Constructing a Marshmallow Catapult

Warren James DiBiase
UNC Charlotte, USA

Judith R. McDonald
Belmont-Abbey College, USA

Kellan Strong
UNC Charlotte, USA

EXECUTIVE SUMMARY

This case will present a project-based scenario where students will take the place of an astronaut stranded on Mars. Like the character in the Disney film The Martian, the astronaut only has a small collection of "spare parts" at his disposal to ensure survival. In this scenario, our astronauts meet predators and in an effort to fend them off, they must design and construct a catapult. During this deep dive process the astronauts working in groups of four, will take an inventory of spare parts available, design and draw a plan for building, build the catapult, test the catapult, and then go through a series of revisions, retesting and sharing their redesigns.

LITERATURE REVIEW

Engineering design activities can be a powerful entry point into science learning. Attempting a design-build project, students use creativity within their project to tackle the problem (Wicklein, 2006). As students develop an understanding of design-build projects, teachers can challenge them with an application of a local community based engineering issue to create a relevant issue that students can begin to solve.

Engineering design-build projects, "hands-on" or "learning by doing," is grounded in constructivist theory (Fortus, Krajcikb, Dershimerb, Marx, & Mamlok-Naamand, 2005) that is shown to improve student achievement in higher level cognitive tasks, such as scientific processes and mathematical problem solving (Satchwell & Loepp, 2002). Current research indicates that when students are given a project-based task, their interest in STEM can be increased because it requires students to solve authentic problems based on real issues (Fortus et al., 2005). Teachers today are challenged in many ways, from administrative tasks to having students reach goals on the state mandated test scores; this form of instruction provides an engaging methodology that allows the curriculum to be relevant while teaching important skills to your students. Students will be engaged in problem-solving, using critical thinking skills, collaboration, communication, and creativity, all while learning the content you are asked to teach your students. Art and engineering embody creativity by integrating the physics of nature while using the art to creatively design the most effective object to solve a problem or solve an issue. Students will experience, or be introduced to, STEM careers while being challenged to solve a problem or issue.

Figure 1. Engineering design triangle: Next generation science standards, grades 9-12