

STEM, part one

February 14, 2009

STEM is no longer simply the part of a flower holding the bud; it's a Hawaii Department of Education program that is helping our young people to bloom.

STEM stands for "science, technology, engineering, and mathematics." In 2004, I introduced a resolution to develop, support, and promote existing robotics education in Hawaii's schools to galvanize students about science and math. I am happy to say that robotics education has taken off, being enthusiastically embraced by students across the state.

With the support of Principal Gail Awakuni, science teacher Scott Schaefer and other dedicated science teachers, have turned students on to robotics at Ewa Beach's James Campbell High School (JCHS), located in my senatorial district. This year's JCHS robotics team is heading to Dallas, Texas this spring to compete in the VEX World Championship, having captured the Excellence Award, the top honor, at the 2008 VEX Pan-American Robotics competition last December. The task of the VEX tournament this year: building and maneuvering a robot that can move a three-inch cube from one spot on the floor and lift it into a triangular chute a distance away. JCHS's robot won the Innovation Award and took top honors at an earlier Maui tournament, with a design so successful that other teams put it on YouTube. By the time the next tournament arrived, other schools incorporated it into their own robots. Other area schools with robotics programs include Waipahu Intermediate, Ewa Beach Elementary, Holomua Elementary, Iroquois Point Elementary, Kaimiloa Elementary, and Pohakea Elementary.

This is precisely the kind of energy and excitement that I envisioned when I advocated robotics education back in 2004. The hands-on learning that comes when students transform theories into an actual working model gives them the experiential knowledge, fervor about science, and sense of competence that will motivate them to go into these valuable, high-skilled, high-paying, much needed careers. Robotics education turns theory from book, calculator, and paper into the "real thing." Seeing concepts in action opens up science and math to students, who learn that these are not subjects only for the "cream of the crop," but exciting ones they can master and enjoy.

The wave of enthusiasm about robotics is encouraging, and great news for the U.S. The popularity of robotics has soared rapidly in Hawaii's elementary, middle, and high schools, growing from 95 programs in January 2008 to over 300 just a year later.

The Robotics Organizing Committee (ROC) develops, coordinates, and supports robotics education in schools across the state. Representatives of all six robotics programs, members of the state government, and local business supporters contribute to the ROC, joined by the overwhelming and widespread community effort by teachers, parents, mentors, and other volunteers who devote their time and expertise. The ROC members are Dr. Song Choi (*VEX*

Robotics), Sara Tamayose (*FIRST Lego League*), Aaron Dengler (*FIRST Lego League*), Art Kimura (*Botball*), Alex Ho (*FIRST Robotics*), Cindy Fong (*Underwater ROV*), Mark Rongstad (*Underwater ROV*), Eric Hagiwara (*Micro Robotics*), Dale Olive (*Micro Robotics*).

There are six robotics education programs in Hawaii's schools.

Student teams in **FIRST Robotics** solve a common engineering problem over six weeks using a standard kit of parts with no instructions. 2008 saw the inaugural **FIRST in Hawaii** Regional Robotics Competition, with more than 700 student participants, including 450 from Hawaii. The 2009 season kicked off on January 3. The Hawaii Regional at the UH-Manoa on March 26-28 will again be an international competition of teams from Hawaii, the mainland, the Philippines and Mexico.

Students in **Botball** build a pair of robots to work in tandem. The Hawaii Botball region is the largest in the U.S., with about 38 teachers/coaches and 400 students.

Elementary and middle school students in the **FIRST LEGO League** build robots and prepare presentations on their research and construction. Competitions typically center around global challenges, such as last year's issue of climate change.

Middle and high school students in **VEX Robotics** design and assemble robots. Hawaii hosted the 2008 Pan-Pacific Championship, an action-packed three-day competition with over 800 students from Hawaii, California, and China.

Students program robots for use in swimming pools in **Underwater ROV (Remote Operating Vehicle)**. Aquatic circumstances present different challenges for the robots, including buoyancy, propellers, and water-proofing. Hawaii is trying to host the 2010 MATE International ROV Competition in Hilo.

High school students in the advanced **Micro Robotics** program use microscopes and magnifying lenses on their robots. In 2008, Hawaii high schoolers who competed in Nagoya, Japan, placed second among the university students they competed against. Hawaii's high school team sparked so much interest that the president of Cal Tech University visited Hilo to personally invite them to participate in an intensive summer math and science program at the university.

Winning competitions is thrilling, but the real achievement is that many students who previously had little interest in this tough academic area are now seeing that a career in science, technology, engineering, and math is not only possible, but satisfying as well. The incredible benefits of stimulating interest in an area so badly needed in our country are what motivates those of us who believe in STEM training to continue on this path. Students not only gear themselves toward this field through robotics education, they also develop critical thinking skills, team work, and problem-solving skills they will need to compete globally as adults. Developing our young people's capacity for innovation through robotics education trains them to adapt to changing times, and ensures a bright future for our state.

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