
NICE
Conference and Expo
2022
JUNE 6 - 8, 2022 | WESTIN PEACHTREE PLAZA | ATLANTA, GA
DEMYSTIFYING CYBERSECURITY
Integrated Approaches to Developing Career Pathways
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NICE Conference and Expo 2022

Signature Pedagogy in Cybersecurity: An Emerging Perspective

Ashley Gess
Program Head, Computer Science Endorsement,
Augusta University

Michael Nowatkowski
Associate Professor and Head of the Cyber Program of Study
Augusta University

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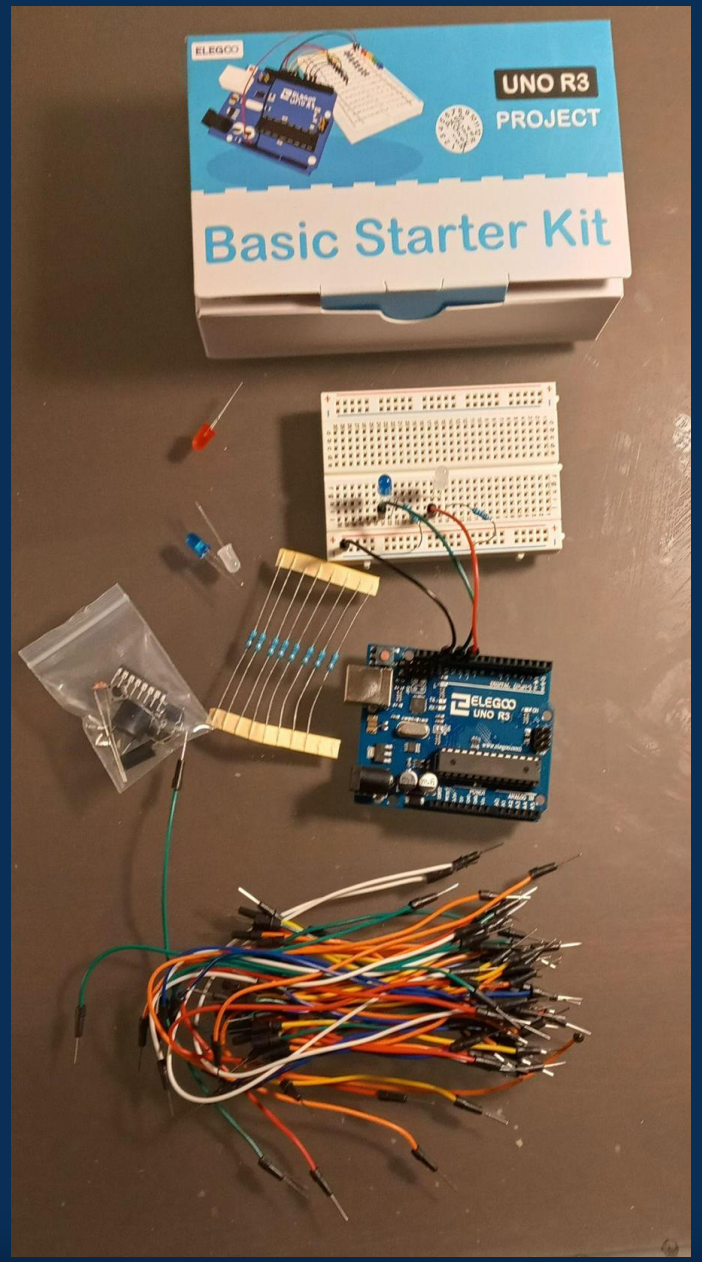
Please choose an activity that most interests you as you enter.

Feel free to have fun… you have approximately 5 minutes.

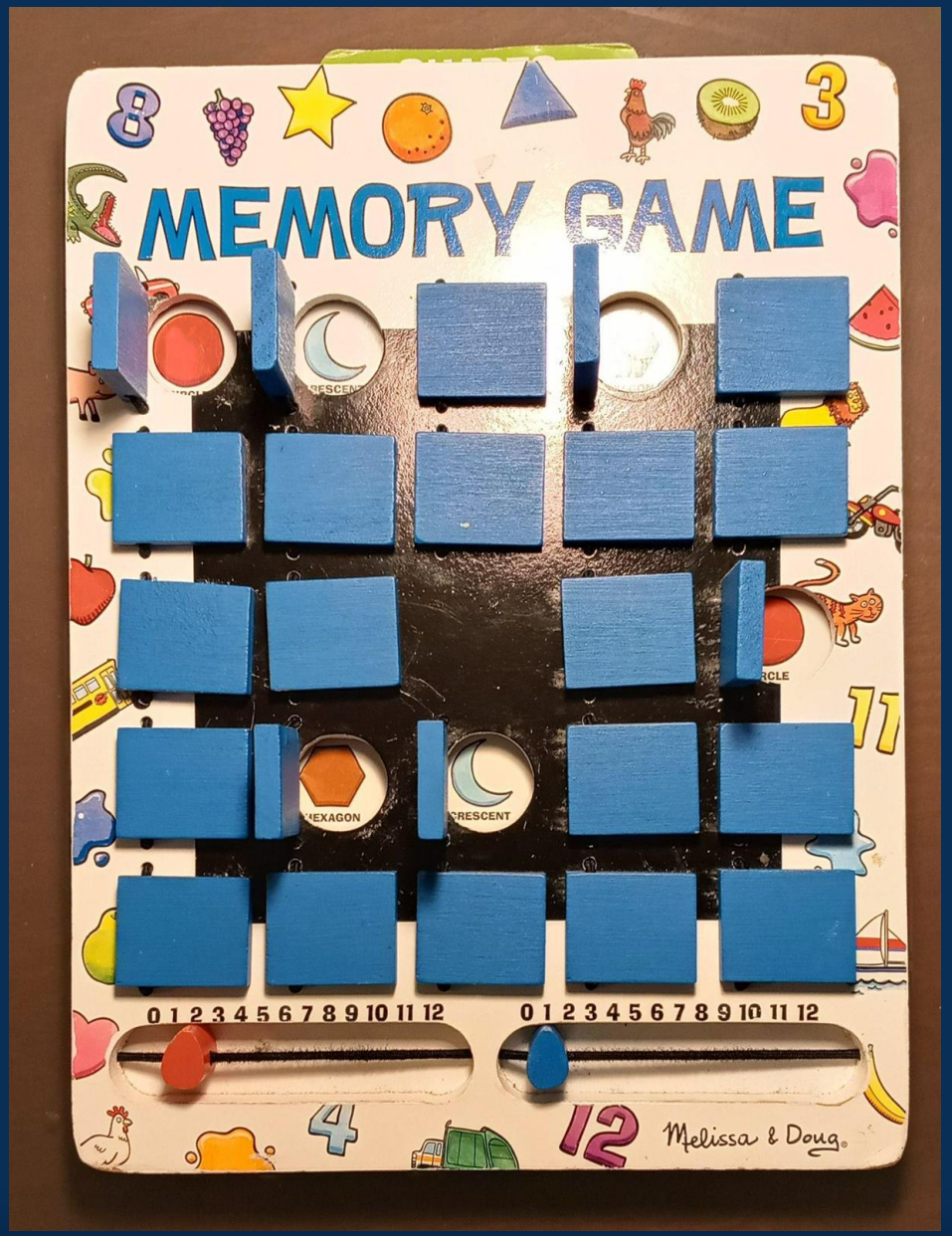
Signature Pedagogy in Cybersecurity: An Emerging Perspective

Ashley J. Gess, PhD
Michael Nowatkowski, PhD
Augusta University, Augusta GA

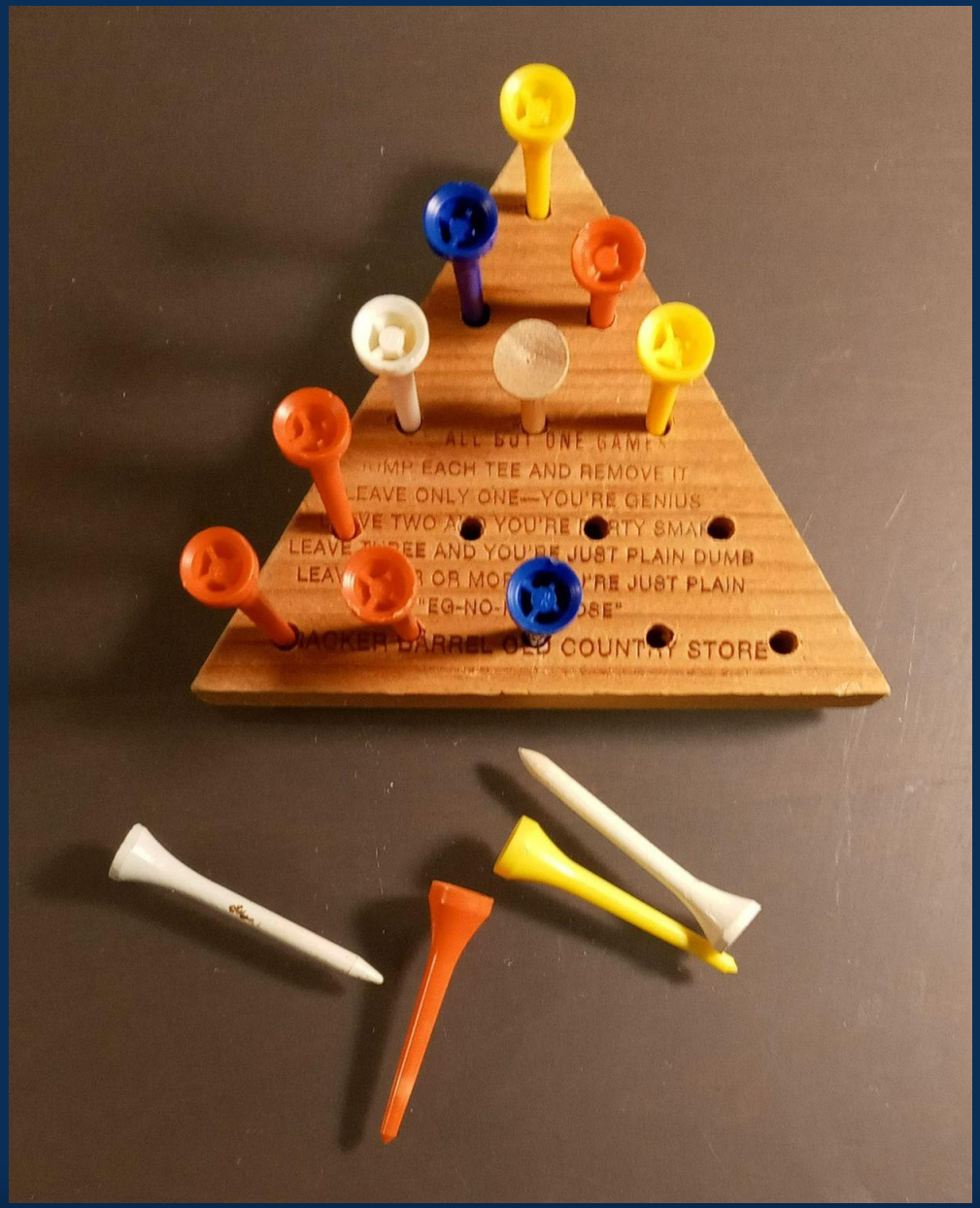
Arduino Starter Kit



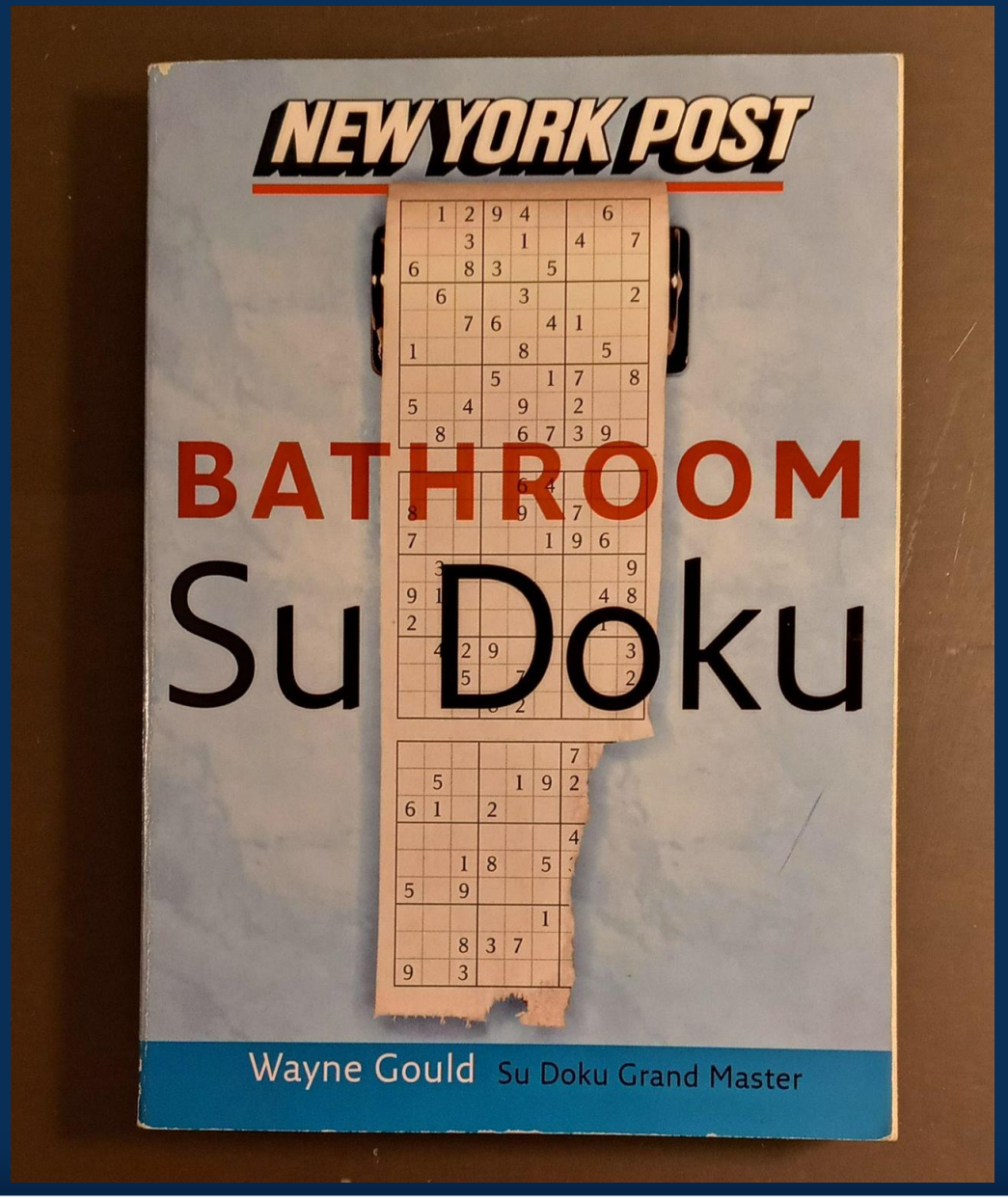
Memory Game


MEMORY GAME
HEXAGON
CRESCENT
0 1 2 3 4 5 6 7 8 9 10 11 12
0 1 2 3 4 5 6 7 8 9 10 11 12
4
12
Melissa & Doug

Peg Game


JUMP EACH TEE AND REMOVE IT
LEAVE ONLY ONE—YOU'RE GENIUS
LEAVE TWO AND YOU'RE JUST PLAIN DUMB
"EG-NO-SE"
COUNTRY STORE

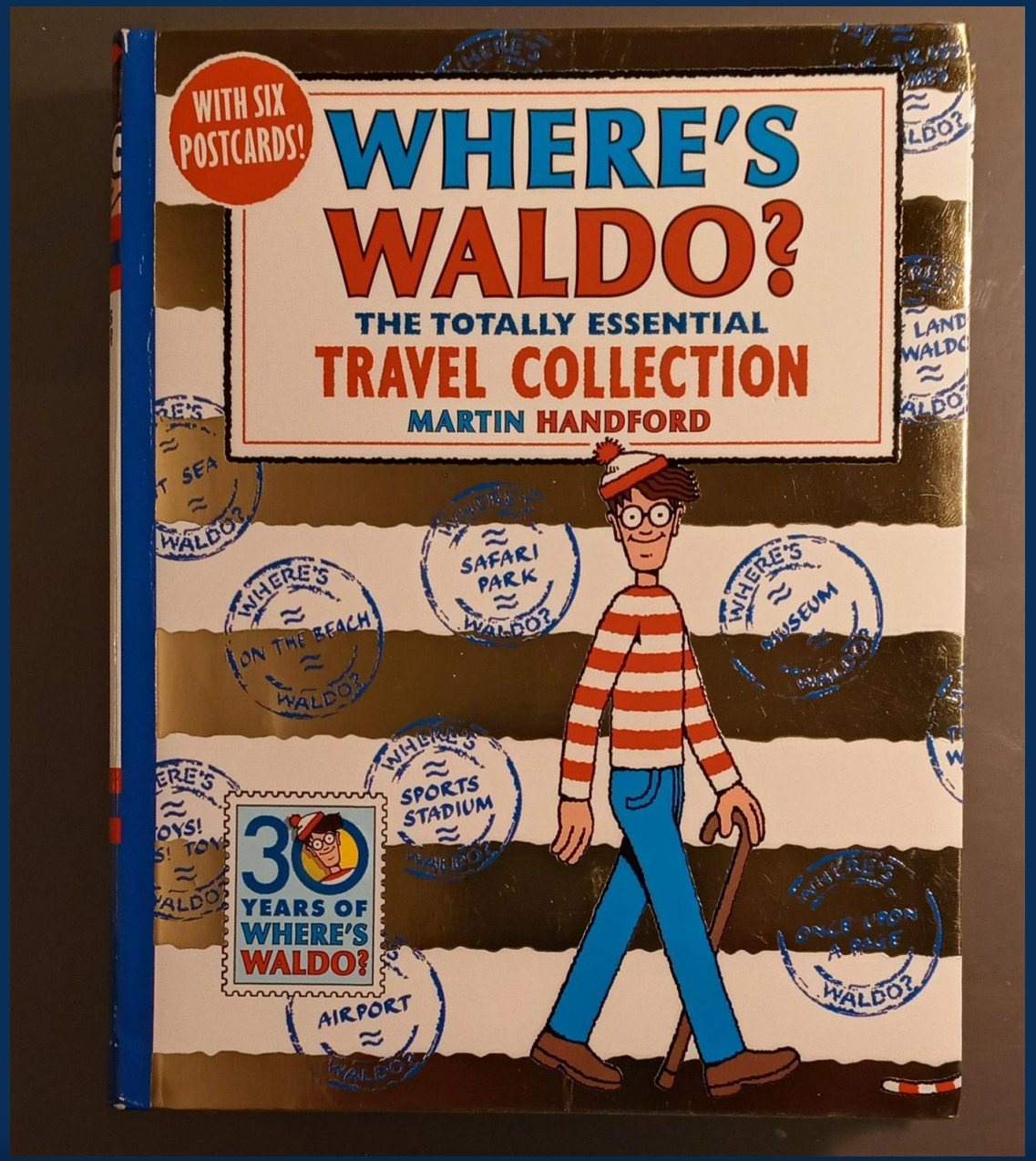
Sudoku


NEW YORK POST
BATHROOM
Su Doku
Wayne Gould
Su Doku Grand Master

Tangoes


TANGOES®
Deluxe Edition
A Puzzle • A Game • A Challenge
Based on an ancient Chinese puzzle that has fascinated people of all ages.
Simple enough for a child's coordination, yet subtle enough to challenge an adult's skill and perception.
A Square cut into 7 pieces.
You solve the 162 puzzles on the TANGOES cards
A friend can use the second set of 7 pieces to challenge your skill in a contest.
Expand your imagination by inventing your own forms.
It takes very little space to play, but a lot of creativity.
TANGOES — 2 sets of 7 pieces
162 puzzles

Where's Waldo?



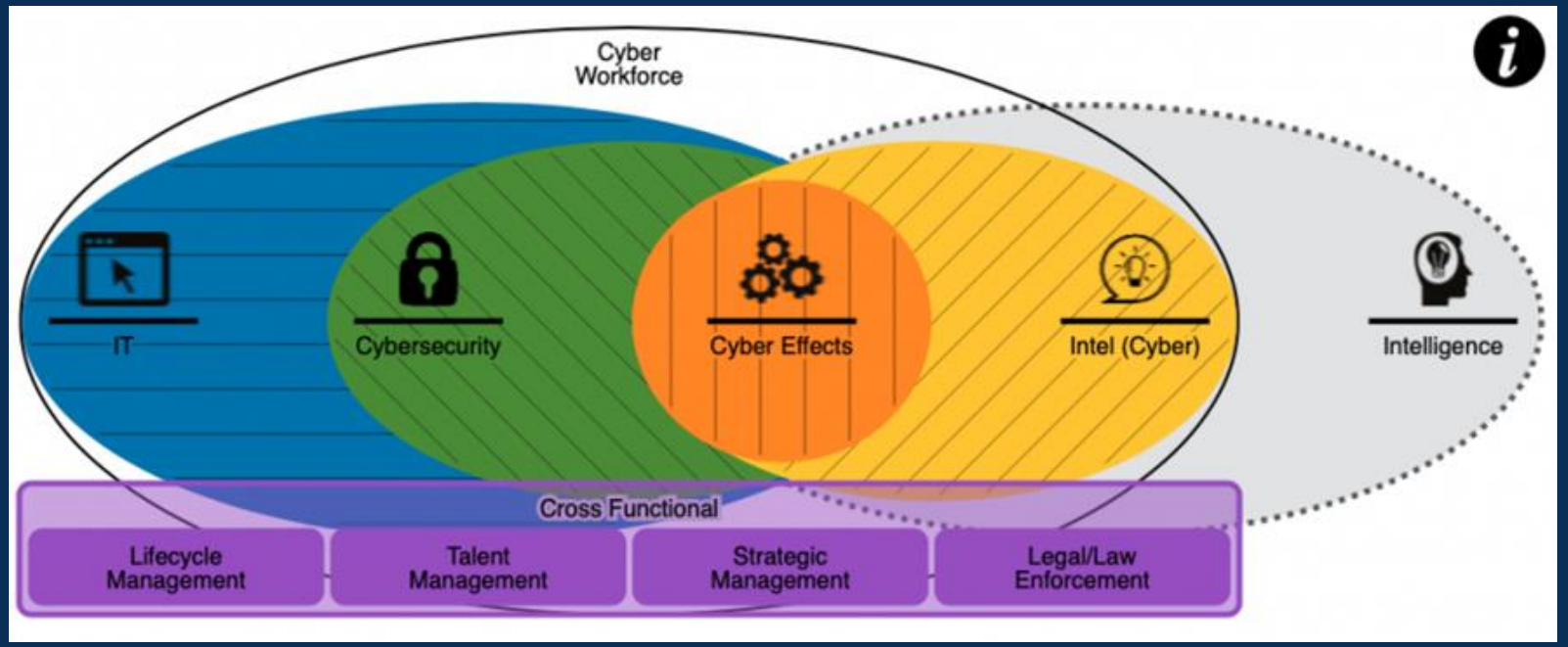
Breakout Box

DaVinci Cryptex

None of the above (I just sat and waited).

Introduction/Background

- 714,548 vacancies in the Cyber Workforce
- Broad range of talents needed
- Parallels between Department of Defense workforce and civilian workforce



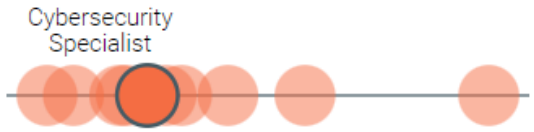
Cyberspace Workforce Elements
https://public.cyber.mil/cw/dcwf/workforce-elements/

Entry Level Jobs

Cybersecurity Specialist

AVERAGE SALARY

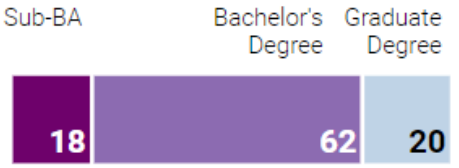
$104,482



COMMON JOB TITLES

- Information Security Specialist
- Security Specialist
- Cyber Security Specialist
- Information Technology Specialist
- Operations Specialist

REQUESTED EDUCATION (%)



TOTAL JOB OPENINGS

10,159

Entry-level Job	Openings	Sub-BA	Bach	Grad	Available Sub-BA	Bach	Grad
Cybersecurity Specialist	10159	18%	62%	20%	1829	6299	2032
Cyber Crime Analyst	1212	10%	64%	25%	121	776	303
Incident & Intrusion Analyst	9853	16%	64%	20%	1576	6306	1971
IT Auditor	8556	5%	76%	19%	428	6503	1626
total	29780	13%	67%	20%	3954	19883	5931

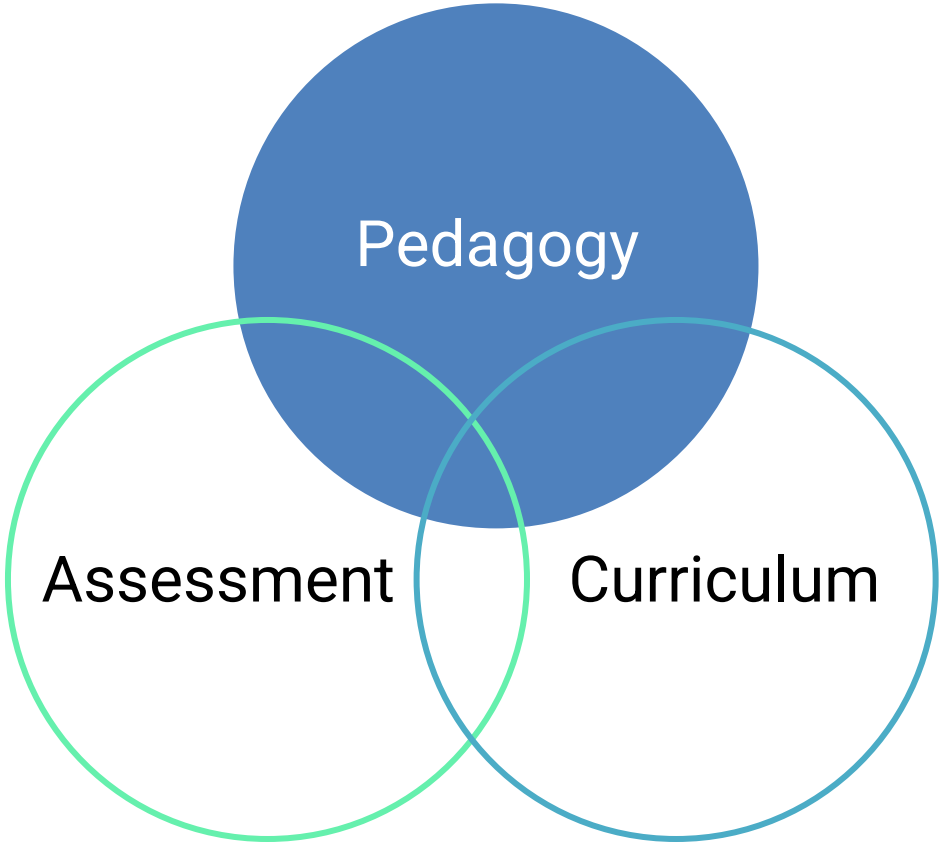
Current Pipeline

- Computer and Information Science (CIS) degrees in 2019
  - 169,288, of those:
    - 31,939 Associate's degrees → 3,954 open
    - 89,421 Bachelor's degrees → 19,883 open
    - 45,754 Master's degrees → 5,931 open
    - 2,174 Doctoral degrees
- How many of these are going into the Cyber Workforce?
- How do we increase the number of students interested in CIS, and specifically Cyber Workforce areas?

The Study: How to best teach Cybersecurity

What is a Pedagogy?

The teaching approaches used to help all students learn the content articulated in the curriculum.



What is a Signature Pedagogy ?

Dimensions of a signature pedagogy (See Shulman, 2005)

Dimension	Description
Surface Structure	Mastery experiences anchored in relevant content and characteristic behaviors around typical presentations of the content.
Deep Structure	Underlying "assumptions about how to best impart a certain body of knowledge and know how" (p. 55). In other words, how to think like the professional when in their job context.
Implicit Structure	"A moral dimension that comprises a set of beliefs about professional attitudes, values and dispositions"(p. 55). In other words, how do professionals behave among each other when engaging in their work?

Characteristic ways of teaching to prepare future professionals to think, perform, and act in the profession

Research Questions

RQ1: How do Cybersecurity professionals think and act when engaging in their profession?

RQ2: How can primary and secondary education professionals develop learners that think and act like Cybersecurity professionals?

Sample	Data Source	Analysis
Cybersecurity professionals n=125	Likert style survey Quantitative: • Cybersecurity profession questions • Cybersecurity teaching questions • Demographics	• Descriptive statistics • Measure of frequencies and central tendencies
Cybersecurity professors n=8	Focus group	• Inductive coding • Interrater reliability of greater than 80% • Member checking
Cybersecurity professionals n=2	Interview	• Inductive coding • Interrater reliability of greater than 80% • Member checking

Research Method and Analysis

Cybersecurity Professionals' Skills

Adapting
Analytical Thinking
Building
Collaboration
Computational Thinking
Creative Thinking
Critical Thinking
Curiosity
Data Gathering
Thinking
Designing
Design Thinking
Ethical Considerations

Persistence
Problem Finding
Problem Solving
Individuality
Resourcefulness
Synthesizing
Understanding
Open-mindedness

Experimenting
Innovating
Knowing
Memorizing
Metacognition

Evaluating
Predicting
Improving
Improvising
Reflection
Making
Mentoring
Visualizing

Resilience
Systems

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Innovating

Knowing

Memorizing

Metacognition

Evaluating

Predicting

Improving

Improvising

Reflection

Making

Mentoring

Visualizing

Resilience

Systems

Teaching approaches reported by Cybersecurity Educators

Case Studies

Interactive Lecture/Discussion

Research Paper

Class Discussion

Interview of CY Professional

Research Project

Coaching

Investigative Research Projects

Research Presentation

Exams

Lecture

Role Play

Games

Media Clips

Self Assessment

Group Projects

Modeling

Service Learning

Group Presentations

Peer Evaluation

Simulation

Guest Speakers

Peer Teaching

Teaching approaches reported by Cybersecurity Educators

Case Studies

Interactive Lecture/Discussion

Research Paper

Class Discussion

Interview of CY Professional

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Self Assessment

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Research Project

Coaching

Investigative Research Projects

Research Presentation

Exams

Lecture

Role Play

Games

Media Clips

Self Assessment

Group Projects

Modeling

Service Learning

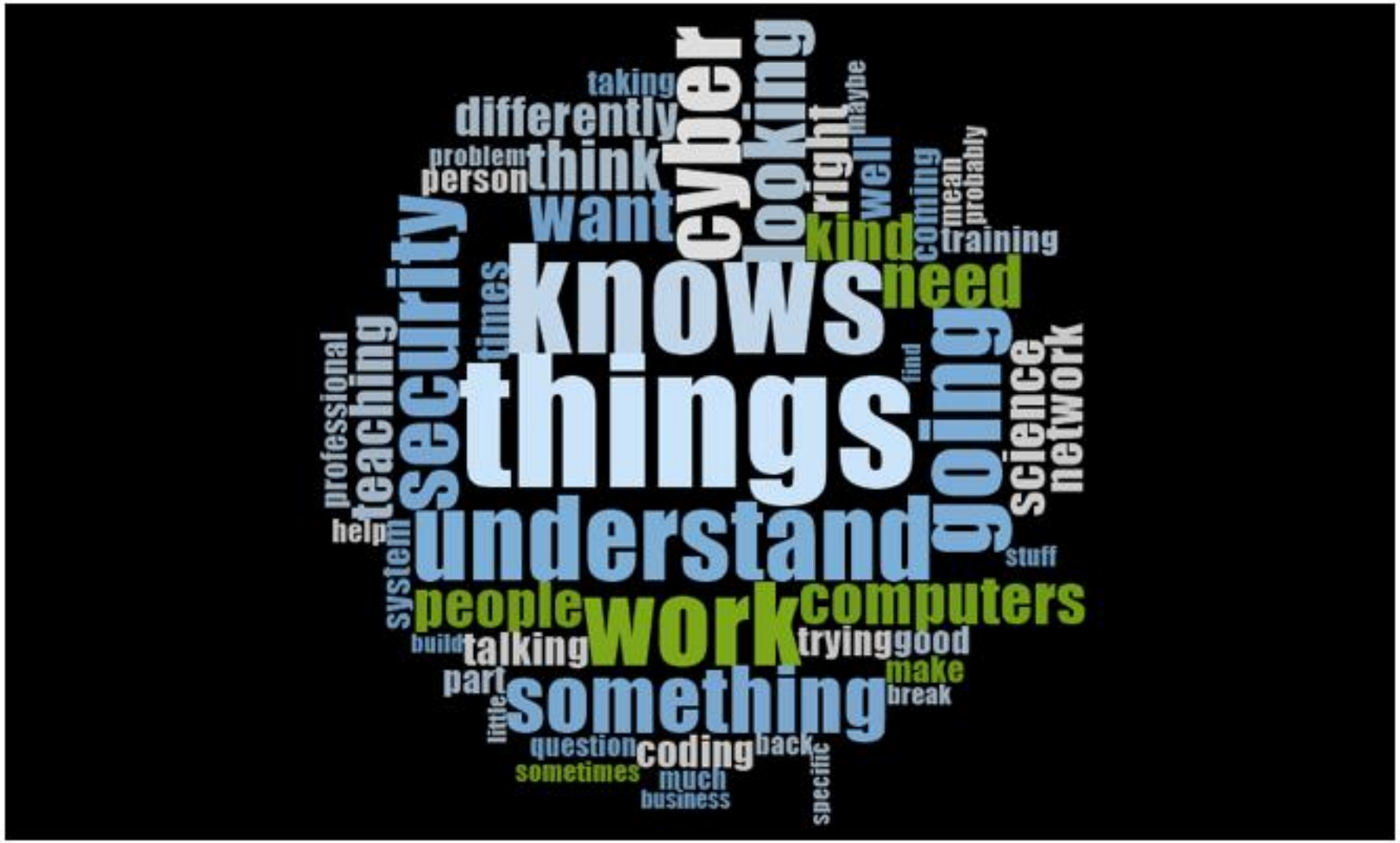
Group Presentations

Peer Evaluation

Simulation

Guest Speakers

Peer Teaching


taking
differently
cyber
looking
maybe
problem
person
think
right
well
coming
mean
probably
want
kind
training
knows
need
security
times
things
going
professional
teaching
find
science
network
understand
help
system
stuff
people
work
computers
build
talking
tryinggood
make
part
break
something
little
question
coding
back
sometimes
much
specific
business

Combined

Conclusions: Surface Structure

"concrete, operational acts of teaching and learning..."

- Demonstration – watch one, do one.
- Provide freedom to explore, try new ways to solve.
- Work in teams.
- Safe environment to experiment (lab access to try stuff).
- Authentic environment
- Play

Conclusions: Deep Structure

"how best to impart a certain body of knowledge and know-how."

- Case studies – discuss what happened, how to prevent it.
- Hands-on/Minds-on labs – can't just watch, students must do.
- Present challenges that may have multiple solutions.
- Opportunities to connect with in practice professionals
  Externship ->Internship (mentor & sponsor)->Apprenticeship

Conclusions: Implicit Structure

"set of beliefs about professional attitudes, values, and dispositions."

- Ethical – have to ask permission if you don't own it.
- Trust
- Persistence
- Try it - break it; Try it-Fail-Try again

Conclusions

1. Lively mind is unique and pervasive
2. Cybersecurity professionals are bricoleurs
   - One who engages in bricolage
   - One who creates from a diverse range of things

Conclusions

1. Lively mind is unique and pervasive
2. Cybersecurity professionals are bricoleurs
3. The pipeline is waning because we are relying on natural proclivities.
4. Interest needs to be cultivated intentionally through pedagogy that helps to develop #1 and #2.
5. Divide between profession and education is deep and persistent across P-16

Implications for Overall Education

1. Don’t bore students
2. Intentional Hands-on/ Minds-on must be planned where demonstrating skills
3. Experiential learning
4. Guided Externship, internship, apprenticeship
5. Adopt an integrative STEAM educational approach

Integrative STEAM educational approach

An approach to teaching where the teacher intentionally plans for students to apply the content and practices of science and mathematics through the design process with outcomes in either engineering, technologies, or arts.

Questions?

Michael Nowatkowski
mnowatkowski@augusta.edu

Ashley Gess
agess@mailbox.sc.edu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Attracting Tomorrow's Cybersecurity Talent Today

Tambre Paster
Cyber System Security Engineer, Senior Staff/Associate Fellow
Lockheed Martin Aeronautics

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Attracting Tomorrow's Cybersecurity Talent Today

2022 NICE Conference and Expo

Atlanta, GA

Tambre Paster

Cyber Systems Security Engineer/Associate Fellow

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Lockheed Martin Corporation

Missiles and Fire Control

- Air and Missile Defense
- Tactical Missiles and Fire Control
- Combat Maneuver Systems
- Energy

Space Systems

- Surveillance and Navigation
- Global Communications
- Human and Deep Space Exploration
- Strategic and Defensive Systems

Aeronautics

- Tactical Fighters
- Tactical /Strategic Airlift
- Advanced Development Programs
- Sustainment Operations

Rotary and Mission Systems

- Maritime Solutions
- Radar and Surveillance Systems
- Aviation Systems and Rotorcraft Platforms
- Training and Logistics Solutions

FG20-05744_5

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Lockheed Martin Cybersecurity Camp

What: Two full-day events packed with an agenda of fun interactive activities, lectures, and demos that taught students principles of cybersecurity.

Top-Level Goals: Educate and Impact

- Increase awareness of cybersecurity as an area of importance and as a career opportunity and develop interest among high school students.
- inspire students to pursue careers in Cyber and STEM and come work for Lockheed Martin in the future
- Encourage students to go study it on their own.

Established: July 2019

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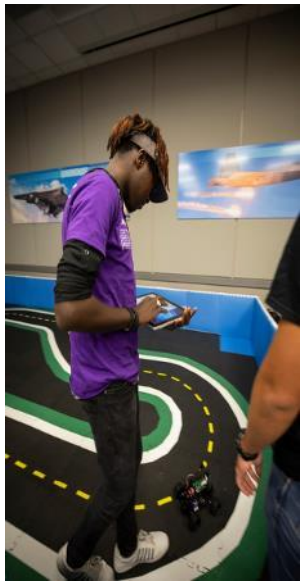
"It was clear that everyone here really loves their job and cares about the campers. I would love to come back!"

"I really loved this camp! I learned a lot of valuable information about cybersecurity."

"I'll be back in 6 years as a LM employee"



"Each activity & presentation was fun to participate in"

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What do you see?

Before

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Can you spot the difference?

After

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Don’t bee boring.

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CRYPTO VR™ Challenge

The **Crypto VR™** Challenge is an fun, educational experience in which players are immersed in an intense, virtual scenario that requires teamwork and ingenuity for mission success.

This a creative, original outreach tool developed by the a small group of Cyber Camp volunteers.

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CRYPTO VR™ Challenge

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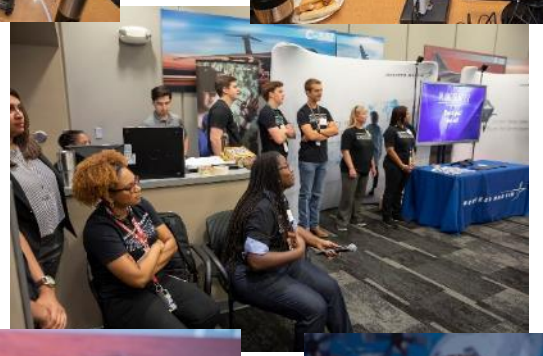








It takes a village.

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F-35 Flight Simulator

Factory Tour

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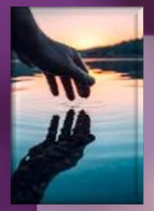
Key Take-Aways

Meet people where they are.

Don’t be boring.



Make it personal.

Dare to inspire.

Don’t give up.

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Session Description

With the demand for Cybersecurity professionals continuing to outpace supply, organizations are looking for creative measures to close workforce gaps. This session will focus on one company's philosophies and tactics for activating the next generation of Cyber professionals. Listen in on the journey to attract and prepare tomorrow's Cyber defenders through Lockheed Martin's first high school Cybersecurity Camp, as told by the lead Cyber Camp developer. This session may be right for you if you are looking for ideas to build your organization's pipeline or need a spark of inspiration to jumpstart your Cyber outreach efforts. This session is designed to inspire those who desire to inspire others.

Building the Cybersecurity Pipeline - 45 minutes - Wed. June 8

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Networking Break: Transform Learning Process

Mike Morris
Associate Dean Cybersecurity
Western Governors University (WGU)

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Integrating Emergency Management Principles into Cybersecurity Education

Markus Rauschecker
Cybersecurity Program Manager
University of Maryland Center for Health and Homeland Security

Netta Squires
Senior Law and Policy Analyst
University of Maryland Center for Health and Homeland Security

Ben Yelin
Program Director, Public Policy & External Affair
University of Maryland Center for Health and Homeland Security

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CHHS

UNIVERSITY OF MARYLAND
CENTER FOR HEALTH &
HOMELAND SECURITY

Integrating Emergency Management Principles into Cybersecurity

Netta Squires, JD, CEM, MSL

Markus Rauschecker, JD

Ben Yelin, JD

Presentation Outline

1. Where emergency management fits in the NICE Framework
2. Defining Emergency Management
3. Practical uses
4. Recommendations and examples
5. Free training resources

NICE Framework

Task, Knowledge, Skills (TKS)

Strategic Planning and Policy

Risk Management

Legal Advice and Advocacy

Cybersecurity Management and Executive Leadership

Emergency Management

- Framework
  - Coordination
  - Collaboration
  - Communication
- Wholistic Approach
  - Mitigation
  - Preparedness
  - Response
  - Recovery

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Cybersecurity as an “emergency”

- Baltimore City ransomware attack
- Colonial pipeline
- Kronos ransomware attack

The Intersection

- All hazard
- Cyber = threat
- Consequence management
- Education

What can Emergency Management principles do for you?

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Left of Boom

- Threat and Hazard Identification Risk Assessment
- Bring all the relevant partners to the table
- Make a plan
- Write the Plan
- Train
- Exercise
- Revise the plan
- Suggest and draft policies and guidelines

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Dooms Day

- Activate plans
  - Response plans
  - COOP plans- MEF
- Open an Emergency Operations Center (EOC)
- Alternate communication methods, Web EOC, Radios, etc
- Coordinate response

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Right of Boom

- Coordinate recovery
- Coordinate resources – local, state, feds
- Request an emergency declaration
- Write Incident Action Plan (IAP)
- Provide Situation Reports (SitReps)
- Public information and warnings / alert systems (PIO)
- After Action Reports (AARs)/ Improvement Plan (IP)

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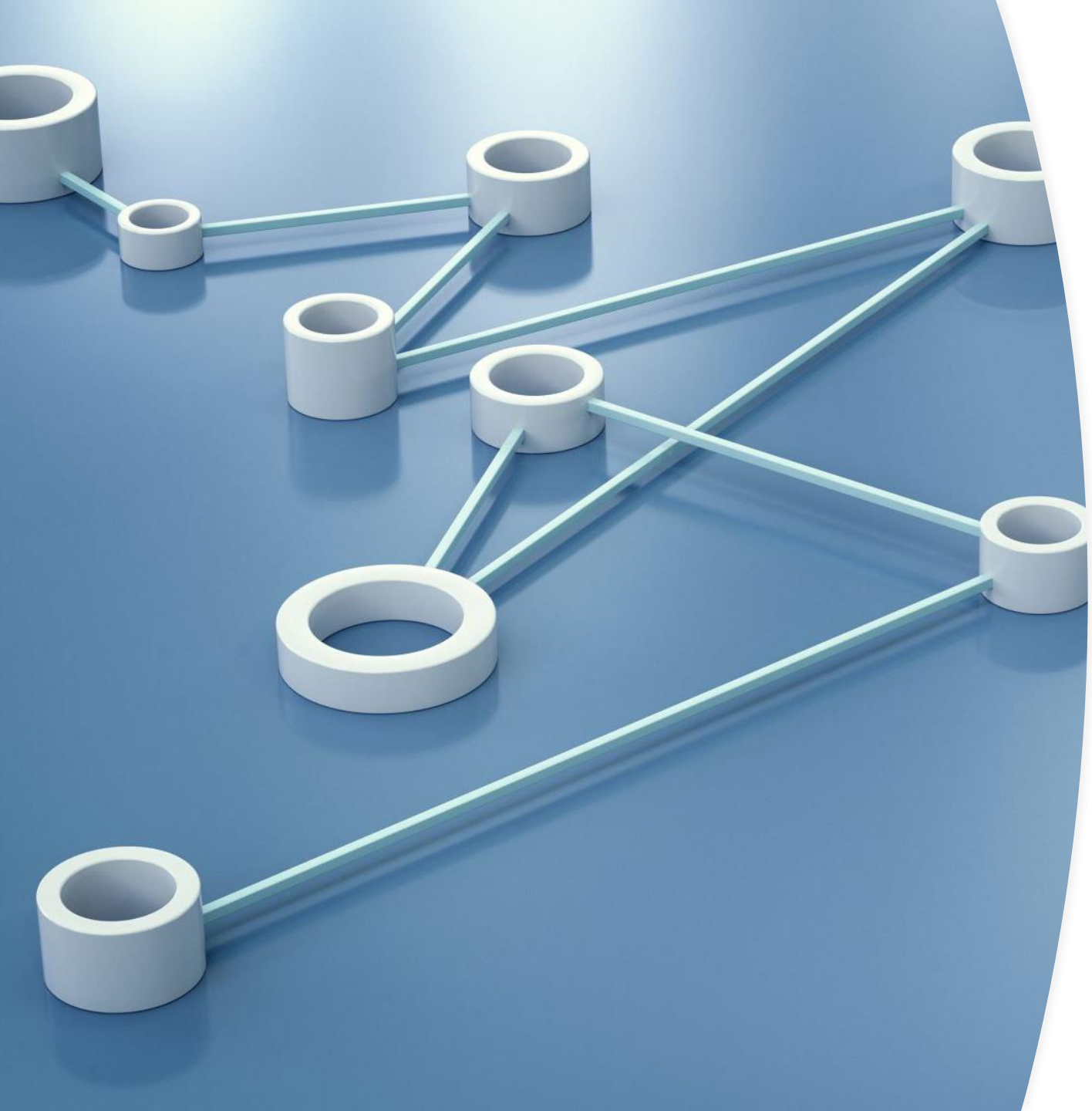

Recommendations

- Incorporate EM Principles into Cybersecurity Curricula (Part of a **Horizontal** education framework).
- Incorporate into all levels of higher education
- Teach in a wholistic approach

Opportunities and Examples

- Undergraduate
  - 100 Level Course in EM Principles
- Graduate Programs
  - Specialized courses in specific emergency management topics (incident command etc., law & policy)
- Professional
  - CISA
  - EMI

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Existing Resources

- **Free Online FEMA Trainings**
  1. IS-230.E: Fundamentals of Emergency Management
  2. IS-235.C: Emergency Planning
  3. IS-100.C: Introduction to the Incident Command System, ICS 100
  4. IS-700.B: An Introduction to the National Incident Management System
  5. IS-120.C: An Introduction to Exercises
-

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Key Takeaways: Emergency Management and Cyber Education

1. Cyber Security is not only an IT issue
2. A key goal of cyber education is to gain institutional knowledge to prepare for, and respond to, cyber incidents.
3. Emergency Management can help you improve your preparedness, response, and recovery from a cyber attack/ event


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