Session 4: Bioinspired Design

In this VFT session, students viewed a pre-lesson video that introduced a tortoise living at the FDC. In a discussion with teachers, students made observations about the protective structures visible on the tortoise, such as its shell and claws. Referencing the tortoise's protective shell, the video made connections to how designs in nature can serve the function of protecting organisms. The pre-lesson video demonstrated how scientists and engineers take inspiration from nature to solve real-life problems like designing and building homes. Examples of natural designs like beehives and cactus spines are discussed on how they have been applied in modern day use (Figure 1). In addition, an exhibit at the FDC showcased a replica of a historical Mono tribe grape vine tepee to foster a discussion on natural building techniques. An exhibit at the ISLE was also shown featuring a replica of NASA's Endeavor shuttle, and an FDC educator explained that students will enter a design challenge with drop tests similar to the durability tests that rockets undergo to survive traveling in space in their next activity.

Figure 1. An image still of the pre-lesson video featured in the Bioinspired Design session. An FDC educator holds a screened bottom board of a beehive with a picture of bees beside her. The video is captioned and says, "So bees have inspired how we store things."

During the VFT, students addressed *NGSS* standard K-2-ETS1-2, “Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem” (National Research Council 2012). After quickly introducing the live tortoise featured in the pre-lesson video, an FDC educator asked students to take out several materials from their activity kits, such as straws, paper, a single Pringle chip, and tape. The FDC educator asked students to imagine a plan for creating a container safe enough to protect a single Pringle chip through a series of drop tests for their design. Using a sheet of paper, students sketched ideas to protect a Pringle chip from breaking or crumbling when a chip is in its container and is dropped from a certain height.

Students have approximately 20 minutes to construct their first design for the first drop test. Students dropped their first constructed design at waist level and checked to see if their design prevented the chip from breaking or cracking (Figure 2). A brief class discussion was held to discuss possible design improvements and modifications that students wanted to make for their final drop test at shoulder level. After providing another 20 minutes for the construction of the students’ last designs, FDC educators synchronized a drop-test showcase where students dropped their protective structure at shoulder-level and shared their results with the class.

Figure 2. A protect-the-Pringle structure is dropped from waist height to the floor.

The post activity for this session was an extension of the Protect-the-Pringle challenge, except with a twist. Given the same materials, teachers gave students a challenge for designing a structure to protect a Pringle chip against a water test or a rock-drop test. For the water test, students designed a structure to help a Pringle chip float and stay dry. For the rock-drop test, students dropped a rock on the protective structure at waist height and then shoulder level to see if their chip remained intact after dropping the rock. Teachers can follow a similar format to the VFT, in which students conduct an initial test, and a showcase is performed with other students to share results.