

TEACHING CYBERSECURITY IN THE COMPUTER SCIENCE CLASSROOM

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AGENDA

- 1. Why Teach Cybersecurity?**
- 2. Types of teacher training available**
- 3. Topics covered in my course**

WHY TEACH CYBERSECURITY?

Cyber crime damage costs to hit \$6 trillion annually by 2021.

Cybersecurity spending to exceed \$1 trillion from 2017 to 2021

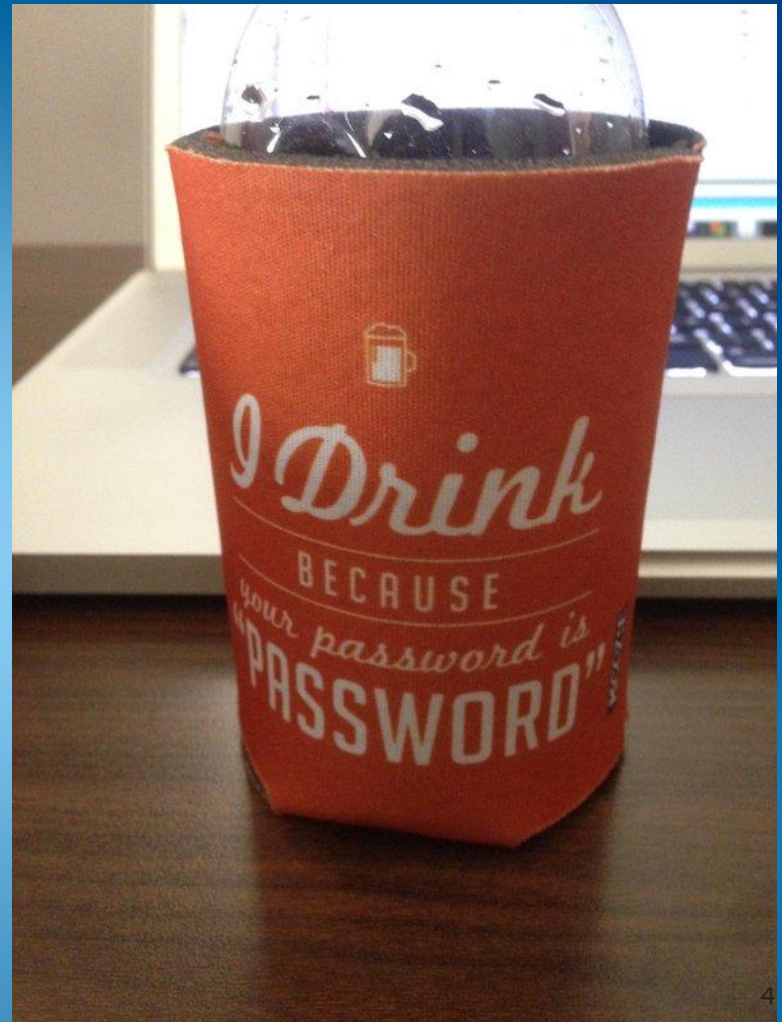
Cyber crime will more than triple the number of unfilled cybersecurity jobs, which is predicted to reach 3.5 million by 2021

Human attack surface to reach 6 billion people by 2022

Global ransomware damage costs are predicted to exceed \$5 billion in 2017. That's up from \$325 million in 2015

Morgan, Steve. "Top 5 Cybersecurity Facts, Figures and Statistics for 2017." *CSO Online*, CSO, 19 Oct. 2017, www.csoonline.com/article/3153707/security/top-5-cybersecurity-facts-figures-and-statistics-for-2017.html.

WHY I TEACH CYBERSECURITY...



TYPES OF TRAINING

- ❖ **Formal degree or certificate programs**
- ❖ **Conferences**
- ❖ **Workshops**
- ❖ **Online - self-paced**



DEGREE OR CERTIFICATE PROGRAMS

❖ DC Area

- University of Maryland
- University of Virginia
- Wilmington University
- Lewis University
- Many others...

❖ New York

- New York University
- Syracuse University
- Rochester Institute of Technology
- Pace University
- Many others...



TOP RATED CYBERSECURITY UNIVERSITIES

School Name	Location	Distinction
George Mason University	Fairfax, VA	Ranked #14 on <i>U.S. News & World Report's</i> 2017 list of most innovative schools
Northeastern University	Boston, MA	Has received cyber security grants from the Defense Advanced Research Projects Agency and the Office of Naval Research
Nova Southeastern University	Fort Lauderdale, FL	The Department of Homeland Security and the National Security Agency designated the university as a National Center for Academic Excellence in Information Assurance Education
University at Buffalo	Buffalo, NY	Faculty averages \$4.5 million annually in research awards
University of Houston	Houston, TX	Collaborated with federal agencies, the local government, and local businesses to form the Cyber Security Institute, which offers a certificate program as well as courses to business owners and high school students
University of Maryland	Adelphi, MD	Offers a cybersecurity competition team known as the Cyber Padawans
The University of Texas at San Antonio	San Antonio, TX	Students enrolled at the Institute for Cyber Security can compete in the National Collegiate Cyber Defense Competition.

CONFERENCES - NATIONAL

- ❖ **Annual NICE K-12 Cybersecurity Education Conference**
- ❖ **Computer Science Teachers Association - Annual Conference
- Cybersecurity workshops**
- ❖ **RSA Cybersecurity Conference - Largest in nation,
Cybersecurity Professionals and Educators- Workshops**

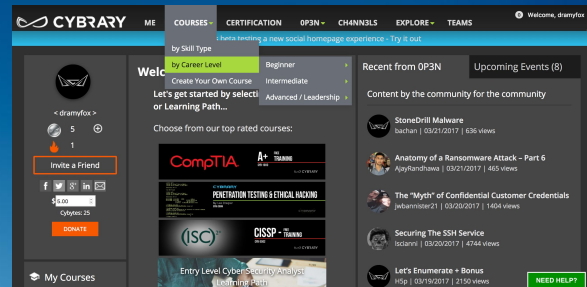
NATIONAL WORKSHOP



- ❖ **GenCyber – summer cybersecurity camp experiences for students and teachers at the K-12 level**
 - **NSF/NSA program**

ONLINE TRAINING

- ❖ **Cybrary - <https://www.cybrary.it/>**
- ❖ **Cyber Innovation Center NICERC Workshops - online**
 - **Cyber Education Program**
 - **<http://nicerc.org/pd/cert>**
- ❖ **CSTA Cybersecurity Teacher Certification (online)**
 - **<http://www.csteachers.org/page/Cyber4Teachers>**
- ❖ **Hacker High School**
 - **<http://www.hackerhighschool.org/>**



OTHER RESOURCES AND MATERIALS

- ❖ [Cyber Innovation Center](#)
 - Government, private industry academia collaboration
- ❖ [National Integrated Cyber Education Research Center](#)
 - Develops and shares K-12 cybersecurity material and resources
- ❖ [AFA CyberPatriot Competition](#)
 - National Youth Cyber Education / Cyber Defense Competition



AIR FORCE ASSOCIATION'S
CYBERPATRIOT
THE NATIONAL YOUTH CYBER EDUCATION PROGRAM

presented by
NORTHROP GRUMMAN
Foundation



CURRICULUM GUIDELINES (HIGHER EDUCATION)

Joint Task Force (ACM and IEEE) on Cybersecurity Education Curriculum Guidelines recommends for higher education:

- ❖ **Data Security**
- ❖ **Software Security**
- ❖ **System Security**
- ❖ **Human Security**
- ❖ **Organizational Security**
- ❖ **Societal Security**



**Association for
Computing Machinery**



IEEE

CYBERSECURITY UNIT IN INTRO TO COMP SCI, VHS

- ❖ **Careers in CS**
 - **NSA/Lifejourney Day of Cyber**
- ❖ **Cybersecurity Fundamentals**
- ❖ **Biometrics**
- ❖ **Cryptography**
- ❖ **Network Security**
- ❖ **Mobile Forensics**
- ❖ **The Dark Web – Silk Road case study**



DAY OF
CYBER

AN INTERACTIVE EXPERIENCE SPONSORED BY NSA

DAY OF CYBER

- ❖ **NSA Day Of Cyber** is a free, online program that allows students to experience a day in the life of the nation's top cybersecurity experts – in just three hours
 - **Journeys**
 - **Challenges**

FUNDAMENTALS

❖ **Properties**

- Confidentiality
- Integrity
- Availability
- Non-repudiation

❖ **Definitions**

❖ **Threats**

❖ **Legal issues**

❖ **Computer Fraud and Abuse Act of 1986**



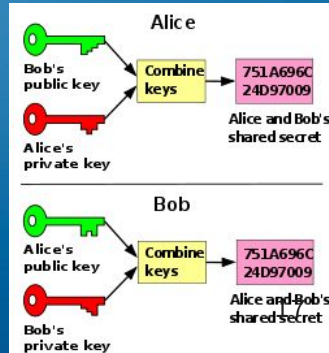
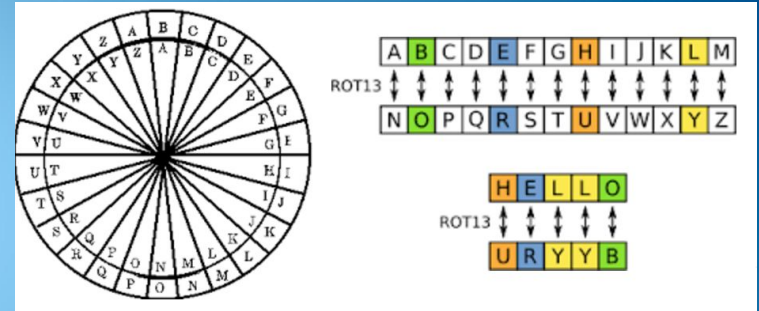
BIOMETRICS

- ❖ **Definition**
- ❖ **Authentication**
- ❖ **Attributes**
- ❖ **Pattern recognition**
- ❖ **Specific biometrics**



CRYPTOGRAPHY

- ❖ Timeline of Historic uses of cryptography
- ❖ Caesar Cipher
- ❖ Vigenere's Cipher
- ❖ Public/Private key encryption
- ❖ Digital Signatures
- ❖ Steganography



NETWORK SECURITY

- ❖ **Host based security**
 - **Anti-Virus**
- ❖ **Firewalls**
- ❖ **Honeypots**
- ❖ **Hacking - White Hat / Black Hat**
- ❖ **The Dark Net - Case Study: Silk Road**



MOBILE FORENSICS

- ❖ **Definition**
- ❖ **The Goal**
- ❖ **Where is the Evidence?**
- ❖ **Importance of Mobile**
- ❖ **What's Different with Mobile?**
- ❖ **History**
- ❖ **Statistics**
- ❖ **Evidence**
- ❖ **Case Studies**
- ❖ **Tools**





KEEP CALM
AND

FOCUS ON

TEACHING AND
LEARNING

IMPACT ON TEACHING AND LEARNING

- ❖ **Introduction to “backend” computer science**
- ❖ **Better understanding**
 - **Information & Data – Storage, representation and encryption**
 - **Internet – How it works**
 - **Computer/Information/Network/Internet Security**
 - **Dark Net**
 - **Tools and command line access**
 - **Investigation and forensics considerations**
- ❖ **More student engagement**

SUMMARY

- ❖ **There is a critical shortage in Cybersecurity professionals**
- ❖ **Potential for career advancement**
- ❖ **Salary**
- ❖ **Opportunities for Teacher Training and**
- ❖ **Ideas for possible topics to include in a curriculum**

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QUESTIONS AND DISCUSSION