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NORTHROP GRUMMAN

Why Cybersecurity Education is Critical

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Elizabeth “Alex” Farrell

Cyber Program Analyst, Global Cyber Education and Workforce
Initiatives

- Cybersecurity Fundamentals
- Why is Cyber Education Important?
- CyberPatriot – A Global Student Gateway for Cyber and Science, Technology, Engineering and Math (STEM)
- Additional Resources



Cybersecurity Fundamentals

First, Let's Define *Cybersecurity*

The ability to protect or defend the use of cyberspace from cyber attacks.

Source: CNSSI-4009

Protecting your stuff on devices and online from people you don't want to share with.

Source: Alex Farrell

The activity or process, ability or capability, or state whereby information and communication systems and the information therein are protected from and/or defended against damage, unauthorized use or modification or exploitation. Source: US-CERT

Refers to the protection (defense), exploitation and/or attack of networks, systems, information, physical assets and people (the users) through cyberspace. It includes capabilities that allow one to detect, assess, respond to and exploit potential cyber threats in real / near real time.

(Based on Northrop Grumman Operational definition)

CYBERSECURITY

Strategy, policy, and standards regarding the security of and operations in cyberspace, and encompass[ing] the full range of threat reduction, vulnerability reduction, deterrence, international engagement, incident response, resiliency, and recovery policies and activities, including computer network operations, information assurance, law enforcement, diplomacy, military, and intelligence missions as they relate to the security and stability of the global information and communications infrastructure. Source: US-CERT

Information Security Triad: Three Key Cybersecurity Tenets

INFOSEC

CONFIDENTIALITY

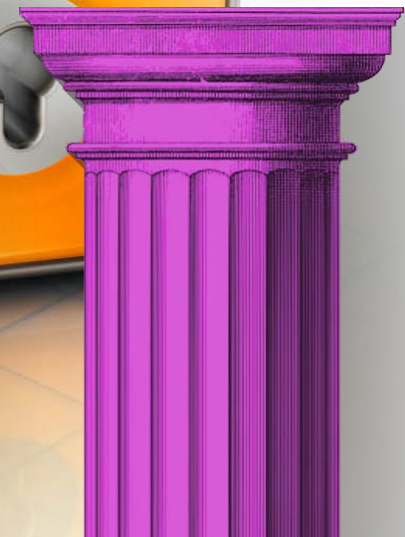
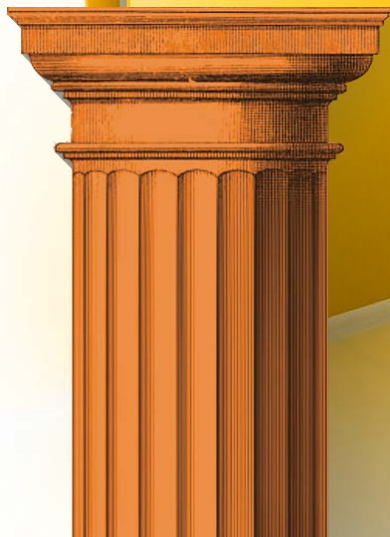
Only shared among
authorized persons
or organizations

INTEGRITY

Authentic and Complete
Sufficiently Accurate
Trustworthy and Reliable

AVAILABILITY

Accessible when
needed by those
who need it



Why the Internet is Not Secure



- Security was not considered in development of protocols (rules)
 - Designed for connectivity
 - Security was an afterthought
- Transmission mediums are wide open (Ethernet, wireless, 3G/4G)
 - Communications subject to sniffing
 - Not inherently secure
- Open access is everywhere
 - Airports / Hotels / Restaurants
- Networks, hosts, & applications have not been secured

What's at Stake



What's at Stake



Background: Key Takeaways

- Confidentiality, Integrity, and Availability are the three pillars of Cybersecurity.
- The Internet is a global network of dissimilar networks that communicate via common protocols.
- Security was not considered in the development of Internet protocols. This directly relates to the prominence of cyber attacks today.
- Internet security impacts national security, economic prosperity, and personal privacy.



The internet impacts everyone's way of life

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Why is Cyber Education Important?

Why Do We need Cyber Professionals?

- Lifestyle dependence
- Defense and Protection of Information
 - Personal
 - Private Industry
 - Public Infrastructure
 - National Security
- Critical fields for our Nation's:
 - Continued security
 - Economic prosperity
 - Critical infrastructure protection
 - Global competitiveness
- Current and future demand
 - Hundreds of thousands of jobs currently open across the government and private industry
 - Continued need for bright minds and diverse innovative solutions!



- Increased number of devices use Internet = more dependence
 - 57% of the world's population is connected to the Internet¹
 - The 2019 global population is 7.7 billion²
 - 23 billion devices connected to the Internet – projected growth to 75 billion by 2025³
- Increased dependence = increased demand for security
 - Complexity to protect increases with number of devices connected to networks
 - Increased interconnections between devices will impact more people when services aren't available

Cyber careers will need to grow and evolve to meet industry needs

Sources: 1. Global digital population as of July 2019 (Statista, Nov 17, 2019);

2. Current World Population (Worldometers, Nov 20, 2019)

3. Internet of Things (IoT) connected devices installed base worldwide from 2015 to 2025 (in billions) (Statista, 2018)

What Can Happen When Cybersecurity Falls Short?

- **Loss of critical services**
 - Example: Local government services unavailable due to ransomware
 - 9-1-1 call center services shut down
 - 7 Florida municipalities attacked with ransomware in 2019¹
- **Personal security compromised**
 - Example: 25% of American families have experienced cyber crime²
 - Loss of money and personal information
- **Economic impact**
 - Example: Small Business
 - 99% of all firms are small businesses³
 - 2.5 million small businesses in Florida³
 - 43% of cyber attacks target small business⁴
 - 60% of small businesses go out of business within 6 months of a cyber attack⁴

Cybersecurity impacts everyone!

Sources: 1. 7 Florida Municipalities Have Fallen Prey to Cyber Attacks Since Last Year (Naples Daily News, Aug 20, 2019); 2. One in Four Americans Have Experienced Cyber Crime (Gallup, Dec 11, 2018); 3. 2018 Small Business Profile (U.S. SBA Office of Advocacy, 2018); 4. Cyber Security Statistics: Numbers Small Businesses Need to Know (Aug 22, 2019);

What is, and continues to be, the number one vulnerability in any cyber system?



- Increased demand across all industries
 - Growing dependence on the Internet
- Not enough skilled employees available to meet demand
 - (ISC)² estimates the current global shortage is 3 million; 498,000 are in the U.S.
- Need for diversity
 - Women are underrepresented in the global cyber workforce (USA 14% / Asia-Pacific 10%)
 - Underrepresented populations (Title 1 schools)
- Millennials have changed trends for computer and technical degrees
 - Millennials are closing the gender gap in computer science and engineering disciplines
 - 52% of women under age 29 have an undergraduate degree in computer science; this trend may drive increased advancement opportunities for women

How do we best balance internet dependency and protection?

Developing Pathways for Tomorrow's Cyber Professionals

Workforce Resources

Characteristics

Ethics, intellectual curiosity, analysis, problem solving, critical thinking, creativity, perseverance

Traditional

Information Systems or Security

Engineering

Cybersecurity

Network Security

Non-Traditional

IS Auditing

Intelligence

Behavioral Science

Education/Academia

Finance

Law Enforcement

Qualifications/ Experience

No College Degree

2, 4, 6 Year College Degree

Internship

Apprenticeship

Certifications

Sustainable, Effective and Engaged Workforce

Capabilities

Communication, collaboration, leadership, adaptability

Architect and Design

Securely Provision

Protect and Defend

Operate and Maintain

Design for Security

Investigate

Collect and Analyze



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CyberPatriot – A Global Student Gateway for Cyber and STEM

CyberPatriot – a Student Gateway for Cyber and STEM



Safe extra-curricular program

Need a small space,
1-2 laptops, and internet
connection to participate

- Elementary through high school (preK-12)
 - CyberPatriot Literature Series
 - CyberPatriot Elementary School Cyber Education Initiative (ESCEI)
 - CyberCamps
 - CyberPatriot National Youth Cyber Defense Competition
- Age appropriate interactive learning modules
- Can reach students earlier and inspire interest in STEM
 - Draw more students into high school programs
 - Attract more females and diversity early
- Low barriers for participation
- Teach non-technical principles
 - Cyber safety, hygiene and ethics

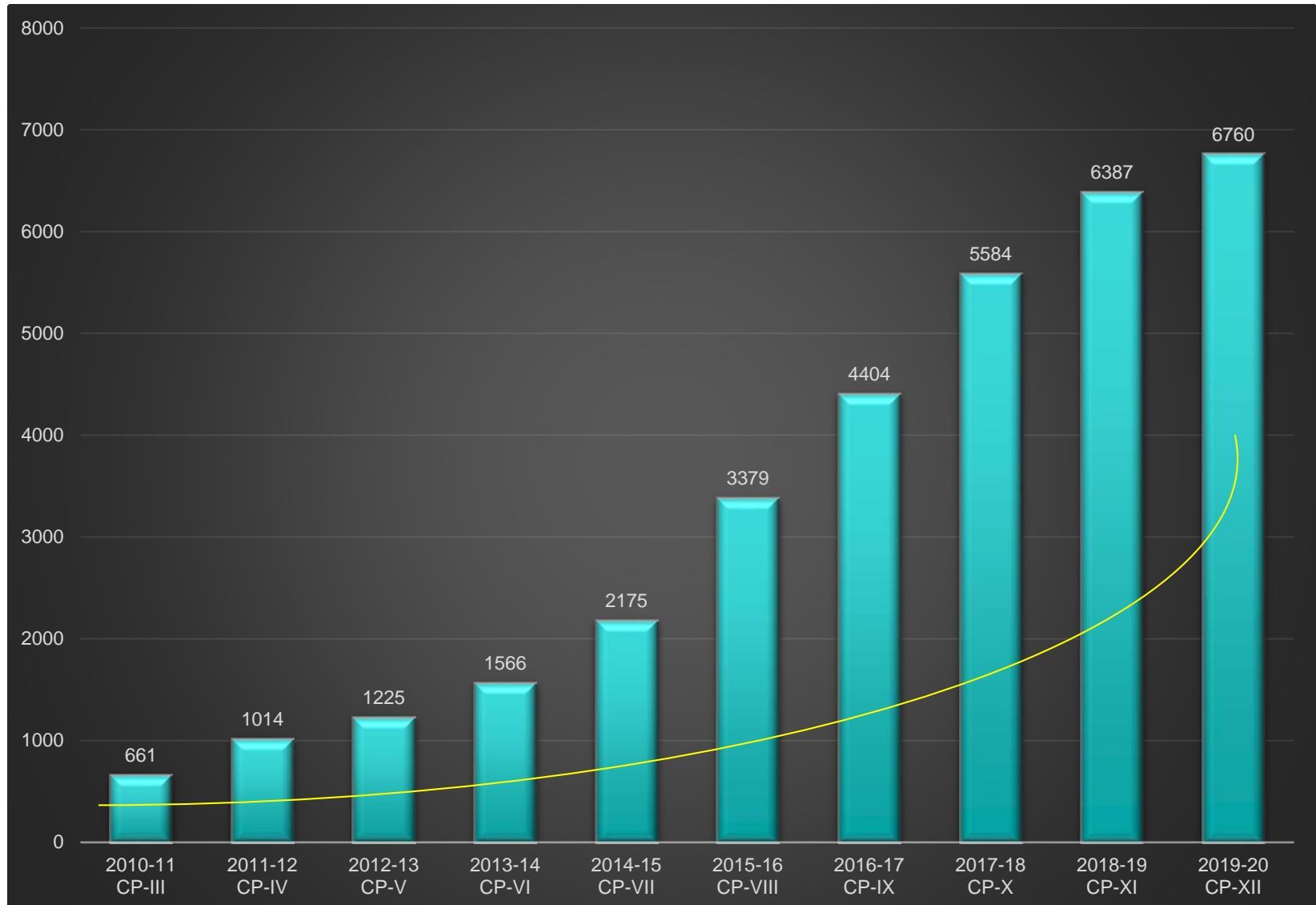
- CyberPatriot is the largest and fastest growing national youth cyber education program designed to excite, educate, and motivate the next generation of cyber defenders (and other STEM grads) critical to our nation's future security
- Created and led by the Air Force Association
- Program Objectives:
 - Promote basic cybersecurity education and understanding
 - Provide a fun and exciting competitive team experience
 - Enhance team-based leadership, communication, and cooperation skills
 - Teach *defensive* techniques; no *offensive* operations
- CyberPatriot provides students the opportunity to gain hands-on, practical knowledge that prepares them for post-secondary education and jobs in cybersecurity

CyberPatriot Success

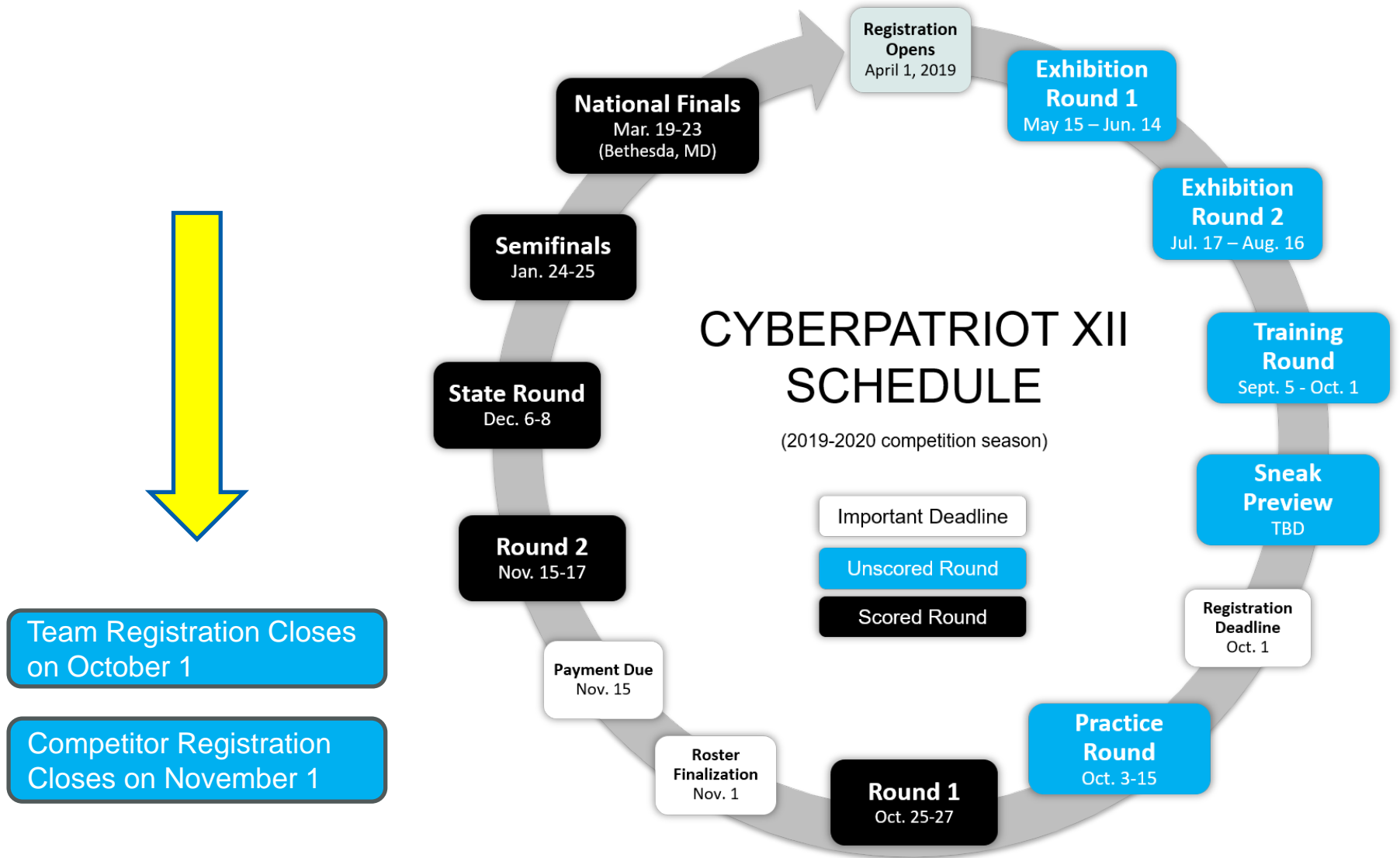
CyberPatriot	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Growth
All Service Division	475	611	806	868	1,007	1,281	1,589	1,717	1,851	1,885	297%
Open Division	186	403	419	628	978	1,638	2,217	2,757	3,293	3,630	1852%
Middle School				70	190	460	598	1,110	1,243	1,245	1679%
Total Teams	661	1,014	1,225	1,566	2,175	3,379	4,404	5,584	6,387	6760	923%

- Northrop Grumman committed over \$ 454,000 in scholarships to top three teams in each high-school aged division since 2011
- Over 355 CyberPatriot competitors have been hired by Northrop Grumman across the U.S. for paid internships since 2011; other sponsors and Government agencies may also hire interns

CyberPatriot Registration Growth



CP- XII Competition Timeline



National Recognition and Endorsement

- National Association of Secondary School Principals (NASSP) listed since 2011
 - “Good Housekeeping” seal of approval
- Competitor Relationship Management System
 - Enables contact with and education/career tracking CyberPatriot alumni
 - Internship/employment opportunities
 - Tracking mechanism to measure our real effectiveness in drawing students to STEM training, education, jobs, and careers



- CyberPatriot in United Kingdom (UK); executed by AFA
- Partnership between NGUK and Cyber Security Challenge UK (CSCUK)
- The only youth-focused cyber competition within a portfolio of sponsored competitions; highly successful and well received
- National Finals held at Plexal in London in March
- 2,059% growth in team registration since inception in 2014

CyberCenturion	I	II	III	IV	V	Growth
Number of Teams	22	115	350	575	475	2059%



Global Expansion - CyberArabia

- CyberPatriot in Kingdom of Saudi Arabia (KSA); executed by AFA
- Partnership between Northrop Grumman Middle East and King Saud University (KSU)
- Participants from many universities across KSA
- Engage Computer Science, Information Systems and Software Engineering students in learning cybersecurity defense tools and techniques in hands-on workshop setting and in discussing the cyber profession
- Each day culminates in competition between campuses; awards for each member of highest scoring teams
- 126% growth in participation since 2015

CyberArabia	I	II	III	Growth
Men's Campus		69	68	-1%
Women's Campus		73	90	23%
Total Teams	70	142	158	126%

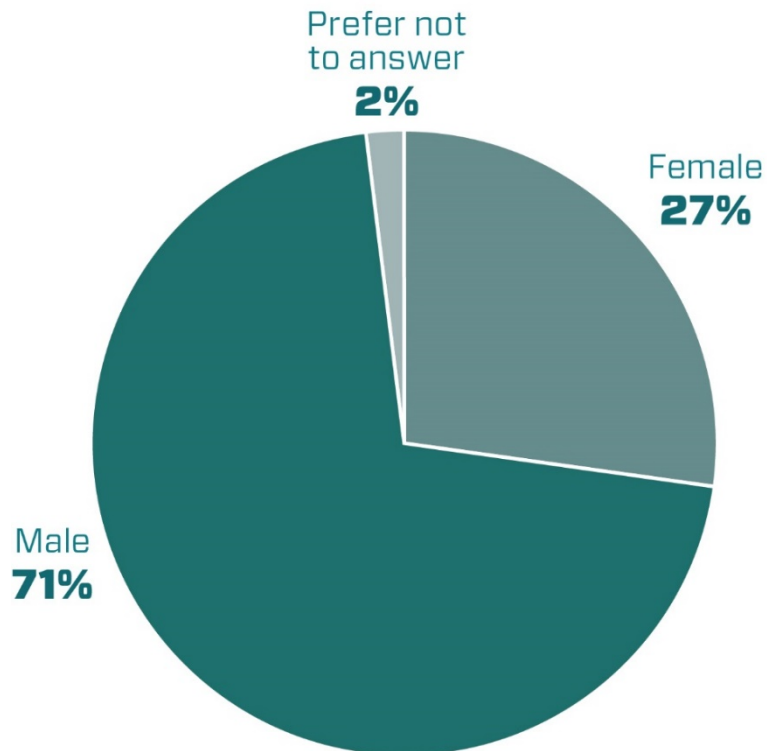


- CyberTaipan in Australia; executed by AFA
- Partnership between Northrop Grumman Australia and Australian Cyber Security Growth Network (AustCyber)
- Launched with pilot competition in June 2018
 - Pilot open to schools in Australian Capital Territory and Victoria
 - National Finals Competition in Canberra March 2019

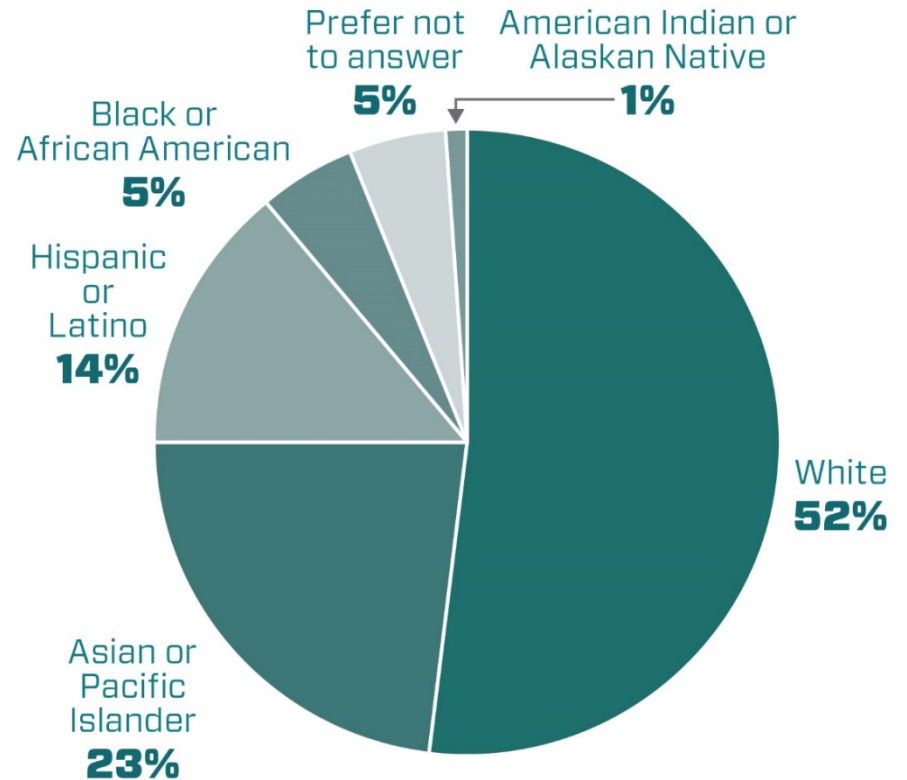


CyberPatriot Participant Demographics

Respondents Gender



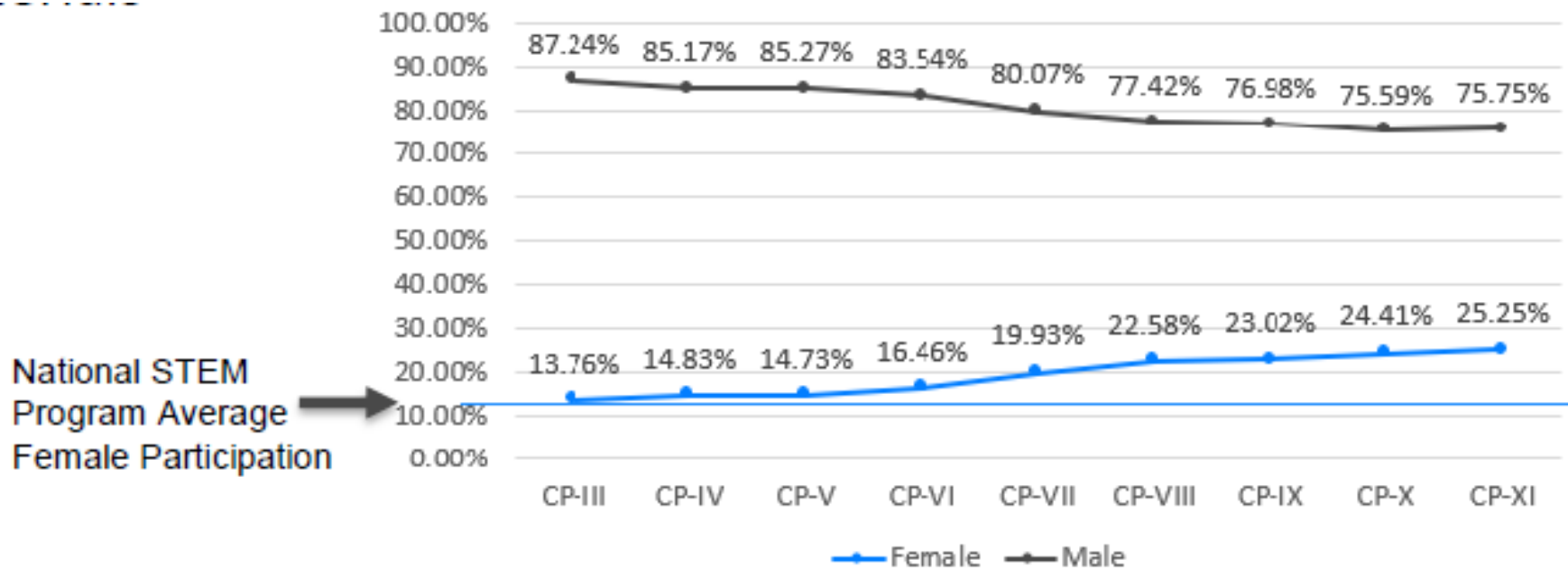
Respondents Ethnicity



Source: CyberPatriot Student Alumni Survey Report - 2018

CyberPatriot Participant Demographics

- Female participation exceeds national STEM Program average
 - 309 all-girl teams in CP XI
 - One all-girl team at CP XI National Finals
 - 244 all-girl team in CP X
 - Two all-girl teams at CP XI National Finals



87.3% vs 44.4%

87.3% of those CyberPatriots enrolled in high school plan to pursue a four-year degree, compared with the national average of 44.4%



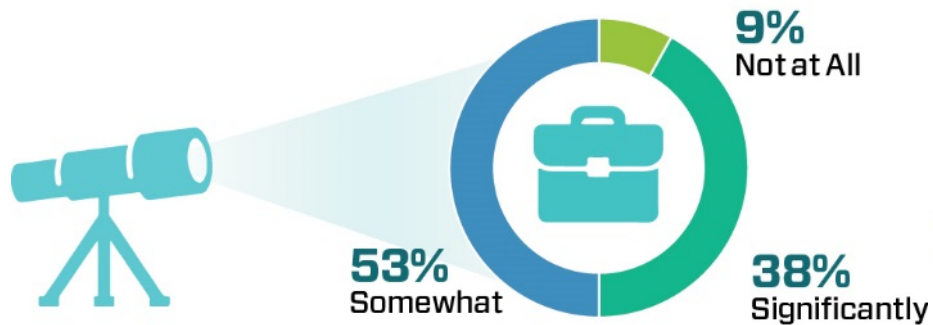
75.6% vs 18.6%

88.7% of high school CyberPatriots surveyed who plan to pursue a 4-year or 2-year degree will do so in cyber or STEM, compared with the national average of 14.9%

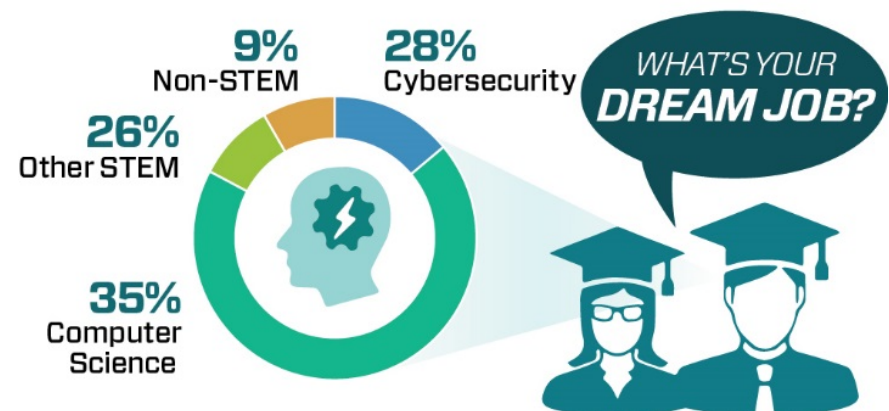


CyberPatriot's Influence on Career Goals

How much did CyberPatriot influence the career path of those who participated?

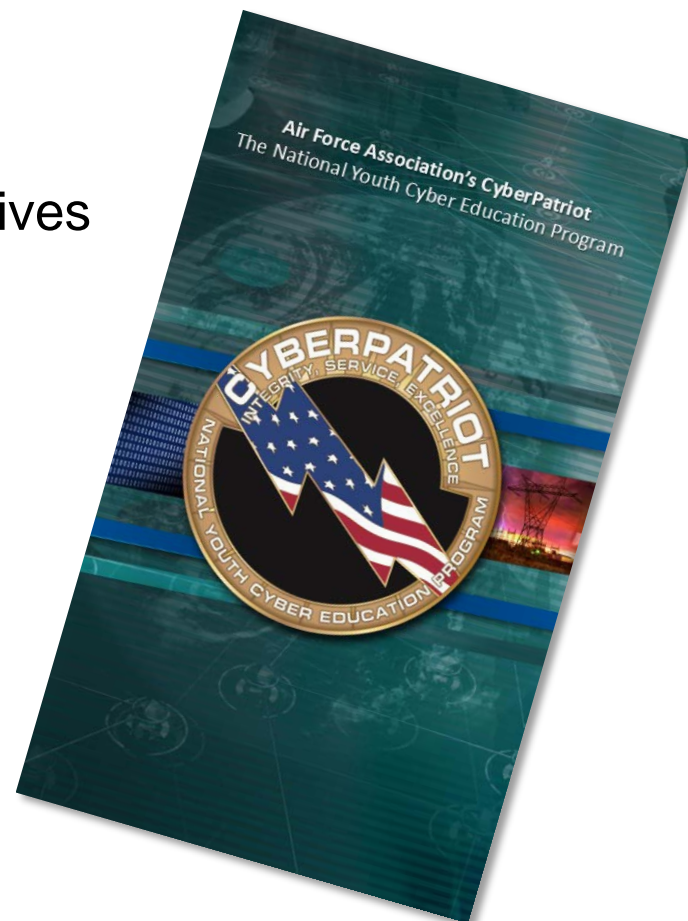


In what fields are CyberPatriot graduates employed?



How Can I Bring CyberPatriot to My School?

- School Information package
- Provides information for different perspectives
 - CyberPatriot XII Fact Sheet
 - Why Hire a CyberPatriot
 - CP XII for Principals
 - CP XII for Coaches
 - CP XII for Mentors
 - CP XII for Parents
 - CP XII for Students
 - Notional Career Path
 - Why is CyberPatriot Important?
- Information updated annually



Timing is important to prepare for first time participation

Getting Started: Resources Needed

- Identify Team Coach
- Register the Coach and Pay registration fee*, which covers:
 - Participant kits (shirts, certificates, etc.) for each competitor
 - Licenses for Microsoft Academic Alliance Developer software package
 - All direct costs, including transportation, food, and lodging for teams qualifying for the in-person National Finals Competition
 - Schools financially unable to pay the registration fee may apply for a grant from Northrop Grumman
- Determine resource availability
 - Teams will need computers, internet access, and a place to practice

* Registration fees per team: Refer to program web site for current information

I'm Not Technical – Can I Be a Coach?

- Practical Needs

- Logistics (meeting space and equipment)
- Internet connection to participate and research

- Student Experience Goals

- Have FUN! Foster intellectual curiosity.
- Learn to make good decisions online to avoid decisions that can exclude them from future job opportunities
- Problem solving approaches (scientific method, root cause analysis, etc)
- Grow by **doing** and **learning** from experience – hallmark of STEM careers
- Making mistakes is OK – mistakes led to many of the worlds best discoveries

- Tips for Success

- Focus on the things you're good at – outsource for expertise where necessary
- Help students set goals - guide them; let them figure out how to reach those goals
- It's ok not to have all of the answers – work as a team to fill knowledge gaps
- Google and YouTube are great resources



Anyone who can lead a team can be a coach!



Additional Resources

- AFA's CyberPatriot website
 - www.uscyberpatriot.org
 - Direct contact at info@uscyberpatriot.org
- Northrop Grumman's CyberPatriot site
 - <http://www.northropgrumman.com/CorporateResponsibility/Pages/CyberPatriot.aspx>
 - Direct contact at cyberpatriot@ngc.com
- CyberPatriot School Information Package
 - Available for download at www.northropgrumman.com/CorporateResponsibility/Pages/CyberPatriot.aspx using link [Additional Resources](#) in right column
- CyberPatriot Video
 - <https://www.youtube.com/watch?v=sesaiofAEWA>
 - Search “CyberPatriot X” on YouTube
- Cyber workforce and education
 - National Initiative for Cybersecurity Education (NICE) Framework <https://www.nist.gov/itl/applied-cybersecurity/nice/resources/nice-cybersecurity-workforce-framework>
 - National Initiative for Cybersecurity Careers and Studies (NICCS) <https://niccs.us-cert.gov/>

CyberPatriot Publication: *CyberSentinel*

- Began publication January 2012
- Pushed monthly to 15,000+ readers
 - Coaches, mentors, participants, public
- 4-8 pages
- CyberPatriot news items
- Competitor achievements
- Cyber education
- Cyber career news



Sign up for a free email subscription by sending a request to info@uscyberpatriot.org

- Introduce the cybersecurity concepts early in age-appropriate language with eye-catching artwork
- Creates a positive, exciting view of cybersecurity
- Companion Activity Book and game sheets available
- Illustrates the important role a girl can play in cyber
- Consider a copy for the school library



A school cyber education program has been teaching Sarah all about cyber safety and how to protect a computer from intruders. Can Sarah use her new cyber skills to shut down the dreaded virus?

AFA's Elementary School Cyber Education Initiative (ESCEI)

- Purpose:
 - Educate on ubiquity of cyber systems
 - Introduce concept cyber security
 - Teach cyber safety basics
- Originally launched July 31,2015
- V2.0 launched July 2016; enhancements:
 - Mac usable
 - Available on “App Stores”
 - Voice over text for all modules
 - Saving capabilities
 - Encourages multiple plays
- Available at no charge to academia



AFA's Elementary School Cyber Education Initiative (ESCEI) Learning Modules

Key Topics: Personal Information
Grade levels: K-2



Security Showdown 2

- Strangers are asking about you, but is it safe to share with them? Learn the basics of sharing personal information with family, friends, and strangers in this simple point-and-click game. Will you share your information correctly and win the security showdown certificate? Featuring charming voxel graphics, simple game mechanics, and voice-overs in both English and Spanish, this game is highly accessible and great for young players.

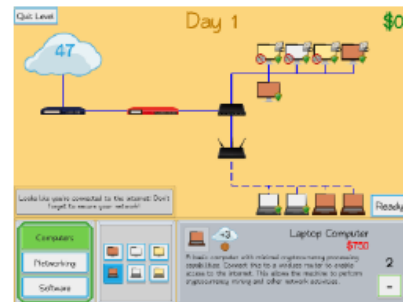
Key Topics: Phishing, Malware, Firewalls
Grade levels: 3-6



JeffOS

- Join Jeff, your helpful sidekick, as he guides you through his operating system and covers everything from basic computer skills to dealing with complex issues like phishing and malware. JeffOS delivers actionable advice for safer computing in the real world and breaks down advanced topics into digestible pieces, all while providing players with fun, interesting interaction. Players will walk away from JeffOS with a more developed set of computer skills and a grasp on the importance of cybersecurity in their everyday lives.

Key Topics: Malware, Defenses, Passwords
Grade levels: 3-6



Packet Protector

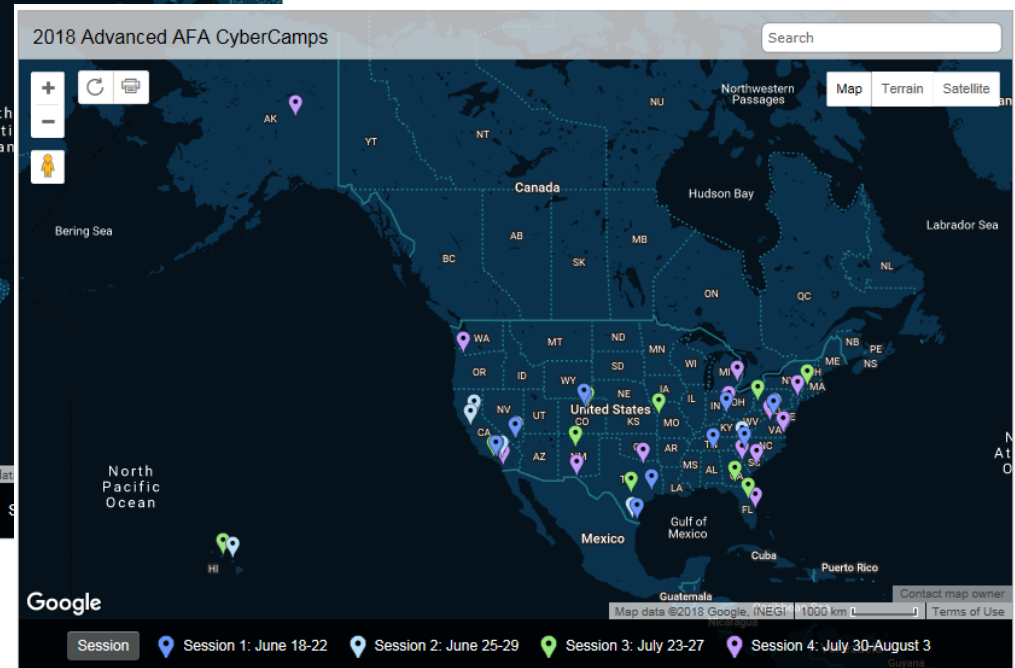
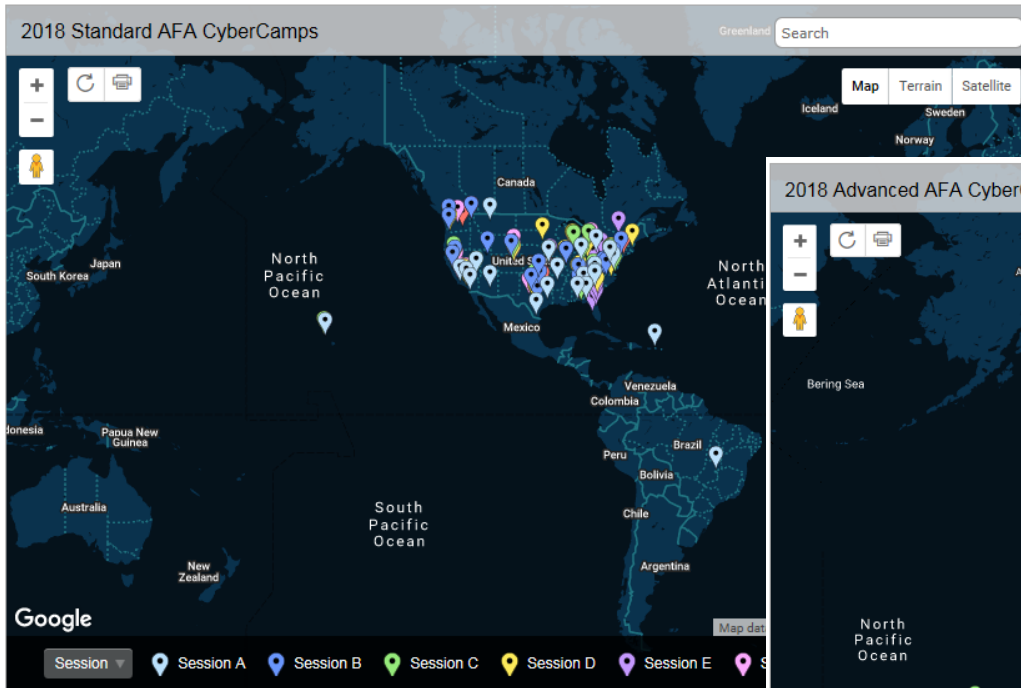
- Build a computer network to mine for cryptocurrency and use this money to expand and secure your network! Watch how your decisions affect the security and effectiveness of a network in this educational simulation. Along the way, you will learn about some basic networking components, malware, and security software, and discover some of the ways you can protect your network from cyber threats.

AFA's Elementary School Cyber Education Initiative (ESCEI) Success



- Over 7,800 ESCEI kits delivered since 2015 - 75,000 students reached
- 1,450 kits delivered in 2018
- 10+ countries
- All 50 states
- Some schools have integrated ESCEI into their technology curriculum

- Curriculum was designed to instruct novice students to learn about cyber ethics, online safety, and the fundamental principles of cybersecurity
- AFA CyberCamp Curriculum Kit:
 - Five four-hour instruction modules
 - Instructor’s guides
 - Student workbooks
 - Demonstration and competition software
- 20-hour Curriculum
 - Completed over five days (Monday through Friday)
 - Fifth day serving as a “mini-CyberPatriot” competition day
- AFA CyberCamp Kit Costs:
 - Please visit the AFA CyberPatriot website for standard and advance camp pricing
 - Digital copies of curriculum materials
 - 2 demo images and 2 competition images
 - Hard copy instructor guides and student workbooks as well as other materials available as additional purchase



- Seven sessions offered early June to early August
- Over 180 camps (6,500 students) conducted around U.S. in 2018
- 18% increase from 2017
- Standard and Advanced curricula offered

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