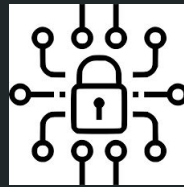
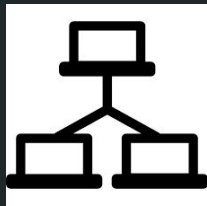


Inclusive, Approachable Cybersecurity for 9-12 Graders

Dr. Shannon Beck * Sharon McPherson * Linda Smith



Released under Los Alamos National Laboratory Unlimited Release: LA-UR-19-32001

Who We Are

Shannon Beck, Ph.D.

- Program Coordinator for the Secure and Trustworthy Cyberspace program at the National Science Foundation
- On leave from Los Alamos National Laboratory
 - Served on the Computer Security Incident Response Team (CSIRT)
 - Conducted research in malware using bioinformatic and Windows logging services
 - Content creator and educator for Department of Energy's Cyber Fire education program

Who We Are

Sharon McPherson

- Assistant Professor of IT/Cybersecurity/Computer Science/GIS at Germanna Community College, Fredericksburg, VA
- 2018/2019 Albert Einstein Distinguished Educator Fellow at the National Science Foundation
- NSF Panelist - BPC pilot programs

Who We Are

Linda “On the Frontlines” Smith

- Cyber Coordinator/Professional Learning Community Lead Teacher - Stafford County Public Schools
- Mountain View High School: computer science and cybersecurity
- CyberPatriot coach



Has this happened to you or your students?

Given an instruction:

*Capture all traffic on
ethernet interface:
\$tcpdump -i eth0*

- What does that mean?
- What is a terminal?
- Why am I doing this?

```
anuj@packetflows:~$ sudo tcpdump -i eth0
[sudo] password for anuj:
tcpdump: verbose output suppressed, use -v or -vv for full protocol decode
listening on eth0, link-type EN10MB (Ethernet), capture size 65535 bytes
23:14:09.691884 IP packetflows.local.47860 > productsearch.ubuntu.com.https: Flags
[S], seq 2046377878, win 29200, options [mss 1460,sackOK,TS val 9320277 ecr 0,nop,w
scale 7], length 0
23:14:09.693521 IP packetflows.local.10745 > cdns01.comcast.net.domain: 47145+ PTR?
49.33.213.162.in-addr.arpa. (44)
23:14:09.693689 IP packetflows.local.10745 > cdns02.comcast.net.domain: 47145+ PTR?
49.33.213.162.in-addr.arpa. (44)
23:14:09.727692 IP cdns01.comcast.net.domain > packetflows.local.10745: 47145 1/0/0
PTR productsearch.ubuntu.com. (82)
23:14:09.728442 IP packetflows.local.12125 > cdns01.comcast.net.domain: 56414+ PTR?
15.2.0.10.in-addr.arpa. (40)
23:14:09.763628 IP cdns01.comcast.net.domain > packetflows.local.12125: 56414 NXDom
ain 0/0/0 (40)
23:14:09.863208 IP productsearch.ubuntu.com.https > packetflows.local.47860: Flags
[S.], seq 1389760001, ack 2046377879, win 65535, options [mss 1460], length 0
23:14:09.863298 IP packetflows.local.47860 > productsearch.ubuntu.com.https: Flags
[.], ack 1, win 29200, length 0
23:14:09.863432 IP cdns02.comcast.net.domain > packetflows.local.10745: 47145 1/0/0
PTR productsearch.ubuntu.com. (82)
23:14:09.863465 IP packetflows.local > cdns02.comcast.net: ICMP packetflows.local u
dp port 10745 unreachable, length 118
23:14:09.864415 IP packetflows.local.47860 > productsearch.ubuntu.com.https: Flags
```

What do we want students to know?

Do we really want beginning cyber students going to run packet capture and monitor their own home networks?

NO!

Instead, the focus is on:

- Understanding of basic concepts, and
- How to be better cyber citizens!



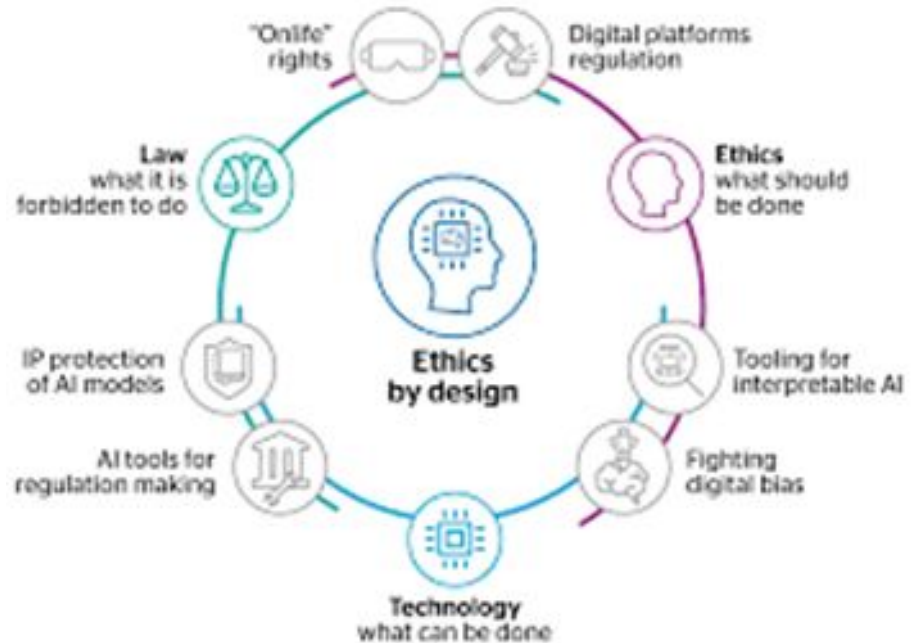
Ethics-centric course

Inclusivity!

- Women
- Under-represented groups
- Technologically fearful

Better cyber citizens: able to protect themselves & others

- Awareness
- Techniques
- Best practices



What it's the purpose of the course?

A survey course -- Why?

- To introduce **students** and **educators** to:
 - Key concepts,
 - Terminology,
 - Current practices in cyber security.
- A **starting point** for those beginning their journey into cyber.



Goals

Overview of:

- Software and Hardware
- Wired and Wireless Networks
- Cyber Security Fundamentals

Focus on:

- Personal Device Security
- Social Network Security
- Careers

Introduction to:

- Malware, Breaches and Threats
- Prevention and Implications
- Big Data



Ethics-Embedded content

Woven into every module is an ethics-first approach

Know The Rules of Cyber Ethics

When determining responsible behaviors consider the following:

1. Do not use rude or offensive language
2. Do not cyberbully
3. Do not plagiarize
4. Do not break into someone else's computer
5. Do not use someone else's password
6. Do not attempt to infect/attempt to make someone else's computer unusable
7. Adhere to copyright restrictions when downloading material from the internet



Term of Course

Current plan

- 36-week course

Future plans

- Tailored ½ year course
- Micro lessons for teachers in other subject areas
 - History
 - English
 - Science
 - Art
 - ... *and more*



Technology Platforms

- Windows and Mac OS operating systems
 - Based on what's available to the students
- Mobile devices
 - Smart phones
 - Tablets
 - IoT discussion
- Brief Introduction to command line and Linux tools



Conceptual Source Material

- VDOE Cybersecurity Fundamentals 6302 competencies
- CSTA K-12 CS Standards
- Cybersecurity Curriculum Framework
 - From the National Cryptologic Museum
- NIST 800-181 for career awareness
 - National Initiative for Cybersecurity Education (NICE) Cybersecurity Workforce Framework



Goals of the Course

Provide **students** with

- Knowledge base of core cyber security objectives
 - Cybercitizenship
 - Protecting home networks
 - Protecting themselves in the digital world

Provide **teachers with little or no background**

- Foundational content
- Confidence to explore topic



Benefits to Teachers & Instructors

- Increased confidence in cyber security concepts
- Increased confidence in pedagogy
- Ability to modify materials and content to fit your classroom



Benefits to Students

- Exposure to cyber security content
- General knowledge of cybersecurity
- Pathways to cyber security careers
- Techniques and procedures students can implement to ensure cyber safety at home.



Expected Outcomes

- Stepping Stone to:
 - More technical certification-centric classes
 - Enhanced career path awareness
- Increased confidence
 - Navigating cyberspace and computers
 - Augmenting awareness of cybersecurity
- Create better informed cyber citizens
 - Enable students to protect themselves and assist others
 - Exposure to current approaches and techniques
 - Empowering students to make informed decisions

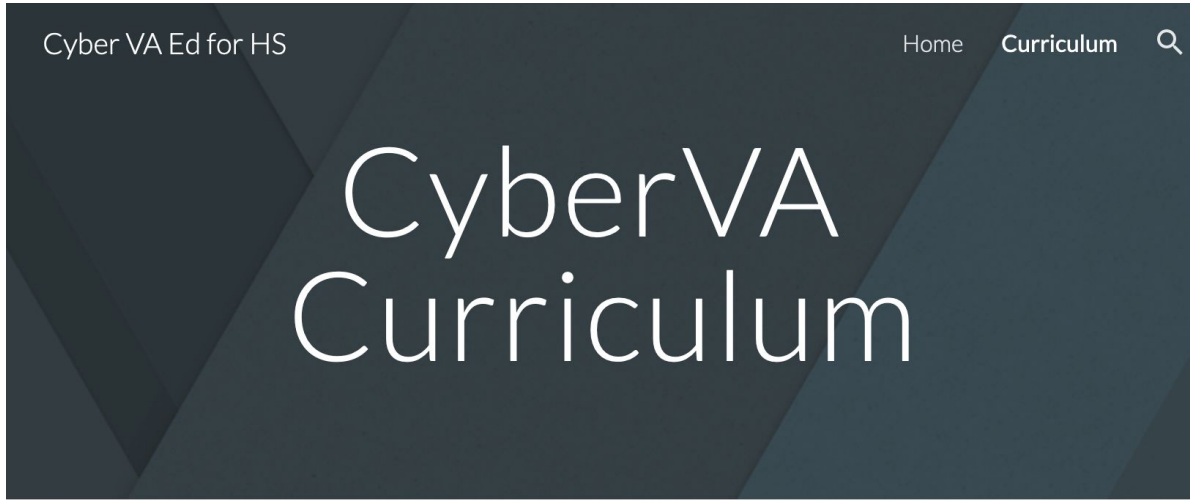


Online Availability

Developing over the course over 2019-2020 school year

<https://www.cyberva.org/>





Questions / Discussion

<https://www.cyberva.org/>

Shannon Beck:
shannonbeck124@gmail.com

Inclusive, Approachable Cybersecurity for 9th-12th Graders in Virginia

Draft - CyberVA Curriculum - Draft

<https://www.cyberva.org/>

9 December 2019

Authors (alphabetical): **Shannon Beck - Sharon McPherson - Linda Smith**