CYBER.ORG

THE ACADEMIC INITIATIVE OF THE CYBER INNOVATION CENTER



The R.E.A.C.H. Initiative

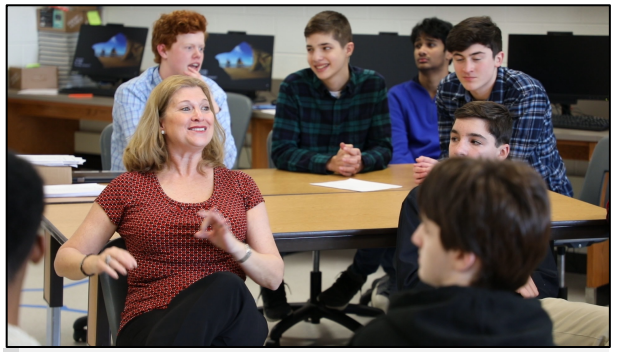
(Realizing Equitable Access to Cybersecurity in High School)

October 2021

Building a Cybersecurity Workforce

Educational Resources and Professional Development

- CYBER.ORG courses integrate foundational concepts like **programming**, **cyber hygiene**, and **security vulnerabilities** into core STEM classes and specialized cyber pathways
- Students from CYBER.ORG partner schools were **4 times** more likely to **pursue a cyber degree program**
- **92%** of active CYBER.ORG teachers said that the program is effective at **helping students understand cyber career pathways**
- **93%** of active CYBER.ORG teachers said that the program was **effective in promoting student achievement**
- Classroom teachers as force multipliers, training them to build the cybersecurity workforce of the future.



*"[Using the curricula], our instructional teams have worked to embed **real-world cybersecurity topics and careers** within our core curriculum – across all subject areas."*
- Middle School Principal

23,464
TEACHERS ACCESSING CURRICULA SINCE 2014

24
CYBER-INTEGRATED K-12 COURSES DEVELOPED SINCE 2012

16,309
TEACHERS TRAINED SINCE 2015

705
TEACHER & STUDENT EVENTS LED SINCE 2015

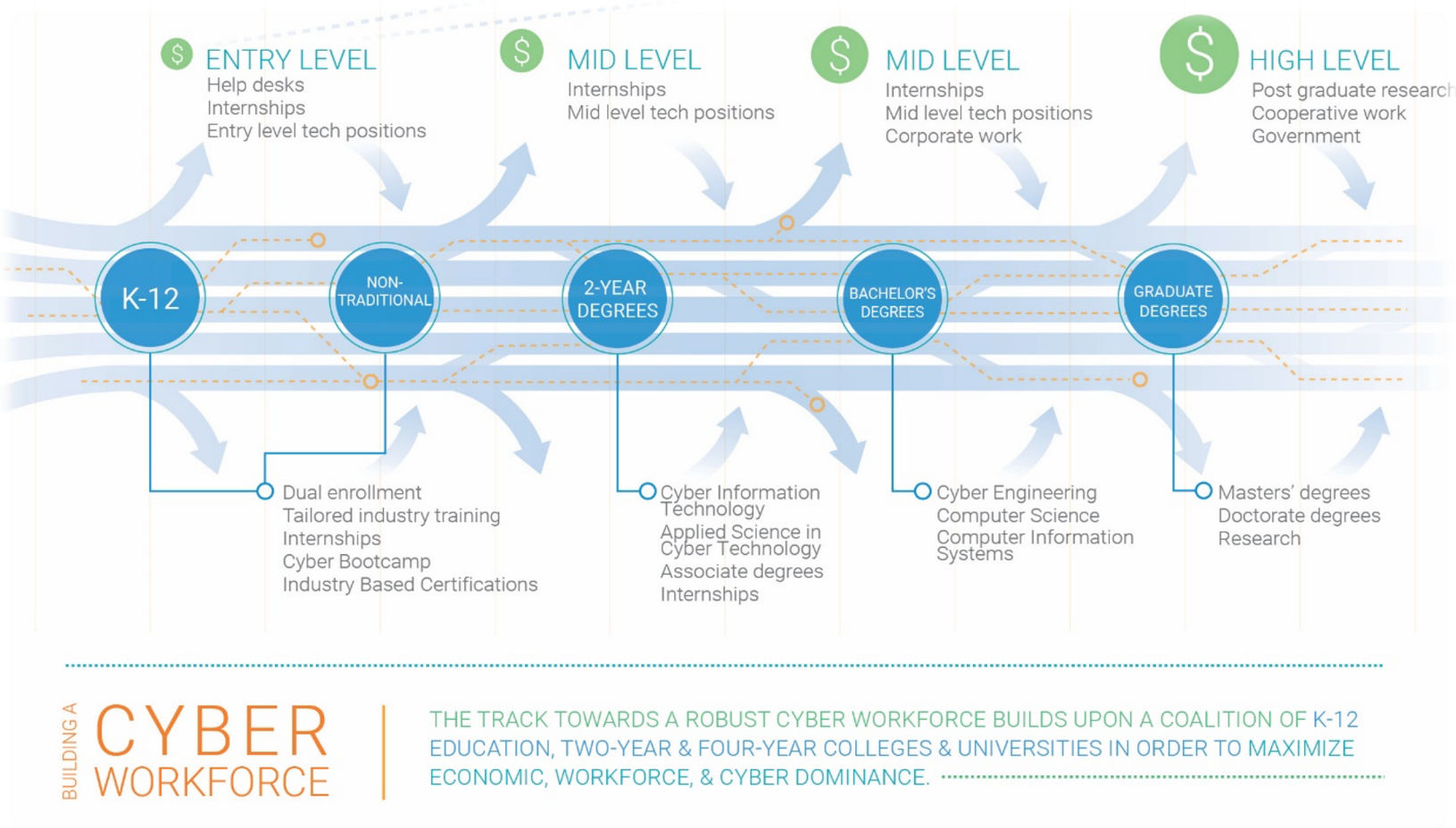
64%
TEACHER PARTICIPANTS FROM TITLE 1 SCHOOLS

CYBER.ORG

Building a Cybersecurity Workforce

Educational Resources and Professional Development

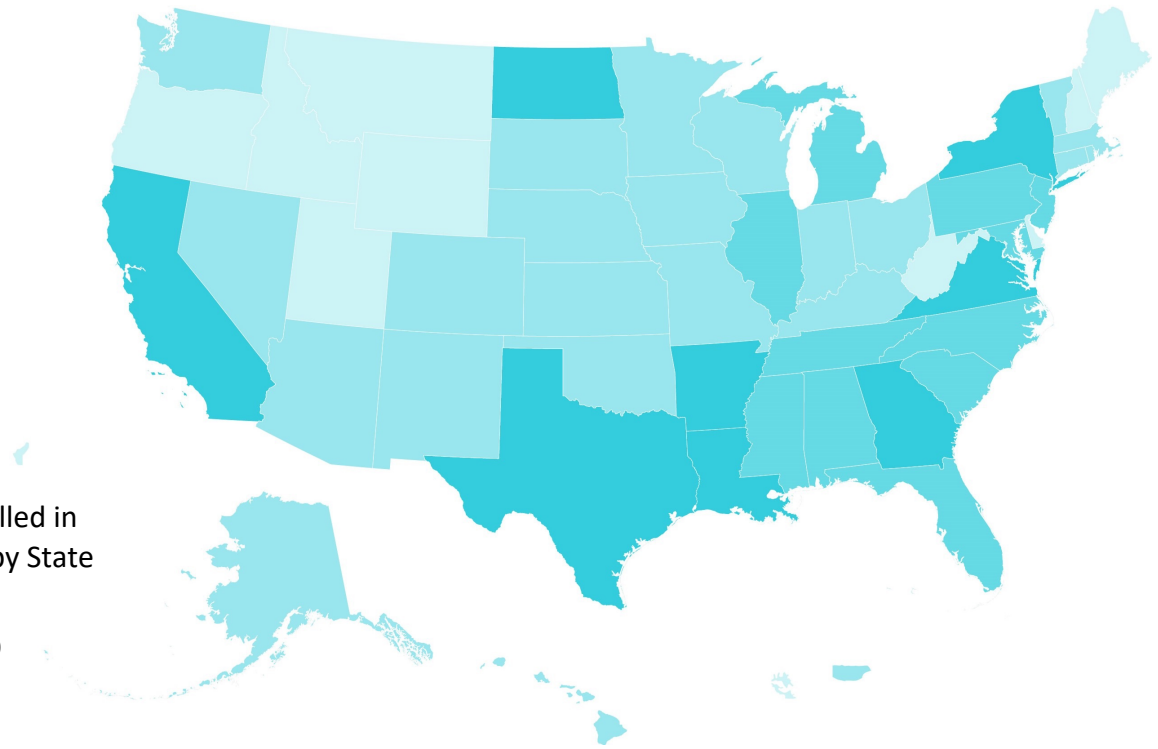
The solution for solving this workforce crisis is developing a capable national workforce, bolstered by a dependable pipeline of individuals entering that workforce at every level of education.



CYBER.ORG

Building a Cybersecurity Workforce

CYBER.ORG National Impact



23,464
TEACHERS ENROLLED IN CYBER.ORG CURRICULA

3 Million
STUDENTS IMPACTED

50
STATES REACHED (+4 U.S. TERRITORIES!)

26
STATE GOVERNMENT PARTNERSHIPS

4
STATES WITH CYBERSECURITY STANDARDS

Strategic Curricula & Professional Development Partners

paloalto NETWORKS Cybersecurity Academy

NICE NATIONAL INITIATIVE FOR CYBERSECURITY EDUCATION

Department of Defense DoDSTEM Science · Technology · Engineering · Mathematics

girl scouts

- Works directly with state departments of education to scale its program throughout the country.
- Alignment **to relevant state standards**, and ensures any teacher can begin teaching cyber
- Helps states develop **cyber-related standards** and **pathways**
- A state-based **Mentor Teacher program** to deepen and sustains impact. This program led to a **250% increase** in the number of teachers engaging with CYBER.ORG's cyber content.

CYBERSECURITY & INFRASTRUCTURE SECURITY AGENCY CISA

CYBER.ORG

CYBER.ORG

K-12 Curricula - Empowering Educators to Teach Cyber

Elementary and Middle School



- Science+
- Cyber Fundamentals
- Computational Thinking
- Cyber Society
- STEM EDA

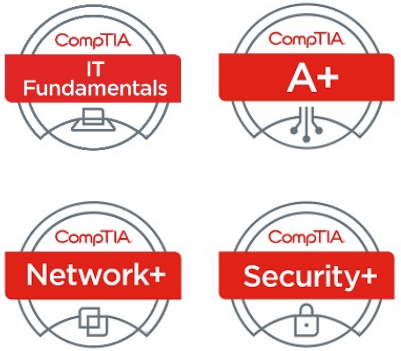
High School



- Cyber Literacy
- Cyber Literacy 2
- Cyber Science
- Computer Science
- Computational Thinking
- Cyber Society
- Cybersecurity

- A+ Certification Prep
- Algebra 1
- Physics
- Advanced Math

Industry Based Certs



- CompTIA
  - IT Fundamentals
  - A+
  - Net+
  - Security+

The R.E.A.C.H. Initiative

Realizing Equitable Access to Cybersecurity in High School



Huntington High School Students: 320

- Courses:
  - Cyber Literacy: 21 students (1 section of class); Cyber Society: 299 students (10 sections of class)
- Impact Demographics
  - Students who Qualify as Economically Disadvantaged: 82%
  - Students of Color: 91%

Woodlawn High School Students: 159

- Courses:
  - IT Fundamentals: 17 students (2 sections of class); Cyber Society: 72 students (2 sections of class); Cyber Literacy: 70 students (2 sections of class)
- Impact Demographics
  - Students who Qualify as Economically Disadvantaged: 96%
  - Students of Color: 99%

Southwood High School Students: 98

- Courses:
  - IT Fundamentals: 17 students (1 section of class); Cyber Society: 31 students (1 section of class); Cyber Literacy 50 students (2 sections of class)
- Impact Demographics
  - Students who Qualify as Economically Disadvantaged: 73%
  - Students of Color: 79%

Building a Cybersecurity Workforce

CYBER.ORG Career Profiles Cards



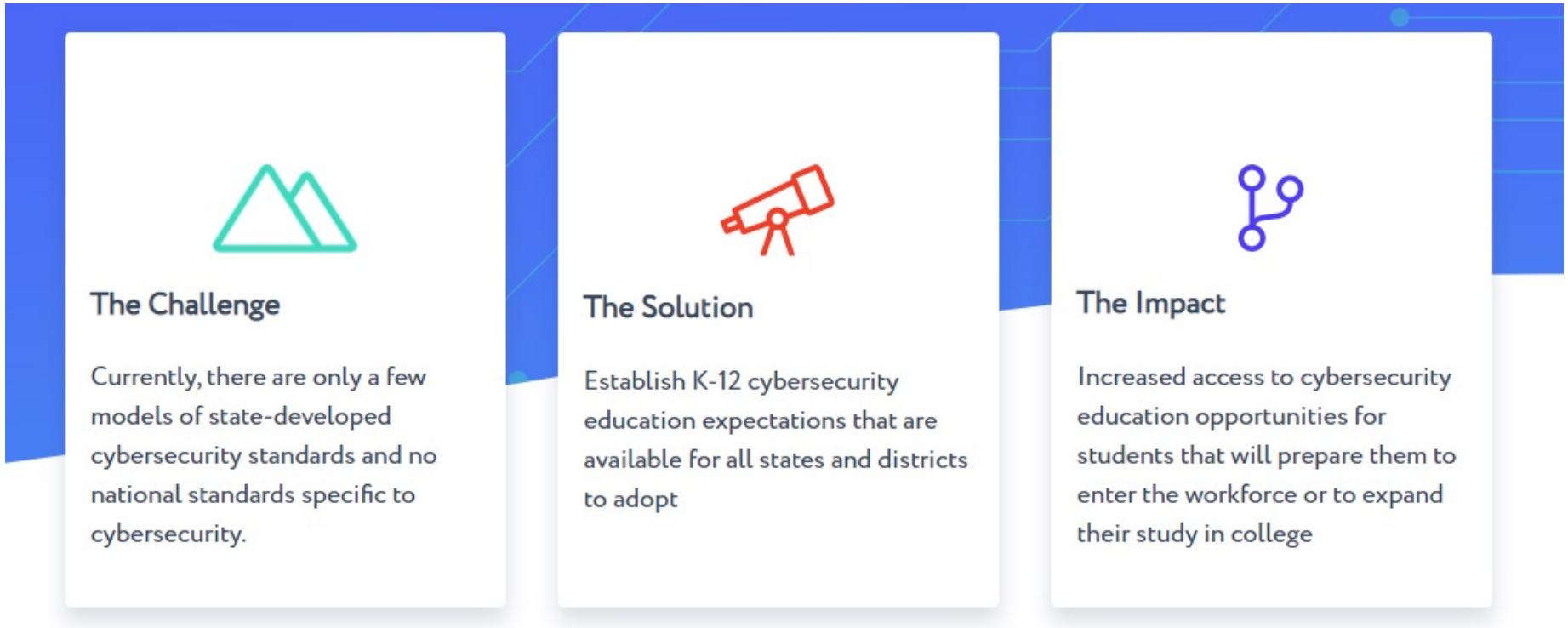




https://cyber.org/career-exploration

CYBER.ORG

K-12 Cybersecurity Standards Need



The goal of the K-12 Cybersecurity Standards is to:

- Bolster foundational and technical cybersecurity education;
- Provide educators with standards to ensure students are learning the right skills at each grade level;
- Increasing the pipeline of cybersecurity talent in communities across the nation.

CYBER.ORG

What are Educational “Standards”

Government Technology and Measurement Standards provide **industries and innovators:**

- A **common language** that facilitates trade, simplifies transactions and enables people to work together toward greater common goals.
- Established **engineering and technical requirements** for various processes, procedures, practices, and methods that have been adopted as standard.





K-12 Education Standards are the learning goals for:

- What students **should know** and **be able to do** at **each grade level**;
- The **skills** they are **expected to attain** and;
- The **intellectual qualities and habits** of mind they are expected to develop **within a pathway or series of courses.**

K-12 Cybersecurity Standards Structure

Computing Systems (CS)

- **Communication and Networking**
  - Network Communication (COMM)
  - Network Components (COMP)
  - Cloud Computing (CC)
  - Protocols (PROT)
  - Data Loss (LOSS)
- **Hardware**
  - Network Hardware Components (HARD)
  - Internet of Things (IOT)
  - Operating Systems (OS)
- **Software**
  - Software Updates (SOFT)
  - Programming and Scripting (PROG)
  - Applications (APPS)

Digital Citizenship (DC)

- **Online Safety**
  - Cyberbullying (CYBL)
  - Digital Footprint (FOOT)
  - Public and Private Information (PPI)
- **Ethics**
  - Threat Actors (THRT)
  - Ethical Integrity (ETH)
- **Policy and Legal Issues**
  - Rules, Laws, and Regulations (LAW)
  - Intellectual Property (IP)
  - Usage and User Agreements (AUP)

Security (SEC)

- **Information Security**
  - CIA Triad (CIA)
  - Access Control (ACC)
  - Data Security (DATA)
  - Threats and Vulnerabilities (INFO)
  - Cryptography (CRY)
- **Network Security**
  - Authentication (AUTH)
  - Securing Network Components (COMP)
  - Threats and Vulnerabilities (NET)
- **Physical Security**
  - Threats and Vulnerabilities (PHYS)
  - Security Controls (CTRL)

Resources to Build Cybersecurity Standards

The K-12 Cybersecurity Standards were shaped using many existing frameworks and standards. These include, but are not limited to:

- NICE Cybersecurity Workforce Framework
- NIST Risk Management Framework
- DoD Cyber Workforce Framework
- NICCS Cybersecurity Website
- Computer Science Teachers Association Standards
- Next Generation Science Standards
- Common Core Standards
- State Cyber and Computer Science Standards:
  - AR, AL, AK, CA, IA, MO, NV, NC, ND, OH, OK, RI, TX



K-12 Cybersecurity Standards Writing Team

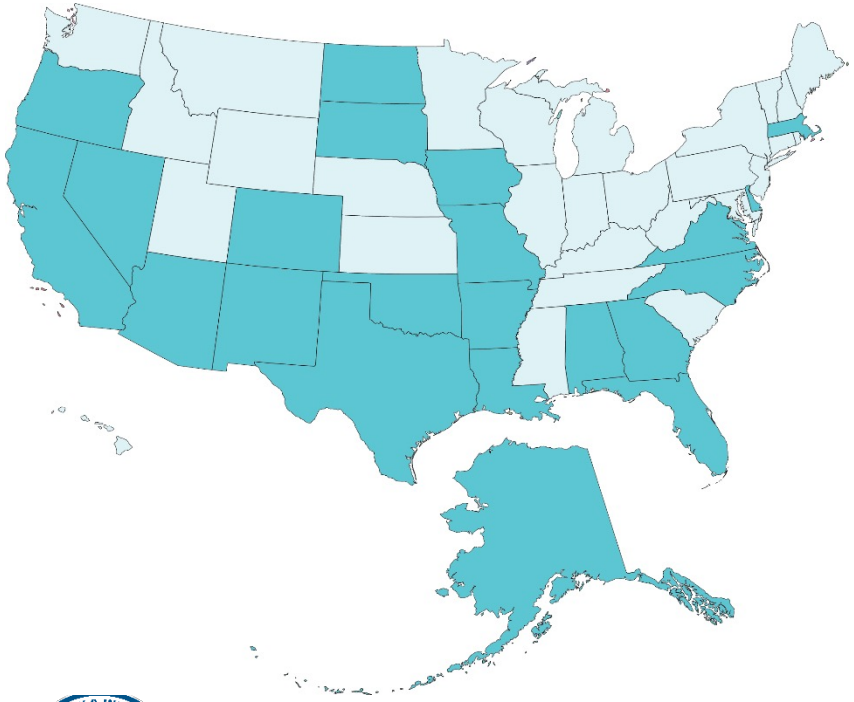
- The standards writing team consists of 29 educators and faculty representing both K-12 and Higher Education.
- Membership on this committee was competitive and required applications along with letters of support.
- The committee has 3-day long meetings and has met in October, December, and April.



CYBER.ORG

K-12 Cybersecurity Standards Writing Team

The Writing Team represents 22 states from across the country, border to border, coast to coast.



Elementary School	Matanuska-Susitna Borough School District	Education Technologist and Library Liason
	MOREnet/University of Missouri	Trainer
	Enid Public Schools	District STEAM Coordinator
	Dell Rapids, St. Mary Catholic School	Teacher
	Episcopal Day School	Director of Technology
	Central Park Elementary (Broward County)	Teacher
	Dallas ISD	Computer Science and Technology Coordinator
	State of ND Information Technology Department	Education Manager
Middle School	Norfolk Public Schools	Career & Technical Ed. Teacher Specialist
	Eagle Hill School	Teacher
	Chandler Unified School District	District Coordinator
	Auburn University Montgomery - College of Education	Faculty - Dept. of Curriculum, Instruction and Technology
	Texas Advance Computing Center (TACC)	Staff
	Mater Academy East	Teacher
	Ladera Vista Junior High School of the Arts	Teacher
	Los Alamos Middle School	Teacher
	Caddo Parish Schools - Caddo Virtual Academy	Teacher
High School	University of Central Arkansas	Faculty - Computer Science
	Airline High School (Bossier Parish)	Teacher
	Future Forward at Bollman (Adams 12)	Teacher
	Robert McQueen High School - Washoe County	Teacher
	North Carolina School of Science and Mathematics	Teacher
	Iowa State University	Faculty - Cybersecurity
	Granby High School (Norfolk)	Teacher
	East Baton Rouge Parish Schools	Instructional Specialist of STEM Programs
	Summit Technology Academy	Teacher
	Manvel High School - Alvin ISD	Teacher
	Sussex Central High School	Teacher
	Center for Advanced Learning	Teacher

CYBER.ORG

K-12 Cybersecurity Standards Review Team

- The review team assembled a group of 30 individuals who represented K-12, Higher Education, Industry and Government.
- Invitations were extended to several government agencies, cybersecurity industry and organizations representing K-12 education interests.
- This committee met in February to review and provide feedback of the standards to the writing committee.
- The Cybersecurity Standards also went through an open-comment period for 6 weeks and received feedback to shape the final version.



CYBER.ORG

Road to Completion

- The standards will be completed and published in August of 2021.
- There will be multiple opportunities for this group and any other government stakeholders to participate in future comment periods.
- States will start working to adopt for the 2022-2023 school year during the Fall of 2021.

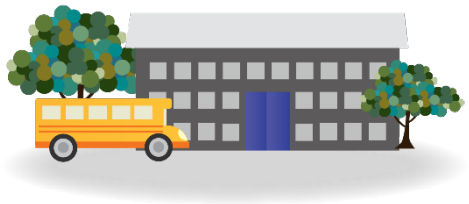


Road to Implementation



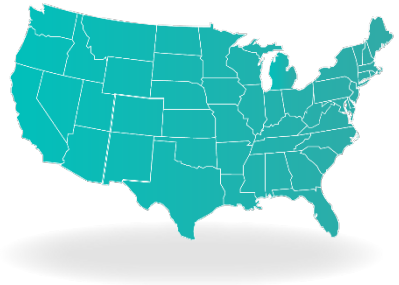
Use by Teachers

- Teachers can use the standards to guide and shape the instruction that will take place inside the classroom.
- Teachers can be able to scaffold the learning to ensure students graduate from high school as cyber-literate students.



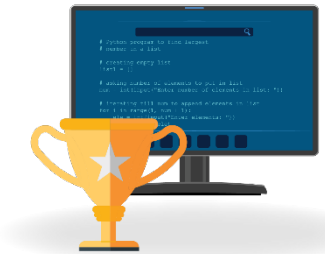
Use by School Districts

- Standards can be used to shape cyber-based pathways for students at any grade level and Career and Technical Education opportunities specifically at the high school level.
- Districts can support all educators (science, math, English, and social studies) to integrate cybersecurity into the classroom.



Use by State Departments of Education

- States can use the standards to establish state-wide pathways in cyber education.
- Standards can be adopted for use within existing Computer Science and core subject standards.



Use by Informal Education Programs

- Community Partners can embed standards into afterschool, weekend, or summer camp opportunities for students.
- Standards can support connections of extra-curricular opportunities to workplace expectations.

CYBER.ORG

Building a Cybersecurity Workforce

Closing the Gender Gap

- Women make up 24% of the cybersecurity workforce industry (ISC^2), with Millennials comprising 45% of women in the industry
- Closing the gender gap is estimated to boost the U.S. economy by $30 billion (Tessian, 2020)
- CYBER.ORG worked with the Girl Scouts USA to develop 18 cybersecurity badges. This work was done in conjunction with industry partner, Palo Alto Networks.
- To date, over 200,000 Cybersecurity Badges have been earned by Girl Scouts from across the country.

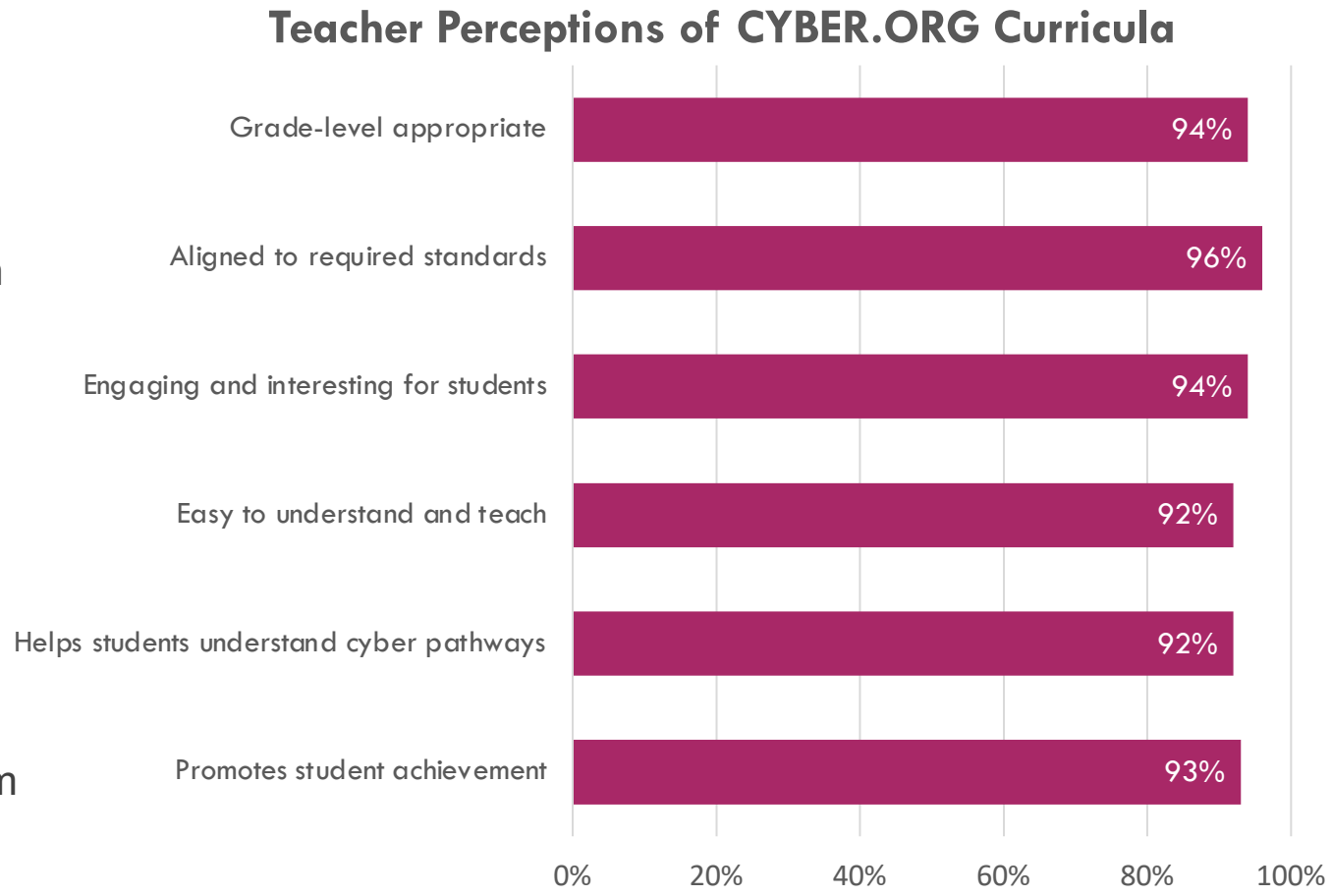


CYBER.ORG

The Results

Impact: Educational Resources

- 21,082 teachers enrolled in Canvas (Sept. 2020)
- Just over half of active Canvas users reported that they had taught at least one CYBER.ORG module in their classroom. Another quarter planned to use CYBER.ORG curriculum within the next year (STEM Innovations, 2019)
- CYBER.ORG's curricula is **effective at promoting 21st-century skills** like critical thinking, problem solving, and collaboration: 80-90% of teachers reported that their students used these skills at least weekly while learning from CYBER.ORG's curriculum (STEM Innovations, 2019)

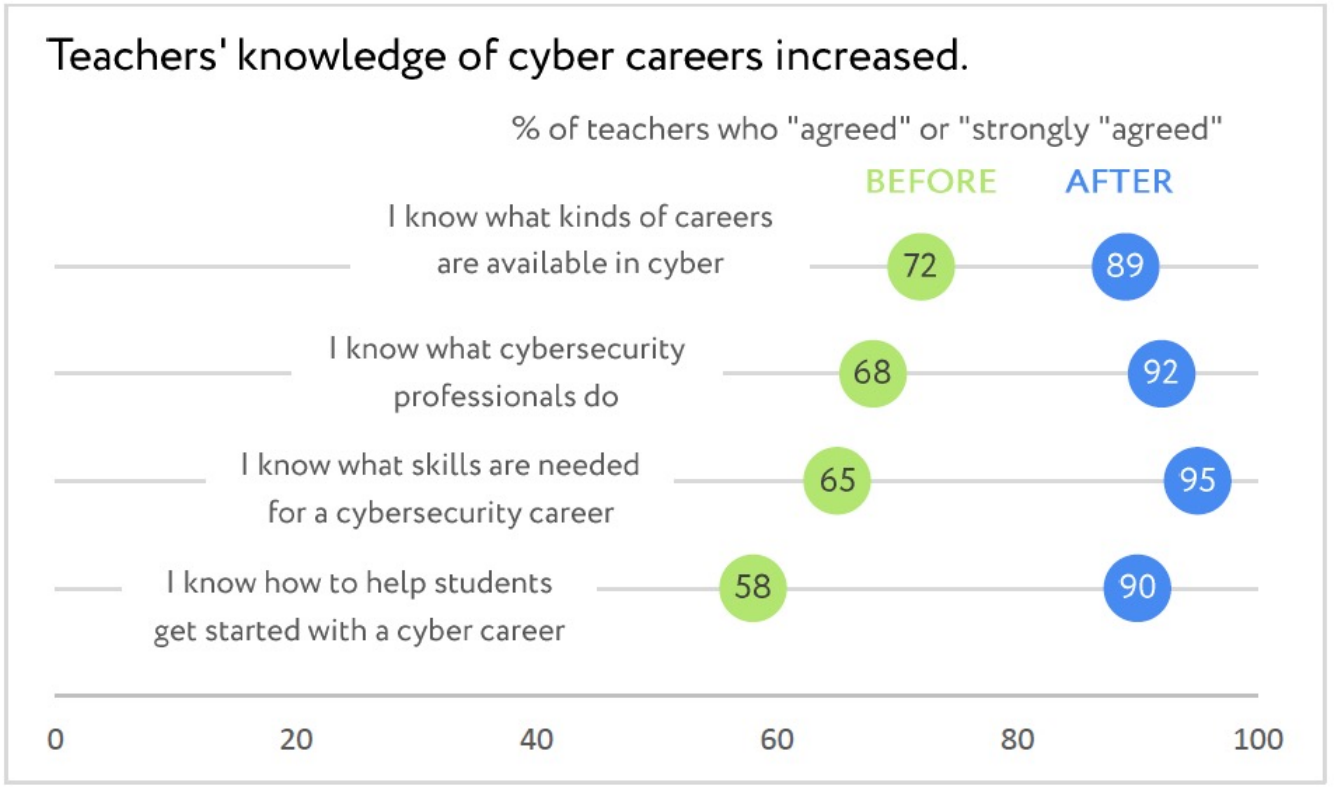


CYBER.ORG

The Results

Impact: Professional Development

- 14,000+ teachers trained through workshops and presentations (October 2020)
- CYBER.ORG's PD workshops significantly raise teachers' confidence in their ability to teach STEM and cyber (STEM Innovations, 2019)
- According to a study this summer (CEDF 2020 Report), most attendees (87%) planned to teach CYBER.ORG curriculum in their classroom during the 2020-21 school year, either by teaching a full-year CYBER.ORG course (30.6%) or incorporating multiple modules into an existing curriculum (56.5%).

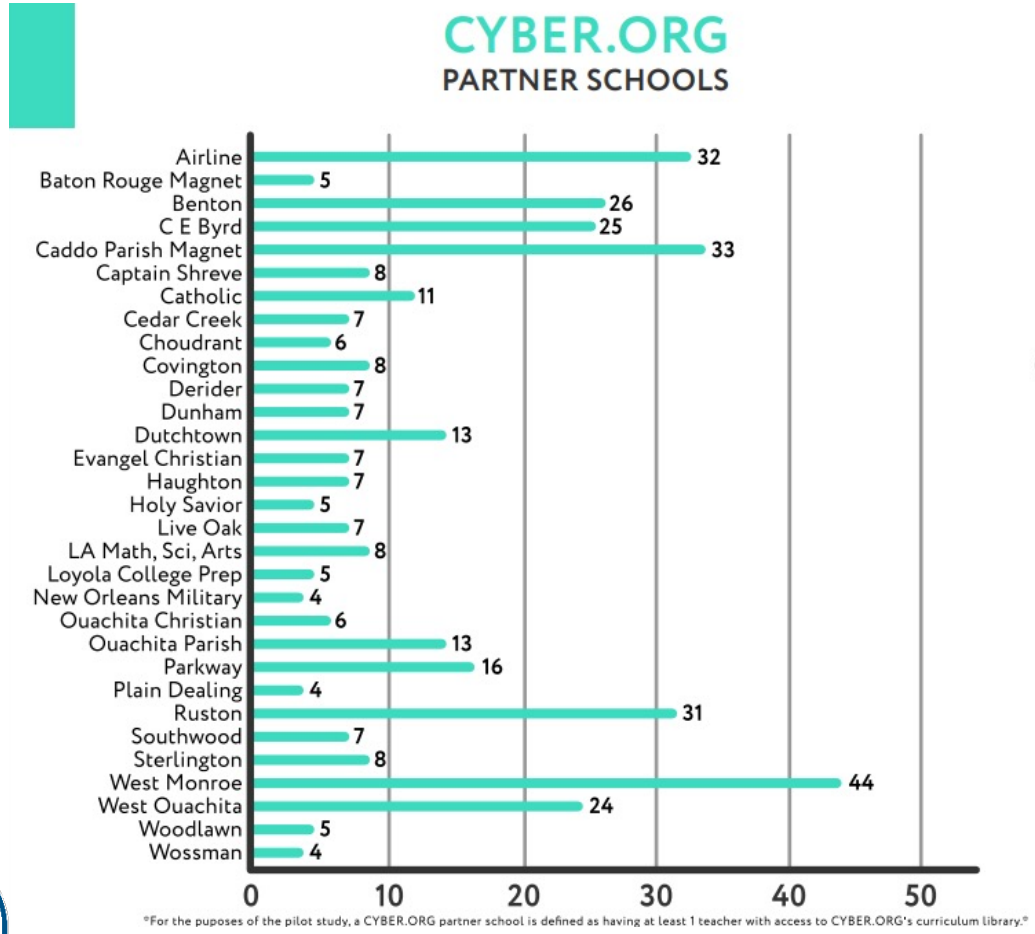


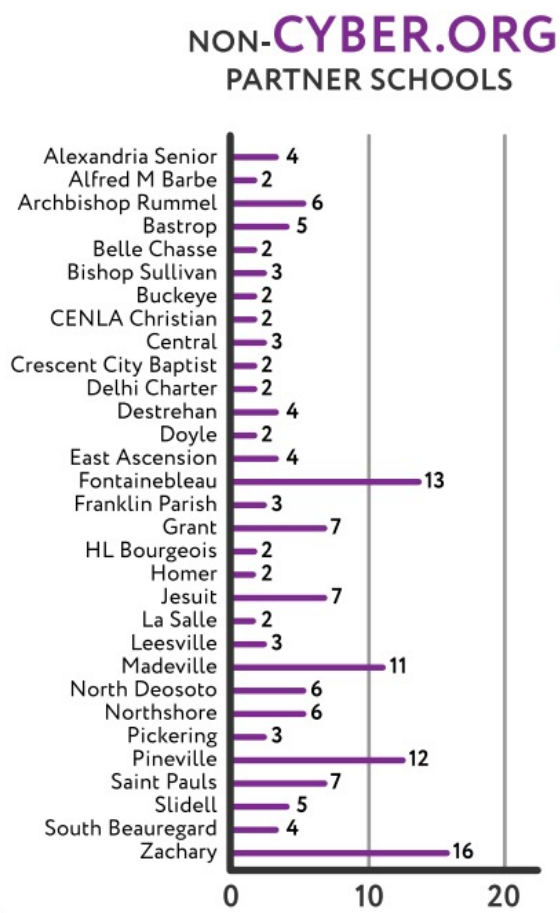
CYBER.ORG

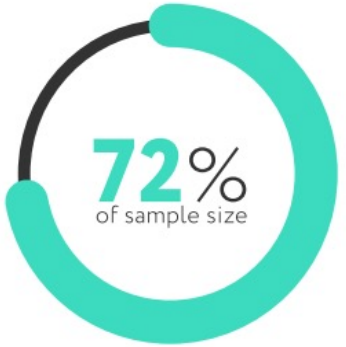
The Multiplier Effect

High Schools teaching CYBER.ORG curricula are sending 4x more students into a cyber-based college or university degree program.*

*According to a regional pilot program; Currently analyzing data from: Cal State Bernardino (CA), Bismarck State College (ND), University of Central Arkansas (AR), and Radford University (VA)









CYBER.ORG

CYBER.ORG

THE ACADEMIC INITIATIVE OF THE CYBER INNOVATION CENTER



Kevin Nolten

Director of Academic Outreach

Kevin.Nolten@cyber.org