



Defining the “Project” in Project Lead the Way

By Sheila Carmody, Project Lead the Way, marketing communications

What sets Project Lead the Way (PLTW) apart from traditional high-school and middle-school curricula? In a word: projects. PLTW, a nonprofit charitable organization that provides a robust science, technology, engineering and math (STEM) curriculum to middle and high schools nationwide, relies on an activities, project and problem-based (APPB) method of learning, meaning students learn by doing.

“As a teacher, I’m a facilitator,” said Heather Carias, a PLTW biomedical sciences teacher at Wheaton High School in Wheaton, MD. “I do a tremendous amount of planning before I get into the classroom. But when I get into the classroom, it’s my students who are doing the work.”

There are a variety of projects and problems incorporated into various scenarios throughout PLTW’s project-based STEM curriculum. Some are built in, while some are open ended and result in student innovation.

APPB learning, as used in the PLTW curriculum, does five things:

- Helps students develop skills for living and working in a knowledge-based, technological society.
- Adds relevance to the learning.
- Challenges students.
- Promotes lifelong learning.
- Meets the needs of students with varying learning styles.

Biomedical sciences

Biomedical sciences is a sequence of courses that follows the PLTW engineering curriculum’s hands-on approach to learning. The sequence generally begins in ninth grade with principles of the biomedical sciences, in which students receive a case involving a woman who is believed to have been murdered. The mystery draws them in. From her symptoms, the students have to figure out how she died. It turns out she has a host of ailments—sickle-cell disease, diabetes, and heart disease—that lead to her death. The ailments set the stage for the rest of the course.



The PLTW pathway to engineering and biomedical sciences programs have capstone courses designed for senior-level students. The biomedical sciences capstone course, called biomedical innovations, is built on eight problems or projects (five are required) that students tackle throughout the year, Carias said.

In with the first project, students design an effective emergency room. They make a Gantt chart using Microsoft Excel and give specific tasks to people in the group.

One of the eight projects requires that students design their own biomedical innovation or take one that exists and enhance it. Students have to create prototypes for the innovations and produce a marketing plan to market their innovations.

The PLTW curriculum is “focused on students’ building up the capacity for learning to solve an authentic problem,” Carias said.

Disaster relief shelter

Solving authentic problems is also part of PLTW’s pathway to engineering program , as proved by the engineering design and development projects that have emerged from it. In engineering design and development (EDD), students visualize a problem they want to solve and then brainstorm solutions, gathering information and focusing their investigation on a final solution that is the best fit.

A team of EDD students from Pike Central High School in Petersburg, IN, spent a year developing a prototype disaster shelter for their design project. The 8x5 disaster relief shelter was inspired by the earthquake in Haiti. Made of plastic panels, it has a ventilation system and solar panel on the roof. Although it took almost a year to design, it only takes about 15 minutes to assemble.

Leigh Estabrooks, an invention education officer with the Massachusetts Institute of Technology (MIT) in Cambridge, told a local newspaper, “This could be pretty big; it’s an invention that’s destined to help people pretty quickly.”

The group is working with Dove Manufacturing in Vincennes, IN, to produce the shelter, and the group members hope to market it to the American Red Cross.

The shelter will be among the featured inventions this summer at MIT’s annual EurekaFest celebration, a showcase for some of the youngest and most gifted inventors and their inventions.

Likewise, the engineering design class at Gulliver Preparatory School in Coral Gables,
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FL, worked with their fellow students in biomedical sciences when they undertook a similarly humanitarian effort for their project. They developed a portable water purification system for a children's hospital in Haiti. The device employs an ultraviolet filter powered by a solar panel and is enclosed in a mobile chassis for portability.

"We teach a lot of theory in regular education, but real learning doesn't work that way," said Ray Niehaus, who teaches EDD at Pike Central. "Everybody is different. There is some theory with project-based learning, but you have people who work on different levels. Some are more mechanical, some are more visual and some have a better understanding of electronics."

One job of a PLTW teacher is to help students discover their comfort zone and facilitate learning through that zone. "When they're doing something they feel comfortable doing, they do better," Niehaus said. "It's human nature."

Carias shared similar sentiments: "What we know as educators is the more interested and passionate students are about what they're doing, the more time they're going to invest in it and the higher quality of work they'll produce."

Collaboration

One of the hallmarks of project-based learning is it doesn't occur in isolation; it plays itself out in groups, with every student contributing to the outcome.

Carias nurtures the collaborative aspect of the biomedical sciences curriculum she teaches by taking students on a monthly basis to the National Intramural Sequencing Center, where they shadow biomedical sciences professionals. It gives them a front-row seat, which helps them to develop good soft skills or interpersonal skills that are imperative to the learning process.

At one of the few DNA sequencing centers in the world, students observe one segment of a group working on one part of the protocol. The group will then pass it along, and another group will perform another task before also passing it off. Ultimately, someone will evaluate the product, Carias said, so in the labs, students witness how collaborative the process is and the importance of each person contributing to the overall product.

For teachers, it's not only about facilitating and making sure students have the skills and learning to complete the task. It's also about how to work with students in their particular groups to help them work productively with others, Carias said.

Sheila Carmody works with marketing communications at [Project Lead the Way](#) (PLTW) in Clifton Park, NY. PLTW partners with middle schools and high schools to provide a rigorous, relevant science, technology, engineering and math education.



Project Lead the Way (PLTW) students—like these two at Maryland’s Washington County Technical High School, a PLTW model school—are actively engaged in project-based learning.