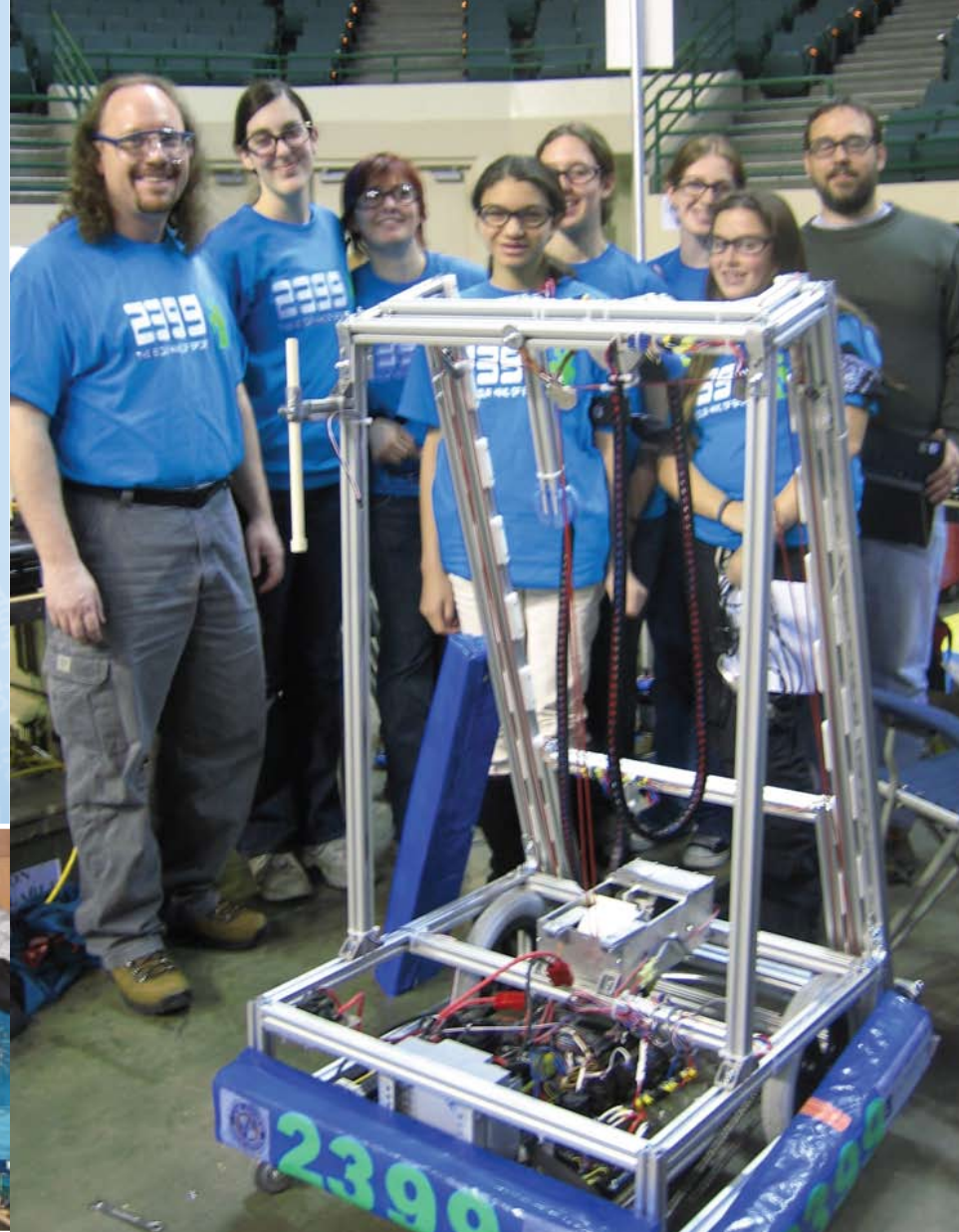


Young women at Hathaway Brown School have one of the most successful and dynamic engineering programs in the nation at their fingertips. From building and programming robots to obtaining United States patents on biomedical and chemical sensor devices, HB students are able to participate in an unlimited array of projects and learning opportunities.



HathawayBrown   
Engineering at **HB**

Students from kindergarten through grade 12 learn engineering through a combination of innovative classroom and hands-on instruction. They also may choose numerous elective courses. Throughout their years at HB, students are taught not only to assess the influence of engineering and technology on improving human lives, but also to assess the environmental and cultural impact of new products and systems.

As it prepares future leaders in the field of engineering, HB helps girls see the fun and significance of a field that's in serious need of their participation and expertise.



HathawayBrown  Like no other.

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HB's excellence in engineering is rooted in the K–12 curriculum. The complexity of tasks and concepts increases in developmentally appropriate ways and includes mechanical, electrical, environmental, chemical, and computer engineering. As they work through the curriculum, students brainstorm problems and design and implement solutions. *Highlights include:*

Primary students experiment with designs of boats, create ramps to test the speed of matchbox cars, design a model of the moon on a basic grid system, and create wind vanes and bat boxes.

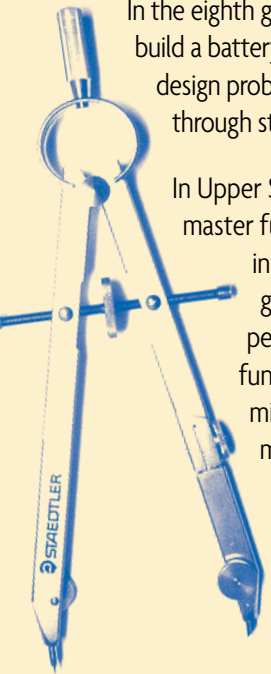
In upper primary classes, students may analyze a self-propelled underwater Rover model or engineer volcano-monitoring equipment. Teams may engineer a solar-powered Rover, build a simulated planet Mars radio station, invent an artificial gravity habitat module for astronauts, or make models of wind turbines or solar collectors.

As part of the Earth: Inside and Out unit, the fifth grade students design, build, and test earthquake-resistant structures. In an interdisciplinary unit between History and Science, students explore the Industrial Revolution through invention and design.

In sixth and seventh grade, all girls are exposed to design and engineering principles through the three-dimensional problem-solving challenges presented in the Invention Lab classes. Using the tools and materials of this unique facility, students construct electric motors and design a new invention with rotary motion, apply their math class skills to construct model homes, and work in teams to solve problems of motion and mechanics.

In the eighth grade Introduction to Physics and Engineering, girls design and build a battery-operated, gear-driven toy car and solve electrical circuitry design problems. Students also engage in environmental engineering through studies of structural failure and alternative energy.

In Upper School science, math, and technology classes, students master fundamental engineering skills and work to identify problems, invent solutions, and evaluate results. Whether exploring genetic engineering through bacterial transformations, performing synthesis of aspirin, investigating the structure and function of carbon nanotubes, or simulating an atomic force microscope, HB Upper School students encounter society's most pressing needs, and they learn the process by which to engineer solutions.



## OUR INVENTION LAB

Unique to HB is the Kettering Invention Lab program and facility. Every student from pre-K through Middle School engages a project or course each year that helps foster engineering thinking skills. The lab helps them put the “tools in the toolbox” of cognitive skill development by providing hand and power machinery to mold the wood, plastics, metals, electricity and more into the products that our brainstorming engineers imagine.

The very youngest students engage large- and fine-motor-control skills to complete simple construction projects. Older students work with three-dimensional design employing the higher-order thinking skills of identifying problems, developing plans, testing hypotheses, evaluating results and implementing solutions.

## ROBOTICS & MECHANICS

Students build robots and machines in all three divisions, learning mechanical, electrical, and computer engineering skills along the way.

Primary School girls use PicoCrickets – tiny computers that make objects spin, light up, and play music – to learn the concepts of programming and robotics, and fourth graders can spend 12 weeks in the FIRST LEGO League competition taking what they have learned several steps further.

Each February Middle School girls participate in the Hathaway Brown Science and Engineering Fair, displaying and defending their mechanical designs to professional engineers who serve as judges.

Upper School students can build individual robots and machines through the Science Research & Engineering Program (SREP), or they can join the popular HB Robotics Team that builds robots for the FIRST Competition each year. In 2008, the team even built a robot that “raced” by itself in Cleveland's Susan G. Komen Race for the Cure.

## MIDDLE SCHOOL ENGINEERING ACADEMIES

Two different engineering opportunities are offered to students through the Middle School's unique Academies Program. In 2008, students who were part of the Cleveland: A Future City Academy participated in the Future City Competition put on by National Engineers' Week. They reinvented Cleveland using SimCity software and built a scale model of their new city that featured interior lights and a working vertical-lift bridge that spanned the Cuyahoga River. The team won first place for “Best Use of Recreation” and “Most Environmentally Friendly City” and second place for “Best Infrastructure.”

The Engineering Academy uses a different theme each semester to explore engineering concepts, identify problems, develop solutions, and implement them with inventions. Past themes have included Buoyancy – inventing watercraft to hold two to four students afloat in HB's own Aquatic Center – and Fluid Dynamics – exploring kite designs that can lift students.



## UPPER SCHOOL SCIENCE RESEARCH & ENGINEERING PROGRAM (SREP)

Students can develop multi-year experiences in engineering through HB's nationally acclaimed Science Research & Engineering Program (SREP). This renowned program provides opportunities unparalleled in the state of Ohio. Now in its eleventh year, the SREP offers a class and facilitates the placement of students in cutting-edge engineering labs at institutions such as Case Western Reserve University, NASA Glenn, and the Cleveland Clinic. They work with mentors to gradually develop projects that are not only rewarding, but often are publishable or patentable as well. Notable topics:

**BIOSENSORS THAT DETECT HEART ATTACKS**

**IMPROVED FUEL CELLS**

**DRUG DELIVERY SYSTEMS UTILIZING NANOTECHNOLOGY**

**SEARCH-AND-RESCUE ROBOTS FOR USE IN COLLAPSED BUILDINGS**

**TESTING BIOMEDICALLY ENGINEERED EQUIPMENT TO HELP ASTRONAUTS EXERCISE IN SPACE TO AVOID MUSCLE ATROPHY**

**LAUNCHING THREE MATERIAL ENGINEERING EXPERIMENTS ABOARD SPACE SHUTTLES DISCOVERY AND ENDEAVOUR.**

*The experiments spent months on the International Space Station before returning to Earth for analysis by HB engineering students.*

The SREP has produced more than 350 college or graduate school-level projects, 100 of which have been in engineering. These engineering projects alone have garnered three U.S. patents, 40 Siemens or Intel finalist or semifinalist spots, 60 published papers on which the students were authors or coauthors, and seven USA Today All-Star Academic Team members. The SREP was also featured in a nationally televised piece on News Hour with Jim Lehrer. To obtain a DVD copy of this broadcast, call the HB Admissions Office at 216.320.8767. The programs' results are real, and its depth and breadth are unsurpassed in the region.

