

## U.S. High School Cybersecurity Competitions and Their Impact on Cyber Education

A well-educated cybersecurity workforce is critical to U.S. national and economic security. Yet nearly 600,000 cybersecurity positions remain vacant across the public and private sectors.

**This report explores some of the barriers to increasing participation in high school cybersecurity competitions as a means to expanding the cyber talent pipeline.** These competitions provide U.S. high school students of varying skill levels with opportunities to build practical expertise, exchange knowledge, and gain exposure to cybersecurity topics and career paths that may be unavailable through formal schooling.

CSET examined high school cybersecurity competitions, their reach, and their impact on students' educational and professional development. CSET ultimately focused on Carnegie Mellon University's picoCTF and the Air Force Association's CyberPatriot National Youth Cyber Defense Competition because they offered an abundance of public data. This data was augmented with interviews of educators and mentors from top-performing teams.

- **Success in cybersecurity competitions appears to hinge on several factors.**
  - Top-performing schools are often **well-equipped with educational and financial resources** to elevate their performance in competitions.
  - Interviewees stressed that students need **access to technology, including the important yet overlooked factor of reliable internet access.**
  - All top-performing schools offer Computer Science (CS) and related courses; however, **interviewees stated the availability of CS courses was not tied to successful competition participation.**
  - Interviewees stated that **qualified, invested teachers and supportive school administrators** are essential. **A shortage of K-12 CS teachers may be the biggest hurdle to expanding participation and success in cybersecurity competitions.**
- **Participation in competitions remains skewed along racial, gender, and regional lines.**
  - Data from 2021 shows that **women and people of color remain underrepresented** despite the efforts from competition organizers to increase the diversity of participants.
  - Consistent national competition winners are largely concentrated in affluent areas. **Greater focus on local, state, and regional competitions could uplift less-resourced schools.** Several top-performing schools support other teams through local competitions or engage in valuable cyber education outreach efforts.

For more information:

- Download the report: <https://cset.georgetown.edu/publication/u-s-high-school-cybersecurity-competitions>
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