

K-12 Cyber Security Education



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Outline

- ☞ **The Need**
- ☞ **The NICE Strategic Plan**
- ☞ **The State of CS Education**
- ☞ **Curriculum Changes**
- ☞ **Cyber Security First Principles**
- ☞ **The GenCyber Program**
- ☞ **Resources**

The Need

- ✧ The lack of cyber security professionals is a national and critical issue that must be addressed
- ✧ Similar to the pressing need for STEM educated workforce, cyber security professionals are in high demand
- ✧ Cyber security is essential to protecting our nation's critical infrastructures
- ✧ Cyber security is not only a national need but a global necessity as well

National Initiative for Cyber Security Education (NICE)

∞ The NICE Strategic Plan: K-12 Formal Education

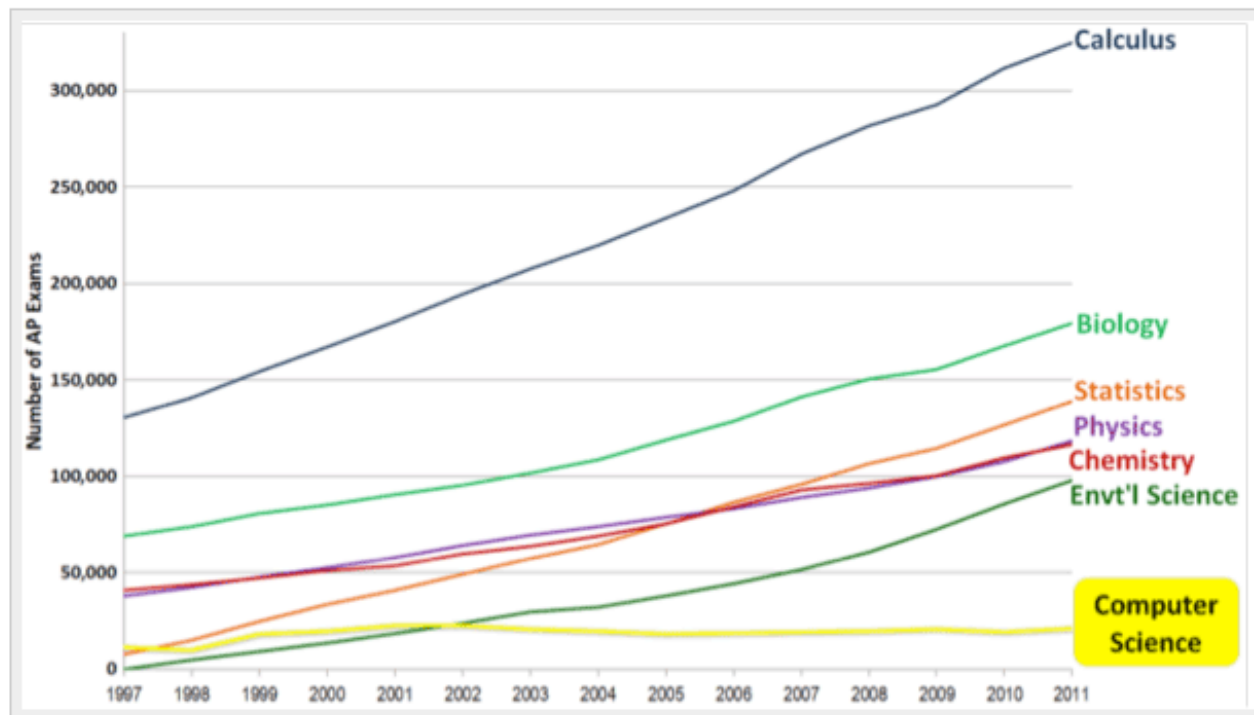
- Early focus on STEM curriculum
- Infusion of CS courses in the high school curricula

∞ Expected outcomes:

- U.S. students will move from the middle to the top of the pack in international assessment
- By 2018, 50% of high schools in the U.S. will offer rigorous academic CS courses taught by well-prepared teachers
- By 2018, 25% of the states will adopt cyber security education standards for K-12.

The Decline in AP Computer Science

AP Exams 1997-2011



Source: College Board, Advanced Placement (AP) Exam Data 2011, available at <http://professionals.collegeboard.com/data-reports-research/ap/data>. Calculus represents the combined data of Calculus AB and BC. Physics represents the combined data of Physics B, C:Electricity and Magnetism, and C:Mechanics. Computer Science represents combined data of Computer Science A and B.

CS Curriculum in High School

∞ The K-12 Curriculum is already crowded

∞ The Core K-12 curriculum

- Science—Biology, Chemistry, Physics
- Mathematics—Algebra and Calculus

∞ Where do we start?

- Support a rigorous CS course in the high school curriculum and infuse cyber security principles in other K-12 courses as possible.

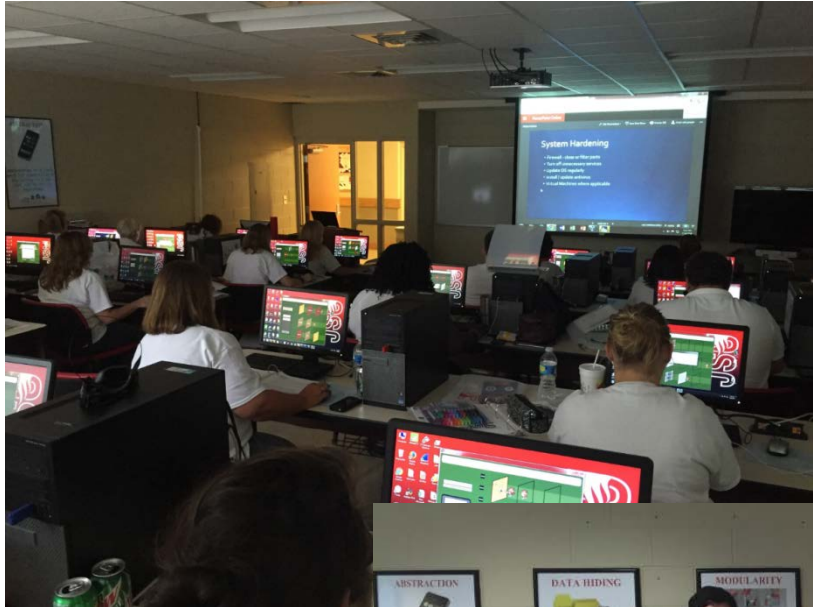
Cyber Security First Principles*

- ✧ Domain Separation
- ✧ Process Isolation
- ✧ Resource Encapsulation
- ✧ Least Privilege
- ✧ Layering
- ✧ Abstraction
- ✧ Information Hiding
- ✧ Modularity
- ✧ Simplicity of Design

The NSA-NSF GenCyber Program

- ✧ The program provides summer cyber security camp experiences for teachers and students
- ✧ The goals are to help the participants understand correct and safe on-line behavior, increase diversity and interest in cyber security careers, and improve teaching methods in delivering cyber security content in the K-12 CS curricula
- ✧ The vision is for the program to be part of the solution to the Nation's shortfall of skilled cyber security professionals that can protect our national and economic security
- ✧ Funding is jointly provide by the National Security Agency and the National Science Foundation

The 2016 JSU GenCyber Program




10
days since
GenCyber Teacher Camp

NAVIGATION
▶ JSU GenCyber HOME
ANNOUNCEMENTS
COURSE MODULES
REGISTER
RESOURCES
SCHEDULE
CONTACT
MEDIA


GenCyber Camp
A Teacher Camp for Cyber Security Training
Jacksonville State University
July 11-15, 2016

Welcome to the GenCyber Teacher Training Camp website! **Registration is closed and camp is full.** Check back in January 2017 for information on the availability of a Summer 2017 camp! Please note that participation is only offered to Middle or High School teachers in either Science, Mathematics, Computers, Technology, or Social Studies area. There are limited seats available.

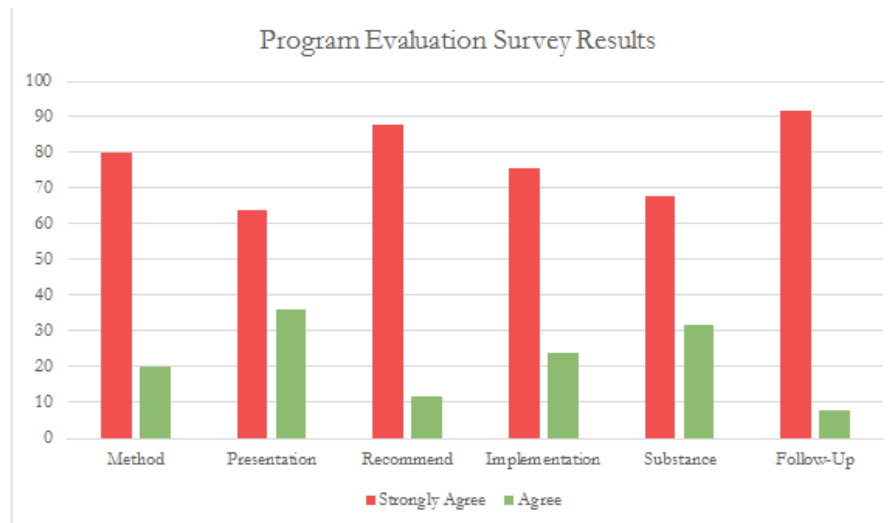
Financial support
Each participant will receive a travel stipend. To be able to receive the stipend, the participant must complete the summer workshop, attend the Fall symposium, and submit a final report.

See you this summer at JSU!



2016 JSU GenCyber Program Evaluation Results

- ☞ The **method** of instruction was appropriate for the objectives in the program.
- ☞ The **presentation** was clear, understandable, and well-organized.
- ☞ I would **recommend** this program to fellow teachers/administrators.
- ☞ The **implementation** of program ideas will help improve student achievement.
- ☞ The **substance** of the program will be useful in the planning and implementation of my teaching assignment.
- ☞ I would attend **follow-up** professional development on this topic.



2016 JSU GenCyber Program Lesson Plan



Module 2: Digital Forensics and Steganography

Learning Objectives

- To understand basic digital forensics investigation, preservation, and analysis;
- To gain an understanding of steganographic techniques, tools, and analysis.

Topic Outline

- Digital forensics concepts, techniques, and tools
- Investigation, preservation, and analysis
- Concepts and techniques of steganography
- Steganographic analysis

Cyber Security Principles Covered

- Process Isolation
- Modularization
- Abstraction
- Information Hiding

Instructional Practices and Strategies

- Multimodal presentation of information
- Cooperative active learning
- Team building
- Periodic checking for understanding

Software Tools

- STools4, File Checksum Integrity Verifier (FCIV), USB Image Tool (USBIT), Autopsy/Sleuthkit

Key Indicators of Understanding (List items that will be used to gauge understanding)

- Recognition of Cyber Security Principle involved
- Basic knowledge of evidence preservation
- Basic knowledge digital forensic analysis
- Familiarity with concepts of steganography

Resources

- ✎ National Initiative for Cybersecurity Careers and Studies (NICCS). URL: <https://niccs.us-cert.gov/education/education-home>
- ✎ National Initiative for Cybersecurity Education (NICE). URL: <http://csrc.nist.gov/nice/>
- ✎ National Cyberwatch Center. URL: <http://www.nationalcyberwatch.org/programs-resources/curriculum/>
- ✎ Association for Computing Machinery (ACM). URL: https://csta.acm.org/Advocacy_Outreach/Other/CSTACyberStandards.pdf
- ✎ National Security Agency GenCyber Program: URL: <https://www.gen-cyber.com/>
- ✎ JSU Teacher Camp for Cyber Security. URL: <https://sites.google.com/site/jsugencybersummer2016/>
- ✎ Cyber Security Education & Career Development. Department of Homeland Security (DHS). URL: <https://www.dhs.gov/topic/cybersecurity-education-career-development>.