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NC STEM Advisory Board Member:

Celebrating Over 10 Years of Cyber Security Outreach for Iowa High Schools

Over the past couple of years we have seen numerous articles about the need to cyber security professionals and how colleges are having a hard time recruiting students in security.  Lead by Dr. Doug Jacobson, the faculty and staff at the Iowa State University Information Assurance Center (IAC) have been pioneers in the effort to encourage high school students to become interested in cyber security and in information technology.

In 2004 the IAC offered one of the nation's first high school summer camps focused on cyber security.  This 4 day camp was designed to help students understand cyber security and to show them career opportunities in security.  In fall of 2005 we decided that we wanted to reach more high school kids by providing an opportunity for schools to introduce cyber security as an after school program.  This led to nation's the first high school cyber defense competition (CDC) in the spring of 2006.  Our first year we had 60 students from10 schools and in 2007 it grew to 130 from 17 schools

With over 25 competitions to our credit, Iowa State University has become a leader in hosting Cyber Defense Competitions (CDCs).  Depending upon our target audience for the event, our competitions range in size from 40 to over 200 student defenders in teams of 4 to 8.  Our largest competitions have been for high school students and our own ISU students who we are trying to keep engaged with technology.

A primary motivation for the style of cyber defense competitions run at ISU is student engagement and learning.  Students don't just defend a network; they must build a computer network based on a scenario written in a short story format.  The scenario consists of a list of functional requirements that the students are required to meet as well as a set of services they need to provide to the users of their network.  Often, the defending students are told that they are the IT staff for a small company or college who has never had an IT shop before for various reasons and that they must implement a complete network to support the work force.   This requires the students to think about the types of services they need to install and how end users will want to use them which mimics demands of a real-world job in IT services.  In addition to delivering services, the defending students must also develop a plan and method to secure their network, again having the same real-world tone.

In addition to defending their network, the students also participate in numerous activities (called anomalies) throughout the competition which are designed to keep them engaged and slightly off balance just as real IT staffs get engaged in new projects and may overlook intrusions or security risks in new implementations.

Based on the success of the high school CDC we decided we should grow the program to help increase the number of students interested in other aspects of Information Technology.  In 2008 with funding from the Iowa Department of Economic Development and in partnership with the Technology Association of Iowa the ISU IAC started the IT-Adventures program which was dedicated to increasing interest in and awareness of information technology (IT).  When the program started we had three tracks from which students can choose to study:  cyber defense, game design programming, and robotics.  As part of the IT-Adventures program, an IT-Club is created at the high school that runs as a year-long, after-school, extra-curricular activity.  The inquiry-based approach of the IT-Club is a successful method to increase student understanding of information assurance and computer/network security in a non-threatening, non-graded environment.  The capstone event for students who participate is an event called IT-Olympics which is held on the ISU campus.

The IT-Adventures / IT-Olympics program grew from a few hundred students to over over 400 students.  In 2011 we partnered with TAI's hyperstream program to provide learning materials for the after school clubs.  Hyperstream was selected as one of the Governor's STEM scale up projects and now provides a single IT focused program for high schools and middle school.  Many of the activities and the inquiry based learning methods used by the Hyperstream program are based on the IT-Adventures program started in 2008.  As a result of the new partnership ISU's IAC continues to operate the IT-Olympics and provides the cyber security curriculum and ISERink access for the Hyperstream schools.

In support of the cyber venue ISU stood the nation's first dedicated cyber security playground for high schools.  First developed to support cyber defense competitions (CDCs), ISERink is a virtual laboratory environment that allows students an opportunity to undertake hands-on activities focused on networking, cyber security, and penetration testing. It is built upon an Internet testbed named ISEAGE that provides a real world networking environment for students. To the students it appears as if their network, which uses public address space, is directly connected to the Internet. In reality, the students' traffic is contained in the controlled ISEAGE testbed. This prevents misconfigurations or other beginner mistakes from disrupting a classroom or campus network.

The latest effort in security education is focused at middle and high schools.  Iowa State has developed one of the nation's first cyber security literacy curriculums.  Our goal is to get some form of cyber security literacy in every school in the state.  We have developed a module based approach to teaching security literacy.  There are several levels of modules intended for different methods of inclusion into the classroom or learning environments.  These modules are designed to provide both students from technical and non-technical majors with the opportunity to formally learn about the many components of practical computer security.  The prime goal of practical computer security literacy is to provide students with security context for many of the activities they encounter throughout their everyday use of computers and the Internet.  As a result, the topics and objectives of the corresponding modules are designed specifically to meet this object and presented in a tangible format for students of all backgrounds to learn.

<http://www.security-literacy.org/>

In addition to the classroom materials we have created a website that provides a lab environment designed to let students and teachers experience certain aspects for security.  The web site for the lab is [www.hackerville.org](http://www.hackerville.org/)