization, an animal learns to react more often or more strongly to a repeated stimulus. For example, exposure to painfully loud sounds causes an animal to respond strongly. The animal may act agitated and try to escape from the source of the sounds. If the loud sounds are followed by lesser sounds that are not painful, the animal may respond to them just as strongly.

Scientists have demonstrated that sensitization occurs because of changes in nerve cells and nerve pathways. These changes take place after nerves have been stimulated repeatedly. This sometimes occurs in a person who has had a painful injury. With repeated stimulation of the nerves, sensitization occurs, and the pain continues even after the injury is healed.

3. Classical conditioning is a type of learning in which an animal learns to associate one stimulus with another. In this type of learning, a stimulus that normally produces a particular behavior is linked with a second stimulus. The second stimulus is something neutral to which the animal does not normally respond. If the animal is repeatedly exposed to both stimuli together, it learns to associate the two stimuli. Because of this association, the animal will respond to the second stimulus alone in the same way that it responds to the normal stimulus. The example of classical conditioning is called conditioned taste aversion. Animals may learn not to eat certain foods if they have ever become ill after eating them. This is an adaptive trait because it may help them avoid foods that are poisonous. For example, animals that vomit after eating a

particular type of berry may learn to avoid eating berries of this type in the future. They become conditioned to avoid the berries because they have learned to associate the berries with vomiting.

4. In **operant conditioning,** an animal learns either to perform a behavior that is rewarded or to stop performing a behavior that is punished. One of the first scientists to investigate this type of learning was Edward Thorndike. In the early 1900s, Thorndike investigated learning in cats. He placed the cats in "puzzle boxes" that he had constructed. It was difficult for the cats to find their way out of the mazelike boxes, but they kept trying because they did not like being confined. When first placed in one of the boxes, a cat needed a long time to find the way out. However, the cat needed less and less time with repeated trials. Through trial and error, the cat learned how to escape from the box.

In operant conditioning, the reward may be something positive that is gained (food in the case of Skinner's rats) or something negative that is avoided (confinement in the case of Thorndike's cats). In either case, a behavior is learned through trial and error because it is reinforced by a reward. Operant conditioning can also use punishment to discourage a behavior. A punishment is something unpleasant or painful. An example of this occurs when cows are placed in a pasture surrounded by an electrified fence. The fence alone is inadequate to keep them in the pasture. It is just a single strand of wire strung between posts that are several feet apart. However, when the cows touch the fence, they receive an electric shock. They soon learn from the punishment (the shock) to stay away from the fence (the behavior).

5. Observational Learning. Perhaps you learned to avoid touching your tongue to a freezing metal object because you saw another child do it and realized how painful it was from the other child's reaction. If so, then you learned not to do it yourself through observational learning. This type of learning involves observing the behavior of another individual and either copying the behavior or avoiding it. Most studies of observational learning have focused on behaviors that are copied. Canadian psychologist Albert Bandura is world renowned for his investigations of observational learning in humans. According to Bandura, learning a behavior by observing it in someone else requires four conditions to be met:

An individual (the observer) must pay attention to the behavior of another individual (the model).The observer must be able to remember what the model has done.

The observer must have the ability or skills to perform the behavior. The observer must be motivated and have the opportunity to perform the behavior. Because of these conditions, observational learning requires considerable intelligence and is found most often in humans. However, observational learning has also been observed in many other species of animal. For example, wolves and other predatory animals that hunt in packs learn hunting skills through observational learning. Young animals observe and copy the behavior of older animals when they hunt together.

Japanese macaques have learned to wash sweet potatoes in the ocean before eating them. This behavior was first noted in one macaque. Other macaques in the troop soon learned the behavior through observational learning.

6. Playing a video game is just one of the many ways in which humans may play. Play involves behaviors that have no particular goal except enjoyment or satisfaction. Play is not restricted to humans. Most mammals and many birds also play when they are young. The drive to play seems to be innate in many species. You have probably seen kittens, like the one in Figure below, playing with a toy. Play may also involve other animals. For example, kittens often play with their littermates. Like other predatory animals — including lions and some species of bears — kittens chase, pounce on, and wrestle with one another. Prey animals such as deer and zebras play somewhat differently. They run, leap, and kick their hind legs when they play.

Kittens often play with toys.

Play is one way that young animals develop the skills needed during adulthood. How does playing with a toy prepare this kitten for catching mice as an adult? Play has risks and costs. It may increase exposure to predators and lead to injury. It also requires energy. For play to have evolved, it is likely to have significant benefits that outweigh these drawbacks. How could play be beneficial? Play is actually a form of learning. Through play, young animals learn important skills. By chasing, pouncing on, and wrestling with one another, kittens and other young predators are learning how to catch prey (see the adult cat in Figure above). By running, leaping, and kicking their hind legs, young deer, zebras, and other prey animals are learning how to escape or ward off attacks from predators. Play can also be beneficial by helping young animals develop muscles and improve their physical fitness.

7. Insight Learning

Several species of animals have been observed using insight learning. Insight learning is the use of past experiences and reasoning to solve problems. Unlike operant conditioning, insight learning does not involve trial and error. Instead, an animal thinks through a solution to a problem based on previous experience. The solution often comes in a flash of insight. Insight learning requires relatively great intelligence. Species most likely to learn in this way include species of apes (chimpanzees, gorillas, and orangutans), crows, and humans.

Examples of insight learning in apes in the wild include chimpanzees "fishing" for termites. The animals place a “tool” such as a twig in a hole of termite mound, and the termites crawl onto the twig. Then the chimpanzee withdraws the twig from the hole and eats the termites. Chimpanzees may also use leaves to sop up drinking water and rocks to smash nuts. They have even been observed sharpening sticks with their teeth and using them as spears to kill small animals for food. Another example of tool use in chimpanzees in the wild is shown in Figure below. Gorillas may use tools to solve problems as well. For example, they have been observed using small branches as walking sticks and as measuring sticks to test the depth of water before wading through it. Orangutans use small sticks to get at edible seeds inside prickly fruits without being pricked. They may also use leaves to make rain-hats and roofs over their sleeping nests. This chimpanzee is using a stick as a tool to obtain food that is out of reach. This is an example of insight learning.

Crows and related species of birds have large brains relative to their body size and are noted for their intelligence. They also use insight learning to solve problems. For example, a crow was observed placing nuts on the crosswalk of a busy street, where cars would drive over them and crack the shells. After the traffic light turned red, the crow entered the street to retrieve the nutmeats. Crows have also been seen working together to eat food scraps in a trashcan. Some of the crows propped up the lid of the can, while the others ate the scraps inside. Then the crows switched places so that all of them had a chance to eat.

Behavior Influenced by Both Genes and Learning

The ability to learn behaviors in all these different ways depends on intelligence, which is at least partly determined by genes. However, the environment also plays a role in learned behaviors. For example, classical conditioning depends on the presence of a suitable reward or punishment, and observational learning depends on the behavior of potential models.

A type of behavior that clearly shows the influence of both genes and environment is imprinting. Like instinct, imprinting results in fixed, lifelong behaviors after exposure to a stimulus. Also like instinct, imprinting leads to full-blown behaviors after the first exposure to the stimulus. However, the environment also plays a role in imprinting. The animal must be exposed to the proper stimulus during a period of development called the critical period. This period is commonly a few days or weeks in early life. In addition, the type of stimulus that triggers an imprinted behavior determines how the behavior is performed. Therefore, imprinting depends on both instinct and learning and may vary with the environment.

8. Imprinting often occurs in species in which the young are fairly mobile early in life. Animals in which imprinting occurs include species of aquatic birds and herbivorous mammals. In these species, baby animals instinctively follow and become attached to whatever large moving object they first see during the critical period. The moving object is usually their mother. Becoming imprinted on the mother helps ensure their survival. They are unlikely to wander off after they have become imprinted on her. However, the infants may become imprinted on any other large moving object if they see it first during the critical period. This could be a balloon blowing across the ground or a human walking nearby. Once attachment to the object occurs through imprinting, the behavior is fixed and cannot be changed. The animal remains attached to the object for life. Moose calves (Figure below) also imprint on their mothers. If a moose calf were to imprint on a human, it would continue its attachment to humans rather than members of its own species. As an adult, the moose would be likely to try to attract humans, rather than other moose, as mates.