WHY ARE TEACHERS NOT TEACHING CYBERSECURITY:
AN ANALYSIS ON UTAH HIGH SCHOOL TEACHERS

CJ CORNEL & DALE ROWE

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  - Researcher and Publisher
    - ETR
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  - Technology Engineering Education/Studies
  - Cybersecurity Competition Participant
  - Web Pentester
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SPEAKER INTRODUCTION

Cj Cornel M.S.

- Lifelong Cybersecurity Professional & Learner
  - Nine years as BYU Faculty creating cybersecurity curricula
  - Coach teams in CCDC and CTF events
    - National top 3 in 2016/2017
  - Research focus: Scaling cybersecurity education, Diversity, Machine learning in Cybersecurity
  - Cybersecurity Consultant, Virtual CISO
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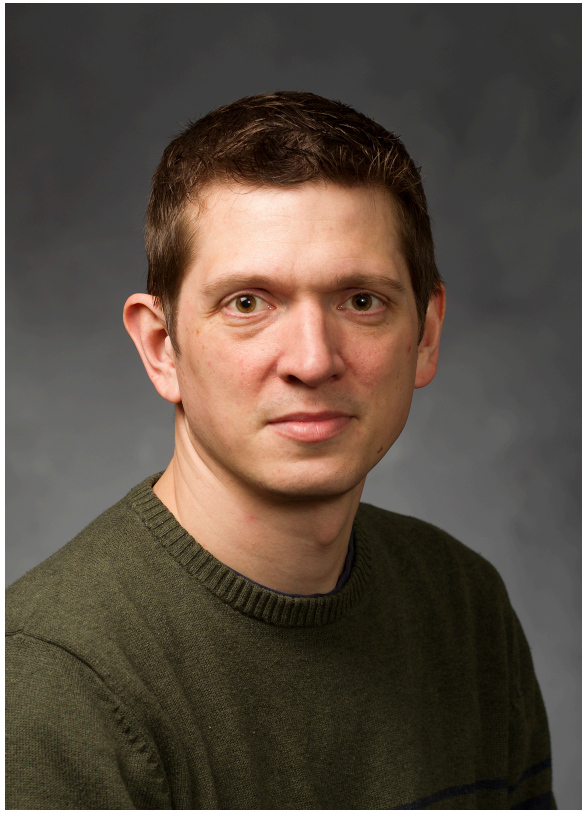

SPEAKER INTRODUCTION

Dale Rowe Ph.D. CISSP GXPN

SKILLS SHORTAGE

- ISC 2018: Currently 2.93M unfilled cybersecurity positions (global)
- Cyberseek.org: Today (12/9): 503,316 unfilled positions in the USA
- Forbes: 74% of businesses say this shortage is impacting their business

- Despite our best efforts, the defecit is still growing:
  - CyberPatriot and GenCyber
  - More college programs
  - New-collar worker programs/cyber vocational training

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STUDY OBJECTIVES

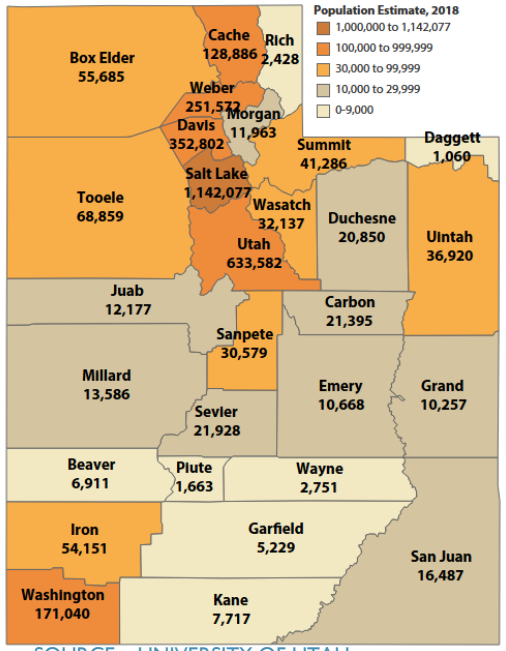
- Why are there so few cybersecurity high-school educators in highschools?
- Created a study to ask subject-matter experts
  - Awareness
  - Knowledge
  - Background
  - Confidence

Disclaimer: We tried to gather statistically significant data, but the shortage of cybersecurity teachers means that some findings do not meet typical acceptance for being significant. We believe they are still worthy of discussion here but other regions may find different results.

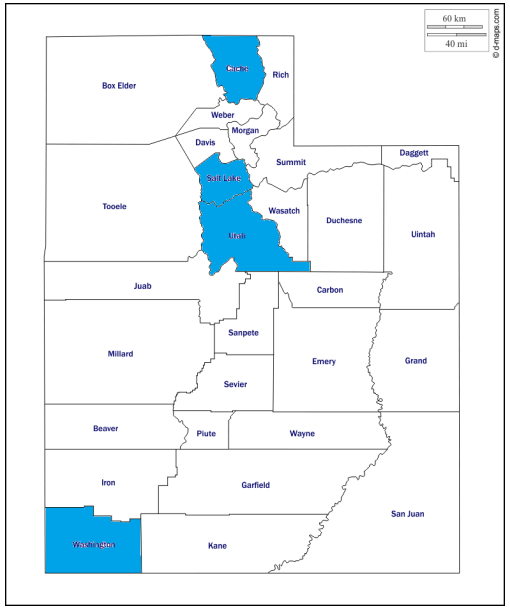
METHODOLOGY

SUBJECT MATTER EXPERTS

- Subject Matter Expert Selection
  - Being a teacher in one of the following Utah districts:
    - Alpine, Cache County, Canyons, Granite, Jordan, Murray City, Nebo, Salt Lake City, or Washington County.
  - The offering of a computer related course or courses.
  - Teaching at the high school level.
- Chosen via respondents and researcher

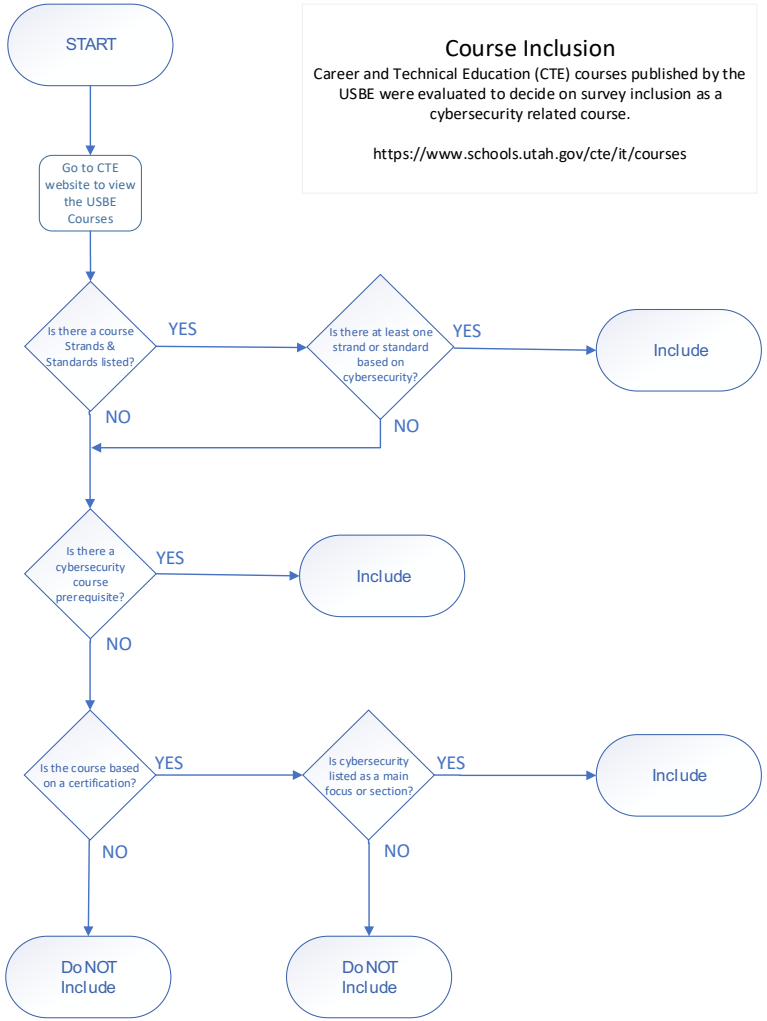


SOURCE – UNIVERSITY OF UTAH



BACKGROUND

- Variables
- What cybersecurity courses do you teach?
  - Related
  - Focused
- What security certifications do you hold?



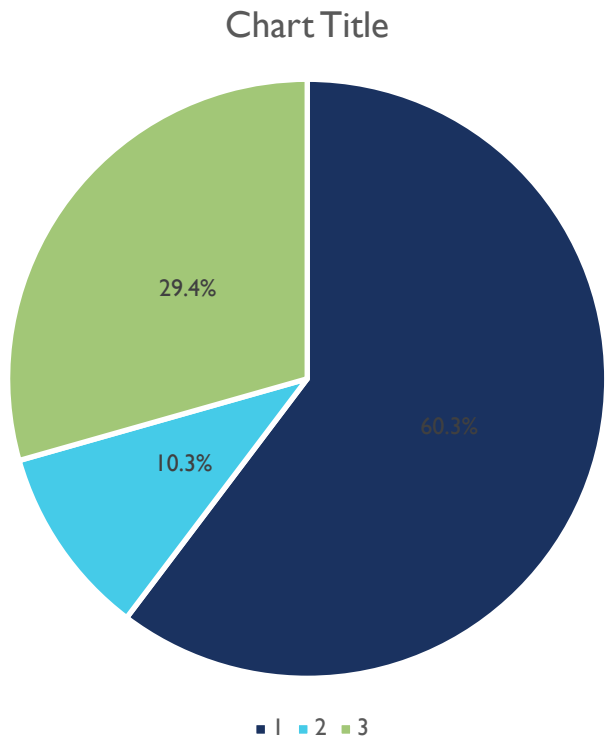
CONFIDENCE, AWARENESS & KNOWLEDGE

- Confidence (Bashir, Wee, Memon & Guo, 2017)
  - Teaching
  - Content knowledge
- Cybersecurity awareness (Peter, Ray, Silvia, 2018)
  - How likely
  - How aware
  - How careful
  - How concerned
- Knowledge Questions (Mangold, 2016)

ANALYSIS

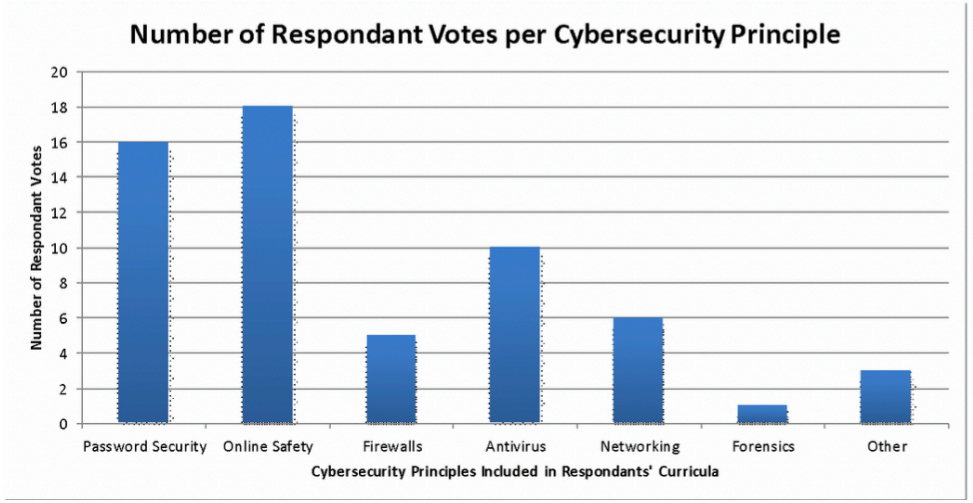
POPULATION

- Utah Schools Directory (USBE)
- Excluded: Box Elder, Davis, Logan City, and Uintah
- Private Schools
- Found
  - P = 68
  - S = 31
  - 90% Confidence Level
  - 11% Margin of Error



CYBERSECURITY PRINCIPLES CURRENTLY TAUGHT

Topic	% of Instructors who Teach
Online Safety	58.1%
Password Security	51.6%
Antivirus	31.0%
Networking	19.3%
Firewalls	16.1%
Forensics	3.2%



TEST TIME - KNOWLEDGE

SOURCE – MEMEGENERATOR.NET

What are the three components of information security?

- ○ Confidentiality, Integrity, and Availability
- ○ Confidentiality, Internal security, and Assurance
- ○ Information Assurance, Non-Repudiation, and Confidentiality
- ○ Logging, Information Security, and Monitoring
- ○ I don't know

What is the best-practice standard for secure web application development?

- ○ OWASP Top-10
- ○ SQL Injection
- ○ Cross Site Scripting
- ○ Documentation Standards
- ○ I don't know

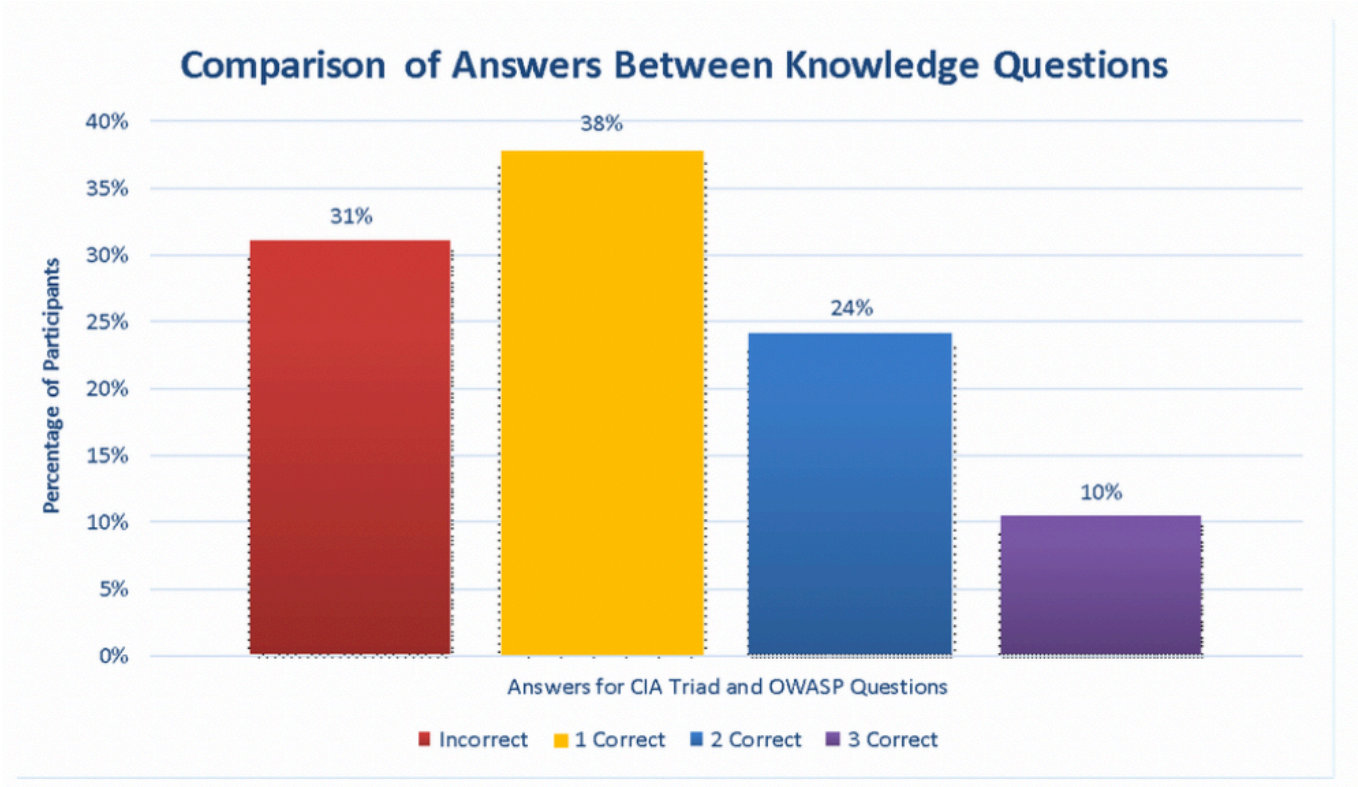
Why is patching important?

- ○ Patching is necessary to keep computers operational and online
- ○ Patching is not necessary to securely operate any computer systems.
- ○ Patching reveals critical security flaws for the security analyst to firewall
- ○ Patching helps keep systems updated and protected against known issues
- ○ I don't know

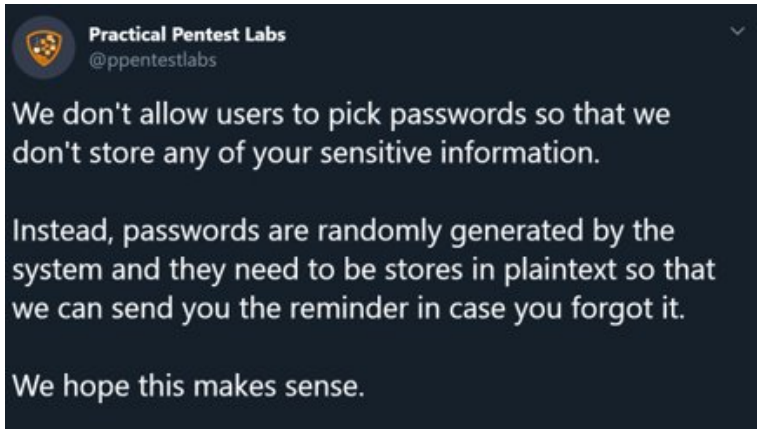
KNOWLEDGE QUESTIONS

Online Safety
(58.1%)

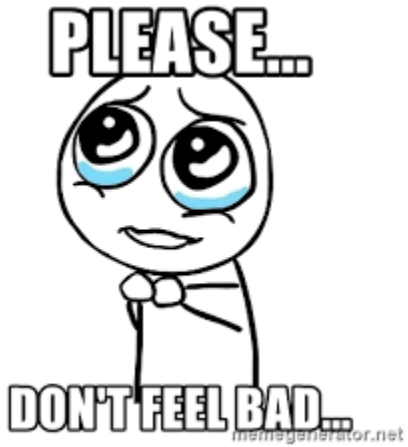
Password Security
(51.6%)



KNOWLEDGE PROBLEMS ARE WIDE-SPREAD



https://twitter.com/ppentestlabs/status/1202906268991664128?s=21



SOURCE – CBS

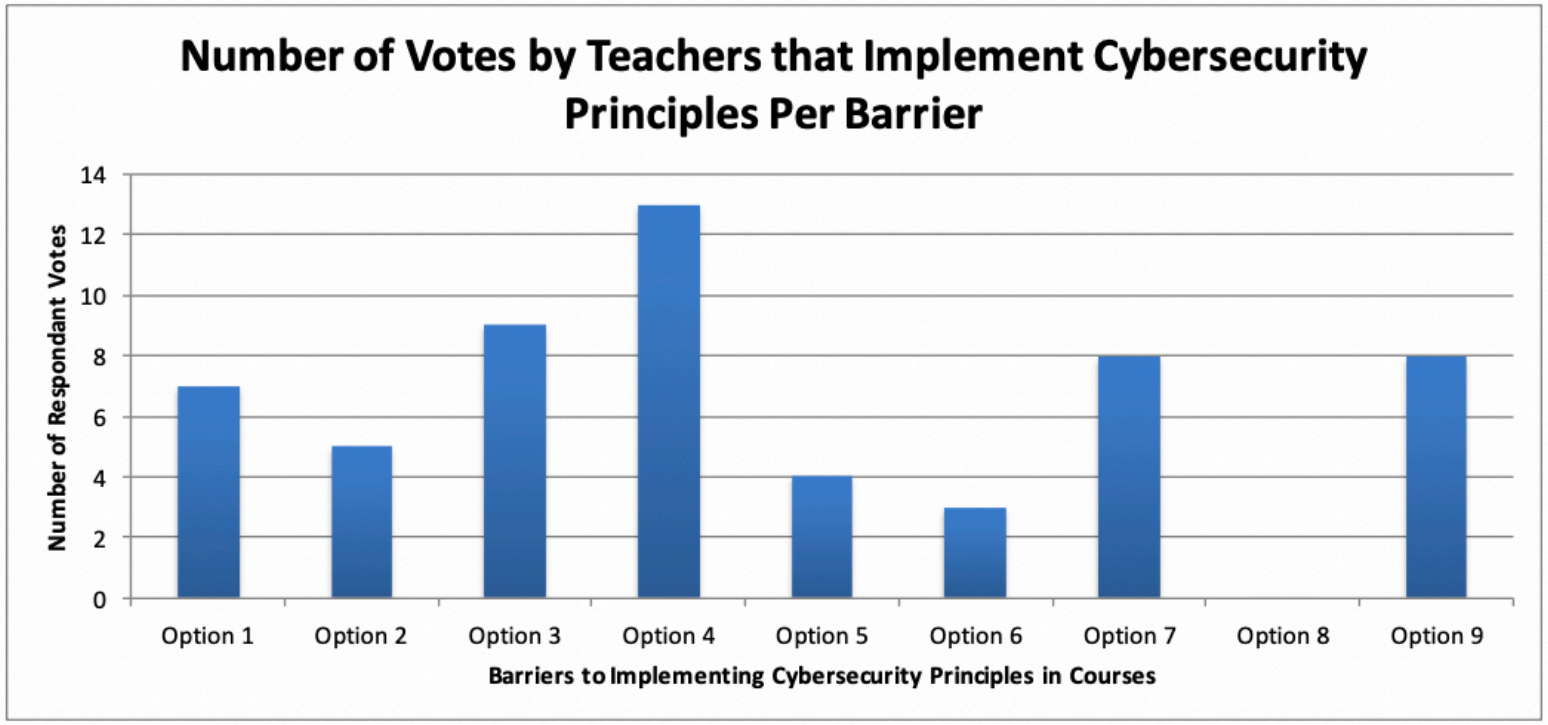
"Neither the NT hash nor the LM hash is salted. *Salting* is a process that combines the password with a random numeric value (the salt) before computing the one-way function. **Windows has never stored hashes in human-readable form, so there has never been a need to salt them.**"

http://technet.microsoft.com/en-us/library/hh994558(v=ws.10).aspx (Prior to 2014)

BARRIERS

LACK OF CYBERSECURITY PRINCIPLES (67.7%)

LACK OF SUPPORT FROM SCHOOLS (54.8%)



Time...adding one more thing to a curriculum already over-stuffed with state-mandated performance objectives.

Teacher knowledge. I don't know wtf I am doing.

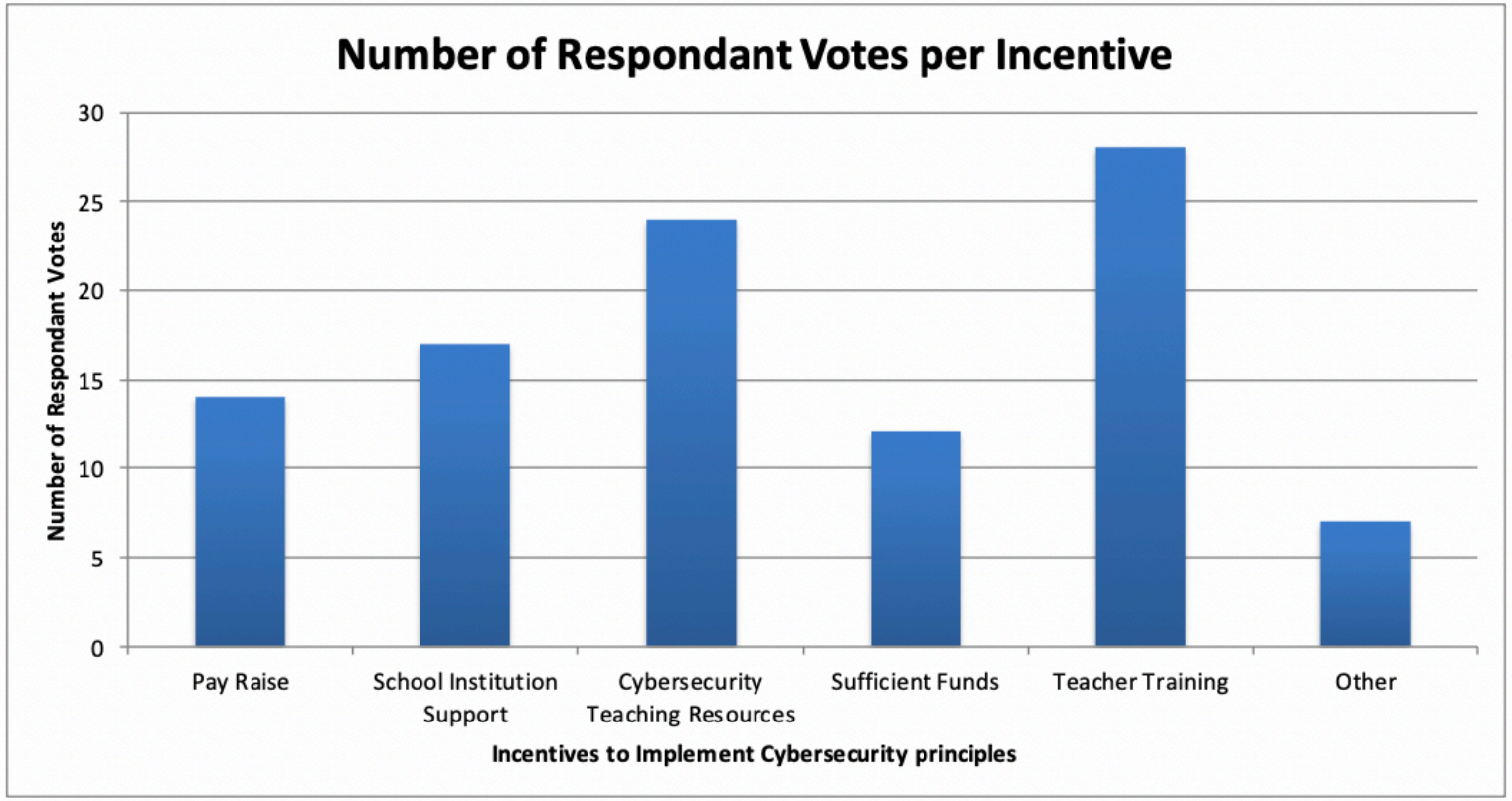
SOURCE – SHUTTERSTOCK.COM

Generally [sic] without state level approved courses and strands-standards we are not allowed to teach items not approved at state level.

ENCOURAGE

TEACHER TRAINING (67.7%)

CYBERSECURITY TEACHING RESOURCES (54.8%)



TECHNICAL TRAINING

Cybersecurity has always been a mystery. The USBE trainings I've attended at summer con[f]erence [sic] are generic with no actual practice / application time. I'd like to learn the general principles AND the most common software used. Thank you!

CONCLUSIONS AND RECOMMENDATIONS

- Less than 20% of respondants are teaching 'technical' cybersecurity content
  - Topics other than antivirus, online safety and password security
- Only 10% of respondants correctly answered all three knowledge questions
- Biggest perceived obstacles were teacher training and teaching resources
  - Institutional support also appears to be a significant factor

- Recommendations
  - Increase collaboration with industry to provide institutionally-supported teacher training and curricular content.

WHAT WE ARE DOING

- Establishing a Industry-College-School initiative called "Utah Cyber Task Force"
- Hoping to launch next year
- Will provide access to free training resources and teaching resources
- Hoping to include teacher scholarships to help incentivize those who pursue certification

QUESTIONS/DISCUSSION

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