

Mountain View High School

3D Systems and *Formula One* racing in Schools get Virginia students up to speed

■ **Mountain View High School** – a four-year secondary school in Stafford, Va., USA, with enrollment of 1,900.

■ **Challenge** – engaging students in education to prepare for careers and higher learning.

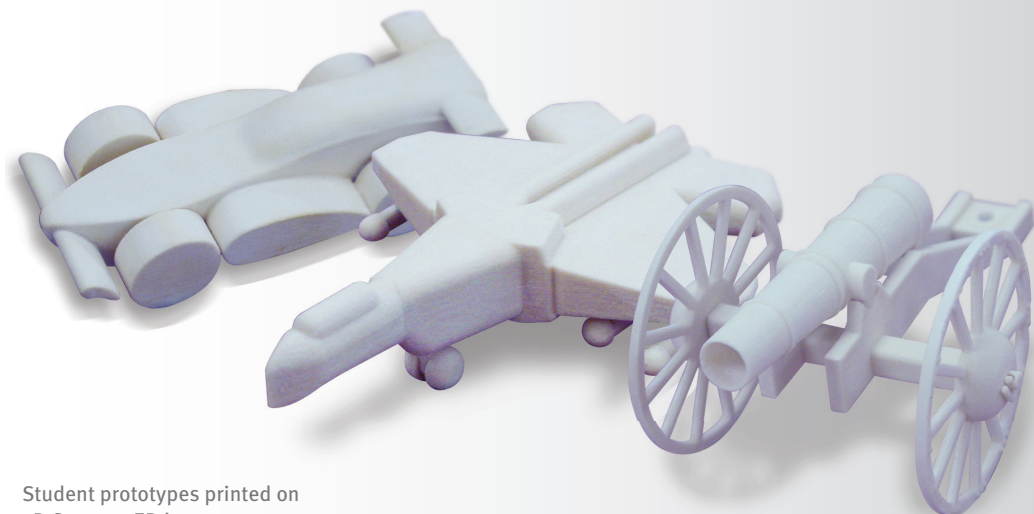
■ **Strategy** – investing in 3D printing as part of a comprehensive technology and engineering program that includes extracurricular *F1 in Schools* competition.

■ **Results** –

- Students developed *Formula One* racing car prototypes that earned them a 2nd place in the Virginia championship, 7th in the world.
- Students, intrigued by the mystique of 3D printing technology, redouble learning efforts so they can use the device.
- 3D printing gives students skills to earn career-focused positions in manufacturing, straight out of high school.
- Students work harder at subjects like math knowing it will help them maximize the capabilities of 3D CAD software and 3D printing.
- Success with 3D printing has prompted the school district to invest in six more ZPrinters, one for each high school.

“3D printing experience signals to an employer that the student has a documented interest in the future of manufacturing.”

– Terry Godwin
Engineering and Technology
Instructor
Mountain View High School



Student prototypes printed on 3D Systems ZPrinter 310.

As your *Formula One* car streaks down the track, the tenuous balance between lift and friction can mean the difference between glory and oblivion. That’s just one reason that students at Mountain View High School (MVHS) in Stafford, Va., USA use 3D printing in their technology and engineering classes.

Each year the school fields a six-member *F1 in Schools Formula One Technology Challenge* team that inevitably sails through local and regional contests to the nationals. The contest involves an eight-inch-long *Formula One* car, powered by a CO₂ cartridge, blazing down a 20-meter track in under two seconds.

Every millisecond matters, so MVHS has developed a winning design protocol that, in addition to producing fast cars, is instilling valuable knowledge and skills in students along the way.

The *Formula One* Design Protocol

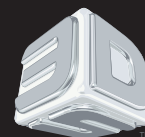
Each student on the team designs a car on paper, refines it in Autodesk Inventor® computer-aided design (CAD) software, and

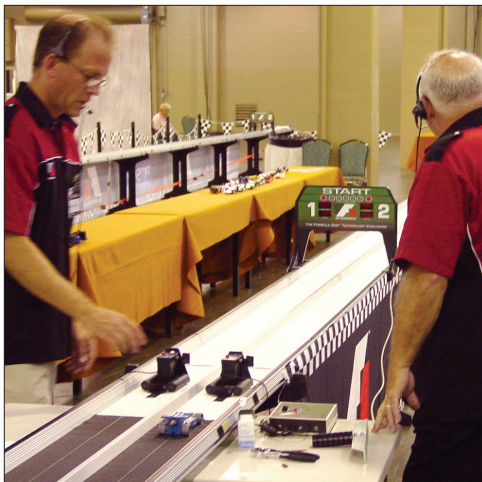
prints a prototype model on a ZPrinter® 310 3D printer from 3D Systems. ZPrinting creates a physical object from a 3D digital image, much as an office printer creates documents from electronic text. Each prototype goes into the class’ wind tunnel, and the two highest-performing designs are built up for competition.

“You can do computer simulations, but they’re never as accurate as the wind tunnel,” says Terry Godwin, Engineering and Technology Instructor and Advisor to the school’s Technology Student Association chapter. “It also exposes students to another compelling technology.”

The approach has its merits. MVHS wound up second in the state of Virginia and seventh in the world in the 2008 *F1 in Schools* Championship held in Orlando, Fla., USA.

In addition to making the prototypes, MVHS used the ZPrinter 310 to assemble its multimedia presentation to judges. The team created a *Formula One* showcase of 3D printed tractor trailer trucks, pits, garages, race cars, tires, tool boxes and more, winning the MVHS team the highest marks in the category.





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– Ben Lennon
Senior and Co-Captain
of *F1 in Schools* Team
Mountain View High School

Beyond Formula One

3D printing, however, has been a victory for more than just the motivated kids on the *F1 in Schools* team. For example:

- A disaffected sophomore was failing Principles of Technology class until his attention locked onto the mysterious machine in the corner of the classroom pumping out 3D models of student creations. He was instantly determined to create a fighter jet like the one his uncle pilots. The student learned 3D CAD, 3D printing and computer-aided machining to accomplish the work. He built the plane, proudly presented it to his uncle, and aced the course.
- Another student with no interest in his Introduction to Engineering course learned 3D CAD and 3D printing so he could fashion a homemade turkey caller. It’s the only thing like it in his family hunting party.
- A group of students from a MVHS English class strolled into Godwin’s classroom recently hoping to create 3D models to bring their literary characters to life. The writers learned some CAD and made their models.
- Math students are buckling down too. They say it will help them do better in engineering, the course with the cool 3D printer.

You Know It’s Working

“When kids say, ‘Would it be okay?’ if they did this or that above and beyond what you’ve assigned, that’s when you know education is working,” says Godwin. “The 3D printer fascinates students by itself, but also dovetails with the explosion of consumer technology and dazzling 3D graphics. Good students will always excel, but why not give students who are at risk a little extra push?”

3D printing experience can be a valuable item on a resume when departing students look for work. One graduate of Godwin’s classes wanted to go to community college to expand his technical credentials but simply couldn’t afford it. Rather than take a low-wage job, he discovered he was qualified for a salaried career-oriented position at a local manufacturer. “What he learned in class, in the *F1 in Schools* competition and the

design-to-manufacture process, earned him an opportunity that turned out better than community college while opening up a world of possibilities – among them, further education any time he wants. 3D printing experience signals to an employer that the student has a documented interest in the future of manufacturing.”

College-bound students also see opportunities in 3D printing. “Although I’ll probably major in computer science, I’ve really come to love designing and engineering,” says MVHS senior Chris Palmer, an *F1 in Schools* co-captain. “3D design and 3D printing have given me a wide range of skills I can build on in college, regardless of which major I select.”

“Although I might choose chemistry, I’ve become computer savvy through these courses, this competition and, in particular, my experience with the 3D printer,” says co-captain and senior Ben Lennon. “It’s been immensely valuable to gain the multifaceted insight that comes with designing and prototyping high-performance products in a businesslike environment.”

MVHS’s success with 3D printing has prompted the district to invest in six more ZPrinter 310s, one for each high school. The school system sticks with ZPrinters because of their speed, low operating costs and exceptional support by Diversified Education Systems (DES). “The 3D printing investment is easy to justify,” says Godwin. “Students are learning material science, manufacturing, physics, math, science, chemistry and ‘softer’ business subjects like teamwork and leadership. It’s state-of-the-art technology, and students who are pursuing engineering or architecture need to see what’s going on; they need to see the result in their hands. Although today’s classrooms can print paper from the whiteboards, printing out real scale models of real engineered models makes light bulbs go off.”



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