This work is supported by National Science Foundation Award # 2206982.
ABOUT ME

El Paso High School

Principles of Applied Engineering
Fundamentals of Cybersecurity
Cybersecurity Capstone

MCSE, A+, CISCO, MCP, MCP+I
Help Desk, Technology Specialist, System Administrator, DoD

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Defending against cyber attacks and hackers

- Data breaches cost businesses an average of $4.35 million in 2022.
- 1 in 2 American internet users had their accounts breached in 2021.

My role: to learn about cyber defense
My work: to develop practices that will enhance student synthesis of Cybersecurity
My goal: design a curriculum that yields better cyber hygiene

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CYBERSECURITY RESEARCH

ARTICLES/DATA
• Intro to cybersecurity
• Cybersecurity Basics
• Gamification
• Cyber Attack Simulation
• Importance of Cybersecurity Education

WEBSITES
• Codecademy.com, umich.edu, Coursera (NYU)
• Geekflare.com
• Academic-conferences.org
• Easychair.org
• Ijiet.org

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ARTICLES/DATA

• Design of Secure Coding Challenges
• Bridging Defense to Offense
• Challenging the landscape of cybersecurity education

WEBSITES

• Link.springer.com
• Sciendo.com
• Link.springer.com

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Cyber Defense Research Activities

Cybersecurity facts
- Phishing
- Password Protection
- Spam
- Malware
- SQL Injection
- Denial of Service
- Man in the Middle
- Ransomware

Networking tools
- Virtual Private Networks
- Firewall
- Virtual Machines
- Linux
- Kali
- Operating System types

Analyzing tools
- Graphic Network Simulator
- Packet Tracer
- Wireshark

Intrusion Detection System
- IDS
- Intrusion Detection System
- Intrusion Protection System
- Security Onion

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CYBER DEFENSE RELEVANCE

HOW

Cyber defense fits perfectly with the cybersecurity capstone class I will be teaching in 2023-2024

WHY

This project covers everything I need to teach in my capstone class

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CYBER DEFENSE TEACHING MODULE

PASSWORD MODULE

• Warm up: password facts in the form of a game
• Hook: Password Hacking Video
• Lesson: Passwords
• Closing: Exit Ticket

LESSON DETAILS - CREATE A PASSWORD

• Check for patterns
• Hack passwords: brute force, password recovery programs
• Password hardening
• Password algorithm

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Timeline

Ethics

Digital Citizenship

Cybersecurity Skills:
- Network design
- OS environments
- Digital forensics

Risk Assessment

Cybersecurity Skills:
- Pen testing
- Cryptography
- Cyber defense

Cybersecurity Skills:
- Emerging Technologies
- Technology communication
- Python Programming

TEKS: 126.52 (c) (1-15)

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## Content – Cybersecurity Capstone

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Topics</th>
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<tr>
<td>126.52 (C)</td>
<td>CYBERSECURITY SKILLS</td>
<td>• Operating System Environments</td>
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<td>• Secure Network Design</td>
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<td>• Emerging Technologies</td>
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<td>• Communication of Technical Information</td>
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</tbody>
</table>

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Content

126.52 (C) (4) DIGITAL CITIZENSHIP

• digital technology, safety, digital hygiene, and cyberbullying.

126.52, (C) (10-12) PYTHON

• Data analysis
• Data visualization

126.52 (C) (3) ETHICS AND LAWS

• ethical and current legal standards,
• rights and restrictions governing technology, technology systems, digital media and information technology,
• the use of social media in the context of today's society

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Content

126.52 (C)(13-15) RISK ASSESSMENT
  • Analyzing threats
  • Ethics and Laws

126.52 (C)(13-15) RISK ASSESSMENT
  • Processes and concepts

126.52 (C)(13-15) RISK ASSESSMENT
  • Effectiveness of environmental controls

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My research project was about cyber defense and how vital its understanding is for students in grades K-12. Studies reveal that students are still not getting it. They are not synthesizing cybersecurity threats and how to protect against them. This effort is to help mitigate cyber attacks and arm our students with the concepts and knowledge they will need for their future.

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Pre-Test outcomes:

• 18% over 60
• 18% over 50
• 64% over 70

Basic Knowledge
• 55% - 100
• 45% - 83

Intermediate Knowledge
• 64% - 100
• 36% - 87.5

Advanced Knowledge

64% PASSED

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THANK YOU

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