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Biomimicry Primer

Overview

The goal of this guide is to provide a framework for implementing the Biomimicry Primer.

This Primer is a prior step to Biomimicry projects such as the Glider or Spacesuit Project.
Introduction

The Biomimicry Primer introduces students to Biomimicry. This short unit (1-2 days) is recommended as a prior step to projects in the Biomimicry Series (e.g. Glider and Spacesuit).

This interdisciplinary unit aims to engage students with exciting activities, next generation technology, and a hands-on mini-design challenge.
At a glance

The Biomimicry Primer is intended as a prior step to the Biomimicry project (e.g. Spacesuit or Glider). The purpose is to introduce the concept of biomimicry and engage students with a fun, hands-on design challenge.

Students begin with a Case Study of biomimicry focused on Velcro technology. Using 3-D models, real examples, and student handouts, students develop an understanding of what biomimicry is and identify multiple examples.

In the next step, the Mini-Design Challenge, students develop deeper connections to Biomimicry by participating in a hands-on design challenge. Students construct physical replicas of burrs (the design inspiration for Velcro) and work in teams to run a relay race where they pick up and drop off their burr models using a ball of string.

After completing the Primer, students will be ready for a Biomimicry Project such as the Spacesuit or Glider Project.
This 1-2 day activity meets standards in Biology, Engineering & Technology, and Reading. Projects (e.g. Glider) that follow the Primer include a variety of activities that match to standards in science, social studies, arts, and literacy. Visit the Creativity Lab webpage for more information on these projects: [www.ptc.com/go/creativitylab](http://www.ptc.com/go/creativitylab)

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Activity 1: Velcro Case Study

Summary: Students are introduced to the big idea of biomimicry and investigate its application by focusing on the invention of Velcro.

Time Required: 30 minutes

Materials: 3-D Burr Stalk model, Biomimicry Overview, Velcro Study

Activity Procedure

Step 1: If possible, pass out strips of Velcro to students. Ask them what uses Velcro has. Ask them how they think it works. View the 3D model of Velcro on your iTunes app or PC version of Creo View.

Step 2: Tell the story of how Velcro was invented.

Step 3: Introduce the concept of Biomimicry and how the invention of Velcro is an example. Pass out the Velcro Study sheet and review its contents.

Step 4: Ask students if they know of other examples of Biomimicry. After this discussion, pass out the Biomimicry Overview and review its contents.

Step 5: Review learning and answer any questions and/or comments.

Additional resources

- Biomimicry Insitute: http://biomimicry.net/
- National Geographic: http://ngm.nationalgeographic.com/2008/04/biomimetics/tom-mueller-text
- Ask Nature: http://www.asknature.org/
- Fast Company: http://www.youtube.com/watch?v=FBUjnG1G4yQ
Activity 2: Hook & Loop Challenge

Summary: Students build burr models using craft materials and then attempt to collect and deposit as many burrs as possible in a time challenge.

Time Required: 45 minutes

Materials: 2 inch foam balls, 3-5 pipe cleaners per student, yarn ball, scissors, duct tape

Overview

This is a fun, short activity for students to deepen their connection to biomimicry and explore the relationship between structure and function in design.

In this mini-challenge, students build replicas of burrs using craft materials. Working in teams (3-5), students each build their own burr out of a 2 inch foam ball and 3-5 pipe cleaners. Paper clips are another option (easier).

The design requirement is the burr has to be picked up and delivered using a ball of string with loops protruding out (the string is meant to represent the microscopic hairs of your clothing or hair).

Working in teams in relay-race format, each team attempts to pick up and drop off all of their burrs in the shortest period of time. At the end of the time challenge, you can review with your students the impact of structure and function and share any comments on how burrs found in nature inspired their design.
Procedure

**Step 1:** Familiarize students with the challenge. Use the overview information above. View the 3D model of the Burr and Stalk on your iTunes app or PC version of Creo View.

**Step 2:** Communicate instructions: time challenge, pick up and drop off, if the burr falls over the student has to start over, limited materials (depending on your class).

**Step 3:** Organize students into teams (3-5 students)

**Step 4:** Pass out the Hook & Loop Challenge student guide.

**Step 5:** Show students the challenge arena. The pickup and drop off points can be anything as simple as taped off sections on the floor (X for the pickup, and a box outline for the drop off station) to elaborate stations that resemble a specific ecosystem or setting. A good distance is 6-8 feet.

**Step 6:** Run the challenge. One team at a time. It is required that each student in the team successfully pick up and drop off their burr with the ball of string. Time them.

**Step 7:** After the challenge, review the experience.
- What did you like about the challenge? What would you change?
- Why did you choose your design?
- How did the burr influence your design?
- Were there other sources of design inspiration?
- What designs worked? What didn’t?