



Using a robotics competition to teach about and stimulate enthusiasm for Earth science and other STEM topics

Hildee Fike (1), Paul Barnhart (2), Corinne E. Brevik (2), Eric C. Brevik (2), Cynthia Burgess (2), Jundong Chen (3), Shawna Egli (3), Billy Harris (3), Paul J. Johanson (3), Naomi Johnson (3), Marie Moe (4), and Reba Olsen (3)

(1) STEM Coordinator, Dickinson State University, Dickinson, ND, USA (hildee.fike@dickinsonstate.edu), (2) Department of Natural Sciences, Dickinson State University, Dickinson, ND, USA (eric.brevik@dickinsonstate.edu), (3) Department of Mathematics and Computer Science, Dickinson State University, Dickinson, ND, USA, (4) Office of Communications and Public Affairs, Dickinson State University, Dickinson, ND, USA

One of the major challenges in recruiting students to careers in STEM (science, technology, engineering, and mathematics) fields is to stimulate enthusiasm about these fields in our youth. BEST (Boosting Engineering Science and Technology) Robotics is a national program in the USA that attempts to recruit junior and senior high school students (ages 13-18) into STEM careers by showing youth how exciting these careers can be by using robotics competitions. The competitions have several aspects, including robot design, software engineering, marketing, public outreach, research into the subject area of the year's tasks, and a set of tasks to be physically performed by the robots that each team builds. The tasks to be performed change every year; therefore, even teams that compete over multiple years must build a new robot each year designed to perform the particular tasks charged to them. Dickinson State University is the home to Blue Hawk BEST, one of the hubs that host the first round of competition for teams hoping to move on to regional, and potentially, national level competition.

The tasks for 2015 revolved around a mining theme. The robots needed to be able to replace the filter in an air filtration system, fix broken pipes, mine simulated aggregate, coal, magnetite, bauxite, chalcopyrite, and spodumene, and move core samples. Points were awarded for successful progress toward each task based on the difficulty of the task and the market value of the commodities. While several STEM fields are covered in various aspects of the competition, the 2015 competition includes Earth science in that the students are required to research the history and science of the commodities being mined and learn about ways the commodities are important to their lives and the economy of their particular region. Several awards are handed out to the top performing teams in various categories, including spirit and sportsmanship awards. As teams compete for these awards a raucous environment is created during the competition, with team members who are not actively competing at any given moment enthusiastically supporting their team members who are competing. However, it also generates a sense of community among the competing teams, and it is common to see members from one team assisting another team that is having problems with their robot, even though the two teams are also in direct competition with one another. The end result is an overall experience that is great fun for the competing students, but one in which they also learn about a wide range of STEM fields. In 2015, that education included an important aspect of the Earth sciences. Using similar techniques for general teaching of some Earth science topics may have promise both in terms of student learning and student enthusiasm for the subject material.