Biophilia and Biomimicry

Humans are drawn to and draw inspiration from nature

Biophilia, literally "love of life," describes the innate tendency humans have to seek connections with nature. Edward O. Wilson, the entomologist who introduced this concept and popularized the study of this field, defines biophilia as "the inherent human affinity for life and lifelike processes." Wilson spent much of his career gathering evidence to support his hypothesis that humans are drawn to nature because we have evolved with nature and are served by natural ecosystems. His work also points to the human longing for nature when there are not enough opportunities to interact with it. Christopher Marley, another author of a publication titled *Biophilia* (2015), reflects that humans, as a species, are burdened with stewardship over this planet and have a deep affinity and need for nature.

Biomimicry is a field of science that studies ways to imitate nature's best, time-tested ideas. Nature has had billions of years to refine itself and develop a plethora of unique structures and survival functions that can imaginatively be applied to solve problems. *Biomimetics* is a related field focused on biochemical imitation, denoting synthetic methods that mimic nature's biochemical processes.

Velcro® is one of the oldest and most frequently cited examples of biomimicry. (The word Velcro was inspired by the French words for loop and hook.) In 1941, George de Mestral looked closely at the burrs found on his clothing and dog. He designed this interlocking system, inspired by plants whose survival mechanism involved seedpods that hitch rides on moving objects and then release seeds in another location. This hook-and-loop structure has applications in many areas, from the household to the space program.

Other biomimicry-inspired innovations that students can research include:

- Humpback whales whose fins inspired wind turbines;
- Plunging birds such as the kingfisher and cape gannets that inspired the Japanese bullet train's aerodynamic shape; and
- Tendrils on climbing plants that inspired hair-holders that don't catch and tangle.

Biomimicry and STEAM

As students engage in STEAM challenges, they can discover that many solutions can be based on the patterns, physical structures, processes, models, and systems found in nature. Humans often imitate elegant natural designs and processes to create innovative solutions that solve real-world problems.

Biomimicry asks students to use the natural world as inspiration to design original solutions, as professional cross-disciplinary teams do in the workplace. These projects can include developing solutions to humans' housing and transportation problems or addressing ecological problems such as air and water pollution and destruction of habitats.

Make Thinking Visible

Just as engineers, mathematicians, scientists, and artists do, students gather disparate thoughts and translate them into actionable ideas. Sketches, hands-on prototypes, and other ways of making thinking visible help students share ideas with others and sort and prioritize what has the best promise for productive use. Look at plant and animal adaptations for examples of how the art elements solve problems. Color—including shading and subtle variations or vivid contrasts, line, shape, form, and texture—helps animals survive. What human-made designs might mimic these natural characteristics?

- A peacock's bright plumage attracts a mate and ensures survival.
- The changing color of the chameleon allows unnoticed arrivals and exits.
- Leaf shapes that match a lizard's tail or a butterfly's wings challenge visual discrimination and provide protection.

Innovations often result from combining already existing elements or systems in new ways to solve other problems. Bringing biomimicry into classrooms underscores the importance of blending each of the STEAM disciplines to view solutions with new multifaceted lenses.

By Susan Snyder