The Greenpower program inspires the pursuit of careers in science, technology, engineering, and mathematics by challenging student teams to design, build, and race a single-seat electric car. With rapid technological advancement, the need for engineers becomes more acute every day and is expected to continue growing. To help fulfill this demand, the Greenpower program challenges students from elementary school through college and beyond to design, build, and race a single-seat electric car, using the excitement of motorsports to inspire the pursuit of careers in science, technology, engineering, and mathematics (STEM).

**GREENPOWER ELECTRIC CAR CHALLENGE**
The first Greenpower Electric Car Challenge took place in the UK in 1999, and the program has since expanded to the US, South Africa, Poland, and China. Established in Huntsville, Alabama, in 2014, GreenpowerUSA (www.greenpowerusa.net) offers racing competitions for schools across the country at four levels: Formula Goblin (ages 9–11), Formula 24 (F24) Intermediate (ages 12–14), F24 Advanced (ages 14–18), and F24+ (ages 18–24). Students start with a kit car at the Goblin level and, as they progress through the program, acquire the skills and knowledge needed to build their own custom race car. There’s also a Corporate Challenge that enables companies to pit their employees’ engineering expertise against those of other companies.

The F24 challenges target middle and high school students and have a simple goal: to design and build an electric car that can go farther than the other cars in 90 minutes. Teams can either use a kit (which costs about $5,000) to assemble their car, or design and manufacture a custom vehicle. A complete F24 kit car takes 40–60 hours to assemble, depending on how knowledgeable the students are. A custom vehicle can take up to two years to design and build.

To assemble a kit car, students must first decipher the manual’s engineering terminology and learn how to use tools safely and effectively. Then they must consider what mechanical alterations would make their car faster—speeds typically range from 20 to 30 miles per hour. Next, they must learn how to correctly wire their car, and run tests to determine the most efficient batteries. Finally, students must design and create the car’s body, finding innovative ways to make it lightweight, aerodynamic, and safe for the driver. Because the body
isn’t part of the kit, styles can vary dramatically and include materials as different as paper and corrugated plastic.

Greenpower races are highly competitive all-day events (see Figure 1) and can attract several thousand spectators. Venues can be as simple as a coned course on a school parking lot or running track (see Figure 2) and as elaborate as a purpose-built or even professional race-car track. Greenpower partnered with INDYCAR, the Sports Car Club of America, Siemens, and Indiana University—Purdue University Indianapolis to stage an Electric Car Challenge with 27 student teams from across the globe at the iconic Indianapolis Motor Speedway on 1 May.
CHALLENGE-BASED LEARNING

ABOUT THE AUTHOR

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2017. The annual International Finals are held in October at the Rockingham Motor Speedway in Corby, England.

GREENPOWER BENEFITS

The program is truly unlike any other. Greenpower provides an immersive, hands-on experience for students that is both fun and brings to life many of the STEM concepts taught in the classroom including basic mechanics, electricity, aerodynamics, and energy conservation.

Problem solving and teamwork are integral to the program. Car racing is a frenetic, pressure-packed endeavor. Anything can—and often does—go wrong during competition. Components unpredictably fail or don’t perform as expected. Students must work together to deal with complications in high-stress situations, leading to a much more effective and exciting learning process.

Greenpower participants also acquire valuable business and public relations skills. Students are responsible for funding their car and team, so they must learn how to solicit financial support from local and corporate sponsors as well as from their community by writing letters, giving formal presentations, and launching crowdfunding initiatives on social media.

Another key outcome is industry readiness. Many school systems provide student teams with advanced equipment to build their cars, such as 3D printers for nose cones and mechanical elements and autoclaves for carbon-fiber bodies. Corporate sponsor Siemens offers students a freely downloadable version of its computer-aided design modeling tool, Solid Edge (www.siemens.com/plm/solid-edge-student). Participants thus get a unique opportunity to work with the kind of software and hardware they will use in their future STEM careers.

Greenpower’s tremendous success speaks for itself. In the UK, where the program originated, the Electric Car Challenge is currently offered to more than 600 schools, reaching some 10,000 students. At the very first US competition, 14 teams, all from the Southeast, raced around a barely paved high school running track. Today there are 140 US teams, and the most recent event was held at a track built specifically for GreenpowerUSA. Many program participants go on to earn substantial college scholarships and have very bright futures.

Each day the world makes thousands of technological advances, and continued innovation will demand new generations of engineers. Greenpower students will be prepared to meet that demand.

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