FastCAP Challenge

Implementation Stories from AM PBL Field-Testing Teachers

State: Vermont

Institution: High School

Grade level: 11th grade, 12th grade

Course: Honors Physics

Class size/group size: 10 students

Details of Implementation:
The Challenge was implemented in the curriculum as a stand-alone supplemental activity that was largely teacher-led. The class completed the entire Challenge within 1-2 weeks.

During a typical class I normally include some direct lecture and modeled problem solving (back of the book problems) along with experiments and design projects. However with this Challenge, I stepped back more and allowed students to teach themselves about the content needed to understand the problem. I circulated through the groups to check for understanding and answer questions. I also offered guidance on other resources that they could access for more information.

Another big change was working with my Alliance partner and her class of university-level mechanical engineers. We arranged for two sessions where all the students could work on discussing the problem and brainstorming ideas about how to solve it. We used the videos and also provided hard copies of the scripts as a starting point for the problem. We broke our rather large group (34 total – 10 high school students and 24 university students) into three discussion groups for the initial look at the problem. After that session, each of the teams worked together during class on three separate days to learn about the problem and possible solutions. Two weeks later, our class traveled to the University to meet again with the engineering students. At that session, we shared the discussion video and allowed the problem groups to discuss their ideas with one another in a round robin format. Each high school team met with three different university student teams to refine their ideas. Following that discussion day, the HS teams worked another day in class to refine their solutions and then presented them to the other teams using Google Slides presentations.

Assessment:
I used the peer evaluation forms provided by the PBL project. Each student evaluated his or her teammates confidentially. I included their average scores as 20% of the overall grade for the problem. I reserved the right to add my own evaluation of their participation, but the students were spot-on on their own assessments, so I let them stand in all cases.

Instructor Comments:

“Although the specific content does not "fit" with my curriculum, the problem solving was valuable because the science and engineering practices were all used to some extent in the problem solving. I really don't consider this to be a difficulty; I view it as an opportunity for my students to stretch their perceptions and exercise their skills.”

“My students are fully accustomed to team projects and embrace them with different levels of enthusiasm. They have some experience with open-ended problems and multiple possible solutions. Their biggest discomfort was with content ideas that were unfamiliar and which they had to teach themselves. All were willing and engaged during the activities. Although this activity exposed them to the risk of ‘not getting the right answer,’ all were willing to dig into challenging ideas and unfamiliar material. Each group developed their own ways of getting to the solution and how to use their resources and time.”

“This was a very positive experience for my students. They were able to teach themselves and learn from their peers in order to develop a solution. Although they experienced many moments of confusion and doubt, they worked through them with tenacity and finished the project. All in all it was a very positive outcome, even though the process was not always as easy or as pleasant as the students would have liked.”

Student Comments:

“I never realized how intricate advanced manufacturing is. I always thought it was based on the macro level.”

“I knew manufacturing was very advanced but anyone who can clearly understand the sputtering process and manipulate it to get the results they want is pretty much a genius. It is easy to forget how advanced and in depth these people go to make products the best they can be.”

“My confidence increased in these areas because unlike the task of solving textbook problems, I had the chance to learn and apply what I learned to solve something real.”

“I enjoyed looking at a physical problem with an out of the normal classroom experience. It provided a unique insight.”

“The Challenge forced me to approach a difficult problem without any previous understanding. Although this was difficult at times, it better prepared me for out-of-school applications.”