

The national youth cyber education program is making a measurable difference in students' lives.

Growing STEM Students Through CYBERPATRIOT

By Peter Grier

AFA photos by David Keith





Left: Maxime Dowla (l) and Giovanni Betti Hernández (r) from Marine Military Academy in Harlingen, Texas, compete in the National Finals, Middle School Division, of CyberPatriot VI. Their team made it to the National Finals again this year, this time in the high school category. Here: Savannah Clemente (r) and Luke Robinson (l) from Rangeview High School in Aurora, Colo., work during the National Finals, High School Open Division, of CyberPatriot VI.

The Air Force Association's CyberPatriot youth cyber education program is six years old and still growing fast. What began in 2009 as a one-round, face-to-face cyber defense contest between eight Orlando, Fla.-area, Junior ROTC and Civil Air Patrol units expanded into a multidivision virtual reality competition that drew more than 2,100 teams from all 50 states, Canada, and Europe in 2014-15.

The cyber defense education effort has also broadened its offerings, morphing into more than an online battle. CyberPatriot's cyber education initiative aims to teach elementary school kids about staying safe when they surf the Web. The program launched trial CyberCamps last summer to engage students in computer security education year-round.

But CyberPatriot's biggest gain, according to its commissioner, may be that it has begun to have a measurable effect on its participants' higher education and occupation choices. Almost 90 percent of past competitors now in college are focusing on a STEM (science, technology, engineering, and math) field, according to a CyberPatriot-sponsored survey. The vast majority of these respondents said that CyberPatriot itself had at least somewhat affected their choice.

YOUNG CYBER EXPERTS

"That's huge. This is a validation of the investment by our sponsors—and a validation of the program. We're impacting their choices for education and subsequent careers," said retired Air Force Brig. Gen. Bernard K. Skoch, CyberPatriot's national commissioner.

The need for more national cyber defenders has become increasingly obvious since Team Spaatz from Osceola High in Kissimmee, Fla., won the initial CyberPatriot challenge six years ago. In late 2014, Sony Pictures suffered an intrusion into its computer systems—launched, according to the FBI, by North Korean hackers. Sony wouldn't have to look far to find the personnel needed to protect their data in the future. A team from North Hollywood High won the Open Division in the 2014 CyberPatriot finals, and local media sought them out as expert commentators in the wake of the Sony fiasco.

The kids felt that given the scale of Sony's losses, the attack had to have been carried out by a highly sophisticated group of hackers. "They probably spent a whole year or so trying to find a single vulner-



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Above: The CyberPatriot VI second place team, Open Division, from Grissom High School in Huntsville, Ala., pose for a selfie with Bernie Skoch, CyberPatriot national commissioner, and Kathy Warden, president of Northrop Grumman Information Systems (second from right). Team members are l-r: Chris Sutton (coach), Morgan Wagner, Angela Cheng, Jeremy Lochner, James Brahm, and Christopher Lin. Left: Team members from Lee's Summit North High School in Missouri work together during the CyberPatriot VI National Finals. They are: Mitchell Bruce, AJ Baker (standing), and Michaela Ditterline.

ability,” North Hollywood High senior Isaac Kim told a local NBC affiliate.

CyberPatriot is meant to bolster America’s cyber workforce by producing as many Isaac Kims as possible. It uses an innovative, fun approach to steer students toward computer science and other STEM fields. So far, its vector is upward.

Following the 2009 Orlando pilot competition, CyberPatriot II went national, attracting about 200 JROTC and CAP teams from across the country. CyberPatriot III expanded to include teams unaffiliated with military organizations, in a separate Open Division. More than 1,000 teams registered for CyberPatriot IV in the 2011-12 school year. It passed the 1,500 mark in CyberPatriot VI. A national middle school category was added for the 2013-14 year. More than 200 middle school teams signed up in 2014-15, pushing CyberPatriot VII’s registration to more than 2,150 teams.

“We grew by over 40 percent in registration [this academic year], so yeah, growth has been strong,” said Skoch.

A substantial part of the increase comes from cities and school systems that have

placed special emphasis on cybersecurity education. Often they are located in areas having a strong military or defense industry presence. CyberPatriot labels these areas Centers of Excellence, and they are Los Angeles, Northern Virginia, Oklahoma City, San Antonio, and Spokane, Wash. Open Division teams have also been ramping upward. They have now reached approximate parity with the JROTC and CAP units, which in the early years were easier for CyberPatriot to reach due to their military affiliation.

“That’s a big deal. Open teams are where our greatest opportunity for growth is,” said Skoch.

ALL ARE WELCOME

As for the middle school teams, CyberPatriot officials have adjusted their software so younger competitors don’t face as challenging a problem set as the high school age participants. “It drives their scores up,” said Skoch. “It’s not that they’re not bright, but they haven’t had the opportunity to learn as much about leadership and creative problem-solving.”

Any school can field a CyberPatriot team. This includes charter high schools, home schools, scout troops, and Boys or Girls Clubs. The teams do not have to have special computer or STEM classes to be able to compete on an equal basis. Each

team needs a coach, usually a teacher or volunteer. The coaches need no special technical background. CyberPatriot provides all cyber teaching materials, and there isn’t a skill prerequisite for the program. Any student who wants to learn about cyber defense can join. If a team needs help with computer basics they can ask the program office to steer them to a mentor, usually a local computer or engineering professional with the necessary skills.

Teams have two to six members. Five compete, with one serving as an alternate. The CyberPatriot competition year begins in October. Early rounds take place online, with teams playing from their own classrooms or computer labs. They download virtual representations of computer operating systems that conceal worms, viruses, or other flaws. Then they race against time to find the bugs while trying to keep the useful parts of the operating systems, such as email, up and running.

In essence they play the role of information technology professionals trying to defend their networks against hacker attacks.

State and then regional rounds of competition narrow the field. Eventually the 12 top Open Division teams, 13 top JROTC or CAP teams, and three middle school teams earn an expense-paid trip to the CyberPatriot National Finals in March at the Gaylord National Resort, outside Washington, D.C., in National Harbor, Md.

Many of the participating students have never been to the nation’s capital so the trip alone is a treat. Winners get more, including a total for the high school divisions of some \$50,000 in scholarships from presenting sponsor the Northrop Grumman Foundation.

But competition is not all CyberPatriot offers. This year it is moving to expand its educational efforts into different areas: elementary school-level cyber safety modules and summer camp curricula for vacation time cyber learning.

The elementary initiative has been under development for some time. It intends to help develop personal cybersecurity awareness in preteens while getting them excited about STEM disciplines in a gentle manner. CyberPatriot will provide elementary schools with three learning modules, according to Skoch. The first is a bilingual K-3 module focusing on cyber safety. It is now getting a final shakedown in a Los Angeles school.

“It teaches basic principles, like what a password is, why it’s important, and why you don’t want to share it with everybody,” said Skoch.

The second and third modules will reach fourth- to sixth-graders. The modules will include games, with a teacher's manual and some instruction. "The overarching purpose of the program is to keep students safe online," said Skoch. "CyberPatriot will provide this at no cost to schools." Rollout of these two modules is scheduled for this year.

The summer camp cyber outreach has been a logical extension. Camp is not just for sports and outdoor activities any more, and many summer camp specialties abound, from tuba camp to stained-glass camp to many variations of robotics and math camps.

CyberPatriot helped conduct three week-long pilot camps last summer: two in Texas and one in Northern Virginia. The total curricular hours were 20, with the first 16 devoted to education about cybersecurity and the last four allotted to a mini-CyberPatriot competition for campers. About 250 kids participated. "They were enormously successful," said Skoch of the pilot camps.

This summer CyberPatriot will debut some 20 camps in several states, including Texas and Hawaii. Along with elementary school programs, it is all part of the move to evolve from a national high school cyber defense competition into a national youth cyber education program.

"Two years ago I'd have said we're trying to break through. Now we're getting invited to STEM conferences," said Skoch. "We're getting the calls now. We are unaware of any peer competitor."

CyberPatriot is still relatively young, as educational initiatives go. But its founders say it is already having a real-world impact on the educational choices and job opportunities of its alumni.

In 2014 CyberPatriot for the first time surveyed students who have participated in past competitions to find out what they are doing now. CyberPatriot alumni still enrolled in high school are an ambitious bunch: Ninety-five percent said they intend to pursue a college degree of some kind. By way of comparison, about 66 percent of high school seniors who graduated in 2013 subsequently entered a higher education program, according to the Bureau of Labor Statistics. "This shows that CyberPatriot alumni are being drawn to higher education at a higher rate than their peers," said Skoch.

They are also tech-oriented. Fully 80 percent of the current high schoolers who want to attend college said they plan to study a STEM topic.

In addition, the choices made by CyberPatriot past participants already in colleges or universities might be even

Photo by Jose Andres Ruiz



Last year's team from Sisler High School in Winnipeg, Manitoba, Canada, compete in the Cyber Crime Scene Challenge. L-r: Jarren Mercado, Arran Retzlaff, Devyn Hrechkosy, and Ajit Matharoo. A team from the school made it to the National Finals again this month.

more indicative of the program's impact. CyberPatriot is now old enough to have a significant number of such graduates, and according to the 2014 survey, they are also drawn to technical fields in disproportionate numbers. Ninety percent of alumni who are enrolled in higher education or who have already graduated with a degree enrolled in STEM fields.

AND IT'S FUN, TOO

It is possible that students drawn to a cyber defense competition in high school might be naturally STEM-oriented and would have majored in math or science in college regardless of CyberPatriot. But the survey asked alumni now in college whether CyberPatriot made a difference in the type of classes they eventually took. Eighty-seven percent said it did. "We're impacting their choices in education," said Skoch.

Part of the reason seems to be that participants find CyberPatriot entertaining, according to the survey. Participants in the 2013 season, polled after the close of competition, generally said they had little knowledge of cybersecurity basics until they signed up for the CyberPatriot competition. Most were glad they did so—51 percent found CyberPatriot "very engaging." Eighty-two percent said it was either fun or the most fun of all their extracurricular activities.

Keeping it fun takes hard work. Social media and the way teenagers interact with electronic devices is changing so fast that CyberPatriot will have to continue to innovate to keep up with the times.

"One of the things I've sought to do is keep things fresh, make it so good we keep drawing the interest we have," said Skoch. For instance, CyberPatriot IV added to the National Finals a forensics competition, accounting for 10 percent of a team's final score. This involves teams analyzing a physical cyber crime scene in an attempt to discover digital evidence and piece together what happened. Skoch said he'd like to broaden that aspect of the contest, perhaps introducing it in earlier rounds.

CyberPatriot is also considering enriching its mobile computing challenges. In the last finals, participants had to harden an iPad against intrusion. Given the explosion in use of mobile devices, there are many ways this might be expanded in a manner that would seem directly useful to students' lives.

For sponsors, Facebook signed up as a CyberPatriot partner in 2014, joining presenting sponsor Northrop Grumman, along with Cisco Systems, Symantec, Microsoft, Riverside Research, Splunk, URS, Leidos, and AT&T, as a private sector supporter.

Government backing comes from the Department of Homeland Security and the Department of Defense. Educational institutions that have signed on include the Massachusetts Institute of Technology's Lincoln Labs, Embry-Riddle Aeronautical University, and the University of Maryland University College.

"We hear a lot of talk about public-private partnerships. I can't think of a program that exemplifies that more than ours," said Skoch. ★

Peter Grier, a Washington, D.C., editor for the Christian Science Monitor, is a longtime contributor to Air Force Magazine. His most recent article, "Kittinger," appeared in August 2014.