Learning STEM Education By Building Electric Vehicles

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02/07/2022

The Mountain West Grand Prix challenge is a popular event that brings student teams of single-seat electric cars that they have built to the Utah Motorsports Campus to race. The work and learning for this event start long before students make it to the racetrack.

Gunnison Valley High School's Blue Dart, #078 finished first in their division in 2021.

The student-led Draper 3 Race Team from APA was one of 24 teams to compete in the 2019 Greenpower Electric Car Challenge. Credit: Siemens

MDF parts were stacked to build a mold of the car. Credit: Siemens

The first car body is shown inverted coming out of Magic Vac's ovens. Credit: Siemens

GEAR UP schools have a long history of success at building and competing with single-seat electric cars in Utah. South Sanpete School District has had teams at the challenge since the first race in 2015. Both Gunnison Valley and Manti High Schools have consistently placed in the top teams at our annual state event. In 2017, Manti High School even took their car to the Indy 500 racetrack in Indianapolis IN to race in the nationals.

To prepare for the competition, students work in teams to design and build an electric kit car from GreenpowerUSA. Guided by teachers or mentors, teams learn by experimenting and trying new things with their vehicles. This is a project-based approach that leads students to apply what they are learning in science, technology, engineering, and mathematics (STEM) classes as they solve real challenges with their cars.

Hard work and perseverance are key factors in making this STEM learning activity a success. One of our GEAR UP schools was featured in a Siemens Solid Edge blog story by Anthony Johnson. The article does a great job of telling the experience of building a new car for the first time and is a model for future teams. It also documents the work done by the students in detailed photos. The story starts when the American Preparatory Academy Draper 3 race team was awarded a new F24 GreenpowerUSA car kit, now valued at $5,400.

The article outlines the process of learning, planning, and community support that APA's Draper 3 race team went through during their preparation for race day 2019. The students started by creating an online model of what they wanted their car to look like. They used Siemens Solid Edge 3D Design program to create and test a digital design for their car.

Since schools rarely have access to manufacturing facilities and materials to assemble the body of an electric

car, the team needed to get creative about partnering with local businesses. During an educational visit to a local vacuum molding company, Magic Vac, students learned about the process they would need to use in building their car and asked for help.

Asking and acquiring funding and support is another key aspect of the process. Students asked for donations and support from Redwood Veterinary Hospital, Magic Vac, and 4x4 Bodies. 4x4 Bodies manufacturing company donated their time and use of a machine to create the mold. Magic Vac agreed to donate their facility to produce the car body.

Building the mold was like solving a complex 3-dimensional puzzle. Starting with over 300 - 1.5-inch thick MDF fiberboard pieces, the car was built by gluing and assembling the model layer by layer and then smoothing and filling the gaps. Once completed, the mold was transported to the vacuum molding company, Magic Vac, to create the car body. Students were impressed that the model “fit the car perfectly – and looked identical to the CAD representation of the design.”

Race day arrived mid-April with 24 teams from19 schools competing. Competing teams follow guidelines requiring them to use the same standard motor and batteries in the vehicle. The event started with qualifying heats to determine which teams would advance to the final round. Qualifying cars raced in one final set. Scoring is based on the number of continuous laps, with extra points awarded for cars competing in the fastest lap.

After the race, APA's Draper 3 race team said that they “learned so much about the engineering process and were able to build a wonderful electric car. We persevered through what seemed like dead ends, and through determination made our process come to life with the help of Solid Edge. This was an awesome project.” To read about APA's car-building journey in detail, along with pictures and resources, visit the Siemens Blog.

The Mountain West Grand Prix, Utah’s Greenpower Electric Car Challenge, will take place on April 26 at the Utah Motorsports Campus. Teams must register in advance to compete in either the Goblin division for grades 4-6, or F24 division for grades 6 and up, following guidelines established by GreenpowerUSA. Public-private partnership, including generous support from rPlus Energies, a Utah-based developer of modern power plants, allow student teams to compete free of charge

The USU STARS! GEAR UP program is part of the Center for the School of the Future in the Emma Eccles Jones College of Education and Human Services at USU. GEAR UP is a national, federally funded pre-collegiate grant program that is designed to increase the number of low-income students who are prepared to enter and succeed in postsecondary education.

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