

# Early College Credit in Cybersecurity (E3C)



National **Cybersecurity**  
Teaching Academy

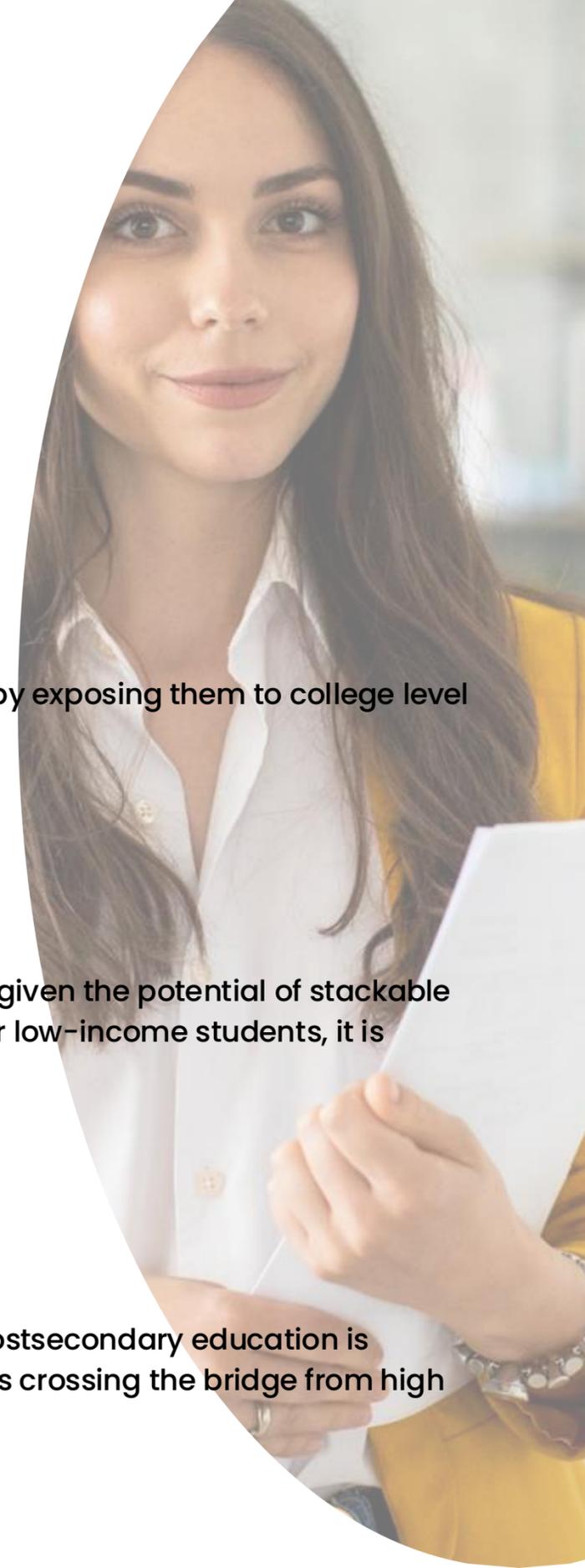
Dr. Melissa Dark

This work is supported by NCAE-C grant funding  
#H98230-22-1-0310

Visit Our Website

<https://teachcyber.org/e3c/>

# Early College Credit



ECC has long been important in the U.S. and is becoming more prevalent with 29% more schools offering ECC today than 15 years ago and 9% more students taking advantage of ECC.

In 2023, 34.7% high school students took at least one AP exam and 21.7% earned a score of 3 or higher. This is an increase from ten years ago when 31.5% of the class of 2013 took an AP Exam with 19.1% earning a score of 3 or higher on at least one AP exam.

## Types of ECC

### AP

program run by the College Board through a wide variety of high school subject-matter courses with examinations annually in May.

### CE

educational programs that enroll secondary students in postsecondary offerings for postsecondary credit.

### DSST

program run by Prometric, Inc that offers exams in specific subject areas for anyone seeking college credit outside the traditional classroom.

### DC

educational programs that enable secondary students to earn both secondary and postsecondary credit.

### IB

program run by the International Baccalaureate Organization that develops programs of international education and rigorous assessment.

## Goals of ECC

ECC aims to lead to increasing the number of talented students pursuing college.



### More Students

ECC aims to get more students to pursue college by exposing them to college level work while in high school.



### Stackable Credits and Credentials

ECC offers opportunities for stackable credits and given the potential of stackable certificate programs to enhance social mobility for low-income students, it is anticipated that such offerings will expand.



### Ignite and Strengthen

ECC experiences can help students realize that postsecondary education is attainable and beneficial leading to more students crossing the bridge from high school to college.

# E3C Keys Findings



## Cybersecurity Programs

1

446 institutions have a total of 799 undergraduate cybersecurity programs of study, i.e., majors, minors, certificates.

2

## Introductory courses

267 of the 446 institutions have introductory cybersecurity courses (60%) and 179 do not (40%). These 267 institutions have 297 intro courses.

3

## Intro Courses -> Plan of Study

These 297 introductory cybersecurity courses are in the plan of study for 70% (n=558) of the cybersecurity programs; 30% have no cybersecurity intro course that students could articulate.

4

## Introductory course categories

The 297 introductory cybersecurity courses fall into three types: 1) 52% are holistic/broad introduction to cybersecurity and 2) 45% are network security and 3) 3% are other, e.g., intro to digital forensics, or international diplomacy and security.

5

## Intro Courses -> Type of Institution

Universities with an E3C candidate course are more likely to have the holistic/broad course and community colleges with E3C candidate course are more likely to have network security.

The full report: <https://teachcyber.org/e3c/>

# What will it take to establish mature E3C programs?

**The first two types of intro courses, i.e., holistic cybersecurity and network security appear to be the “inflection” points.**



## Network security course framework

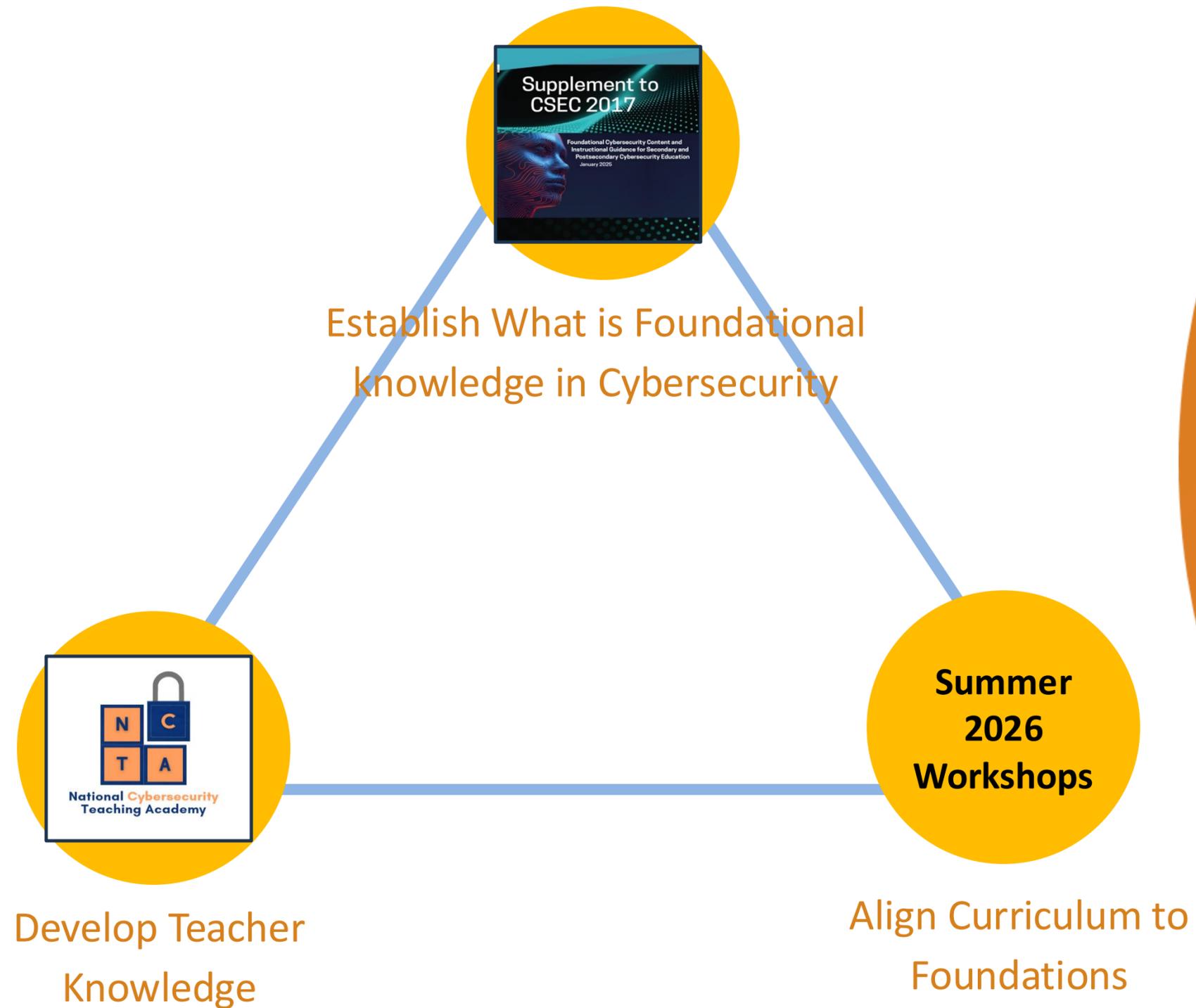
We are aware that the College Board Career Kickstart is working on a two-year ECC sequence in Networking and Network Security. While we do not yet have details on their framework yet, it appears that this effort may help to establish E3C for the ~45% of intro cybersecurity courses that are network security. Again, closer inspection is needed.

## Holistic cybersecurity

NCTA has successfully updated the ACM CSEC curricular guidelines to include foundations of cybersecurity. These foundations will represent the desired content for a holistic/broad intro to cybersecurity course. Finally, if the U.S. wants to build collegiate cybersecurity enrollment through E3C, efforts are needed to establish introductory courses at the 179 CAE/SFS schools that currently have none.



# The NCTC Strategic Effort



## NCTC at a Glance

- **7 Universities**
  - University of Arkansas Little Rock
  - DePaul University
  - University of Louisville
  - Sacramento State University ->Worcester Polytechnica
  - University of Maryland Global Campus
  - Dakota State University
  - University of Arizona
- **Starting our 4<sup>th</sup> Cohort**
- **~500 high school teachers credentialed by end of current grant**
- **Scholarships available for teachers**
- **Open enrollment foundations course new summer 2025**



# AP Cybersecurity Brings New Choices and Enhanced Relevance

Ben Dougherty, Senior Director, AP Curriculum and Assessment

# Career preparedness is a rising priority in K-12 education.

Among students and families surveyed, only 35% of schools offer job-relevant skills education.

## Top 10 Purpose of Education Rankings

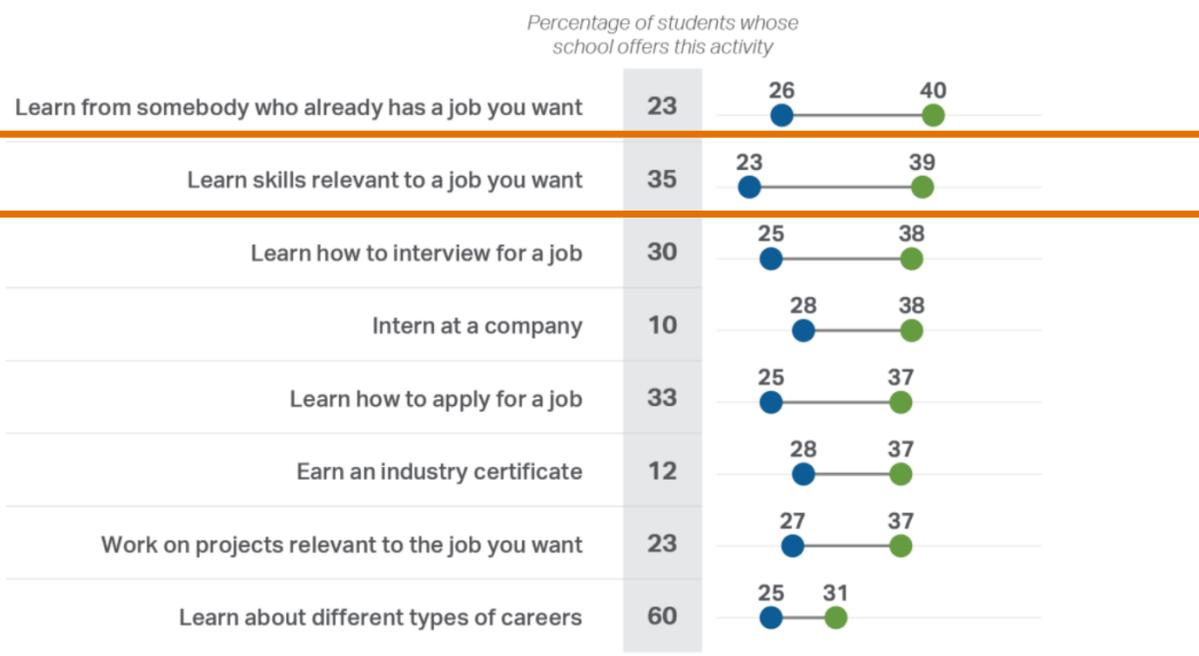
Attributes	2022	2019
Students develop practical skills (e.g. manage personal finances, prepare a meal, make an appointment)	1	1
Students are able to think critically to problem solve and make decisions	2	4
Students demonstrate character (e.g. honesty, kindness, integrity, and ethics)	3	3
Students can demonstrate basic reading, writing, and arithmetic	4	14
All students receive the unique supports that they need throughout their learning	5	19
Students are prepared for a career	6	27

### Future career confidence increases among students whose schools offer career-related activities.

Does your school offer any opportunities to ... ?

% Very prepared for "How prepared do you think you will be to do each of the following in the future: Succeed in a career"

• School does not offer this activity • School offers this activity

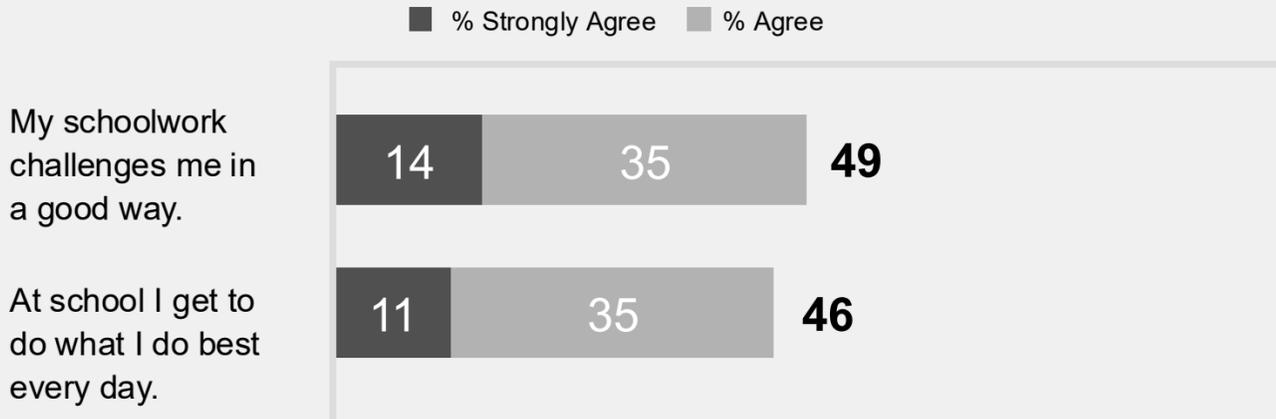


Among Gen Z K-12 students

# Students are telling us how to improve engagement.

## PROBLEM

**Less than 50%** of Gen Z say their coursework challenges them or gives them the opportunity to do what they do best.



## SOLUTION

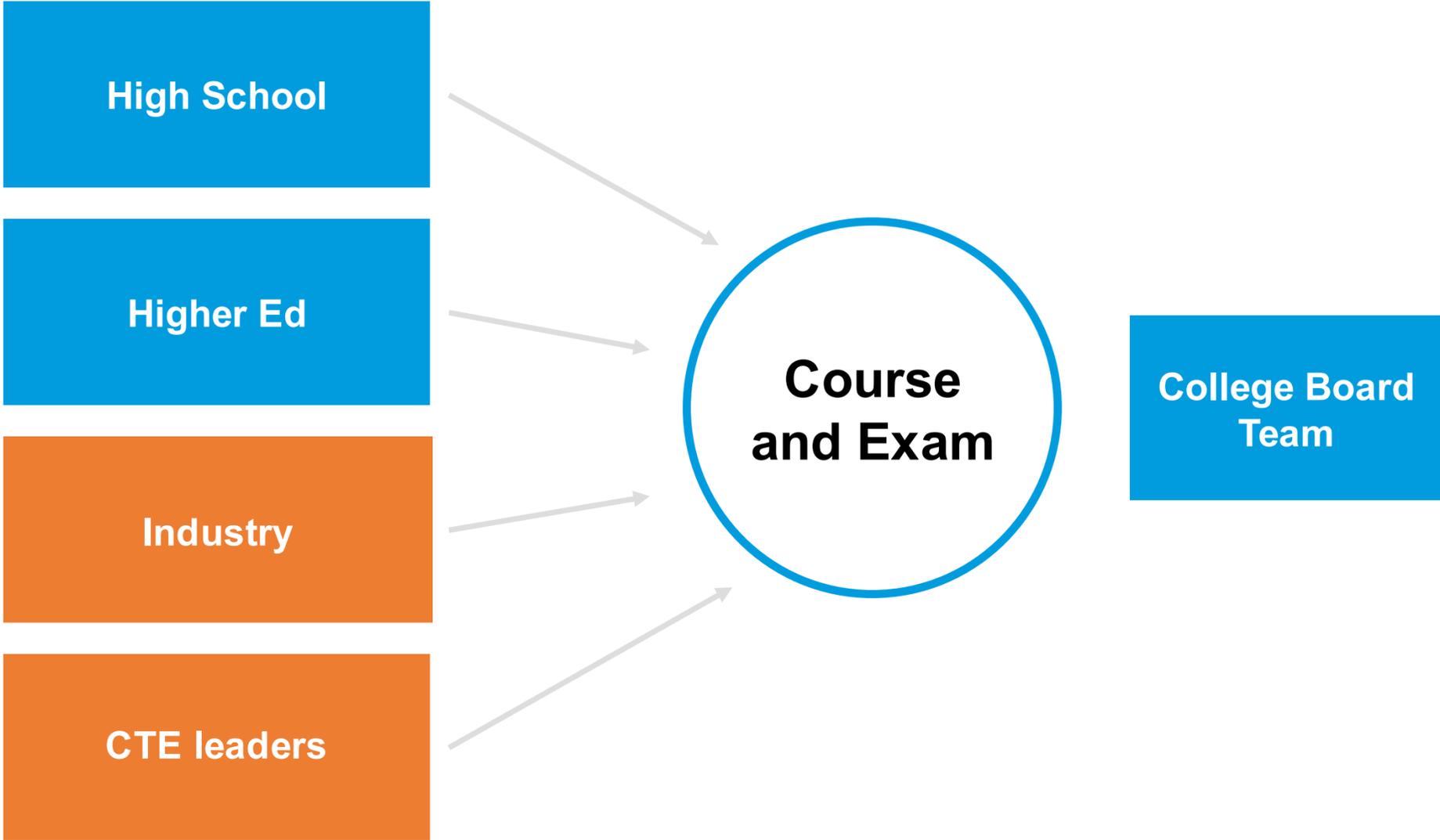
### According to students

The times you've been very excited about or interested in what you learned in school:

- 1 The topic was something I wanted to learn more about.
- 2 I was able to learn in a hands-on way, such as doing an experiment, simulation or demonstration.
- 3 The topic was something I could use in my everyday life or in a current or future job.

Source: Walton Family Foundation-Gallup Voices of Gen Z Study, *Year 2 Annual Survey Report*  
[https://nextgeninsights.waltonfamilyfoundation.org/wp-content/uploads/2024/08/Walton\\_Gallup\\_Voices-of-Gen-Z\\_Year-2-2024-Final-Report.pdf](https://nextgeninsights.waltonfamilyfoundation.org/wp-content/uploads/2024/08/Walton_Gallup_Voices-of-Gen-Z_Year-2-2024-Final-Report.pdf)

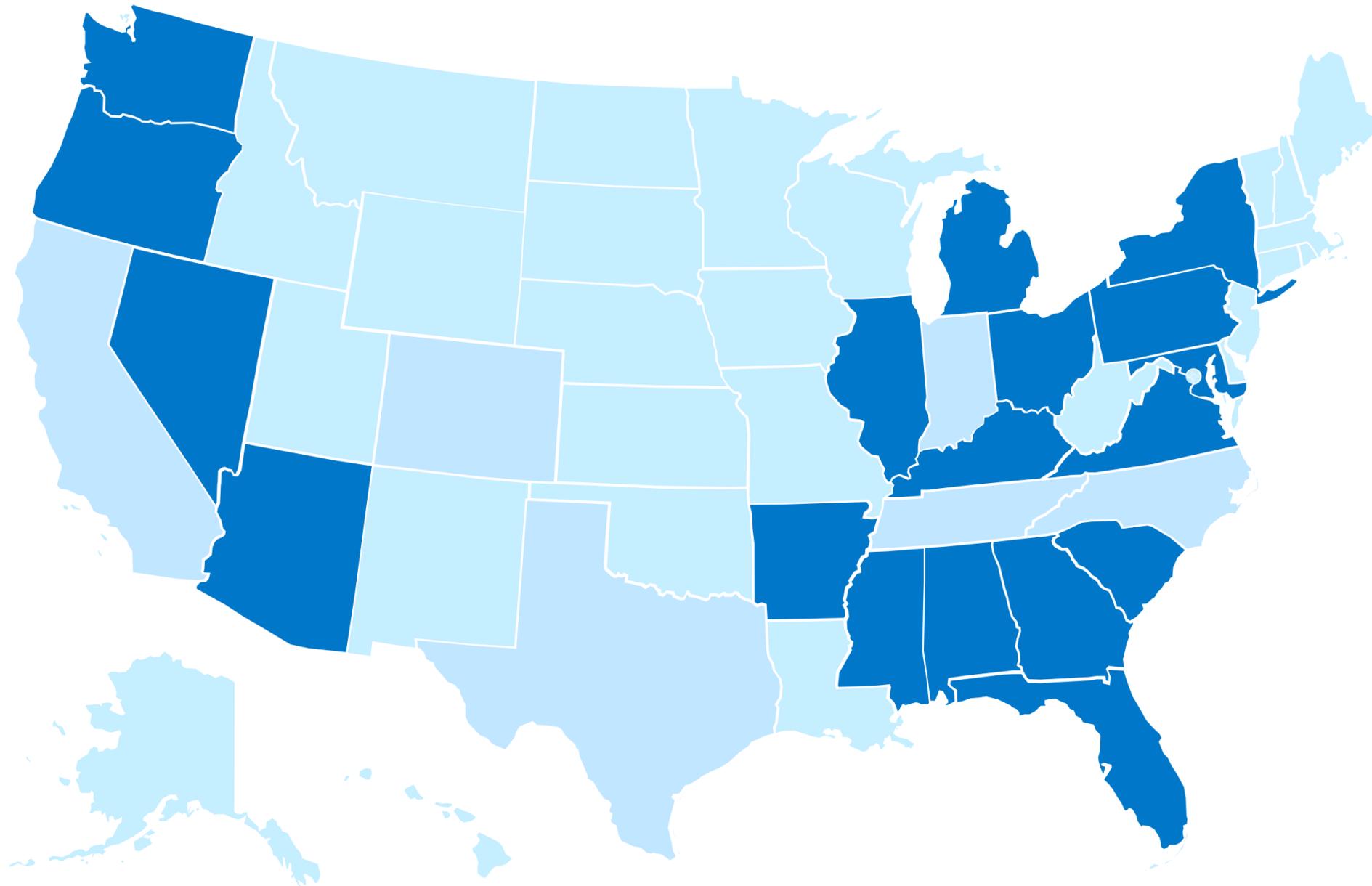
# AP Cybersecurity is built in partnership with industry, higher education, and K-12 leaders.



Example members of Cybersecurity Advisory Board:	
Higher Education*	
Miami Dade College	Front Range Community College
University of Cincinnati	Carnegie Mellon University
Industry*	
Amazon Web Services	IBM
CompTIA	U.S. Bank

\*Selections only, not a complete list of Advisory Board members.

# Pilot Growth



## **SY 2023-2024**

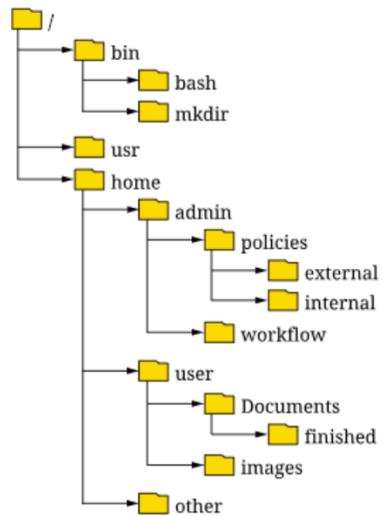
- 6 States
- 25 Schools

## **SY 2024-2025**

- 25 States
- 120+ schools
- Almost 2,000 students taking Networking, Cybersecurity, or both

# Assessment: Exams grounded in job-relevant problem-solving

A network administrator is working within the `/home/user` directory of the following Linux file directory tree.



1 Mark for Review ABC

Which command should the network administrator use to navigate to the `finished` directory using a relative path?

- (A) `cd /home/user/Documents/finished`
- (B) `cd Documents/finished`
- (C) `cd /Documents/finished`
- (D) `cd finished`

Review the following firewall for a server:

1. Allow Inbound TCP port 22 from ALL;
2. Allow Inbound TCP port 80 from ALL;
3. DENY Inbound TCP port 443 from 192.168.0.0/16;
4. Allow Inbound ICMP from ALL;
5. Allow Inbound TCP port 3306 from ALL;
6. Deny Inbound TCP port 3389 from ALL;
7. Allow Inbound TCP port 443 from ALL;
8. Allow Inbound TCP port 587 from ALL;
9. Deny Inbound TCP port 8140 from 192.168.45.0/24;
10. Deny Inbound ALL inbound traffic;

1 Mark for Review ABC

A network technician is trying to access the server using port 443 from a machine with an IP address of 192.168.45.37. However, they are unable to access the server.

Which of the following changes could be made to the firewall in order for the network technician to access the server?

- (A) Swap firewall rule 1 with firewall rule 10.
- (B) Swap firewall rule 3 with firewall rule 4.
- (C) Swap firewall rule 3 with firewall rule 7.
- (D) Swap firewall rule 7 with firewall rule 10.

Dark Enterprises Inc. 

# Questions? Thank You

For Your Attention

Scholarship & Graduate Certificate;  
<https://teachcyber.org/ncta/>

Open Enrollment Foundations Course;  
<https://teachcyber.org/foundations-of-cybersecurity-registration/>

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