Michigan: Inspiring the next generation of cybersecurity experts

A report detailing Michigan's leadership in finding, motivating, and developing the cyber-capable workforce in the United States.

Dear Governor Snyder,

Your insight and leadership in bringing CyberStart to the students of Michigan is already paying dividends for them in the form of learning and scholarships, and it can lead to future job growth and improved cybersecurity in Michigan. Results of the CyberStart pilot program, are summarized below. But before you dig into the numbers and see the lists of high-performing Michigan students, please turn to the back cover of this booklet to enjoy personal notes that participating students wrote specifically for you.

Program Highlights:

- In just two weeks in July, your communications team was able to sign up 104 Michigan students.
- Over 75% of them solved at least one of the assessment challenges and 60% solved enough to be invited to test their cyber aptitude on the 250+ challenges of the full CyberStart program, which they did during August 2017. At the same time your fellow governors in six states signed up a total of nearly 3,300 students.
- Three Michigan high school and college students were in the overall top 50 nationally, and eight Michigan students won scholarships for more advanced education in cybersecurity.
- The state of Michigan excelled in the Moon Base being above average in 6 out of the 7 programming topics covered. Topics included: files, sockets, strings and cryptography.
- As you might guess from the students' notes, they liked CyberStart:
  - 79% rated the game either excellent or very good (and this is a tough crowd!)
  - 93% are considering further cybersecurity training after the program

Please let me know if there is anything I can do to help as you continue to identify talent and grow the next generation of cybersecurity experts in Michigan.

Sincerely,
Alan Paller

SANS Institute
Director of Research
apaller@sans.org

104 students initially registered to see how well they could do on CyberStart Assess, the program's qualifying exam.

79 students got one or more answers correct in CyberStart Assess.

60% **62** students qualified for the CyberStart Game.

16 students reached the elite levels (7+) in the HQ base of the program.

Scholarships **8**

Michigan's next cybersecurity professionals.

Program Introduction

CyberStart is a forward-thinking skills program designed to supply specialist cybersecurity education to young people across the United States. Using a suite of online challenges, tools and games it aims to inspire the next generation of cybersecurity professionals while identifying the best and most talented young Americans.

We are facing a significant shortage of trained and skilled cybersecurity professionals at a time when online technologies continue to evolve, and cybercriminals are becoming more sophisticated. The only way to solve this problem is to introduce, develop and help young people in high school and college pursue a career in this sector.

Phases

CyberStart Assess is a set of 8 questions that test a student's aptitude and existing knowledge of computer security. Based on identifiable, measurable key skills and traits, it works to find young people who possess the innate qualities of an effective security practitioner. Questions look for traits such as problem solving, logical extrapolation and attention to detail, all of which have been proven to be crucial to succeed in a security career.

CyberStart Game is where students become exposed to specialist cybersecurity education. Using a suite of online tools, challenges and games, players attempt to solve more than 250 challenges, all of which are realistic examples of tests and threats faced by practicing cybersecurity engineers in their day-to-day lives. The CyberStart Game enables students to start studying security with challenges written by experts who practice these skills in the real world.

Goals

- Supply specialist cybersecurity education for 16+year olds.
- Grow the U.S. cyber capable workforce.
- Inspire the next generation of cybersecurity experts.
- Identify the most elite young talent.

What Do Players Learn?

The CyberStart Game has over 300 hours of content and covers 14 main topic areas. There are two "bases" that make up the game, each containing several levels and challenges that candidates move through: the Headquarters Base and the Moon Base.

Bases

The **Headquarters Base** forms the main part of the game. Players take on the role of a junior agent in the Cyber Protection Agency, where they deploy their forensics and offensive skills to sleuth through challenges and tackle various online cyber criminal gangs. As they work their way up through the organization, their training develops each of the security disciplines.

The HQ Base teaches students skills in:

- Binary
- Cryptography
- Forensics
- Linux
- Open-source intelligence
- Programming
- Web application

The **Moon Base** is where players learn how to program. Players go through a series of challenges, building up progressively, to write their own programs in Python. The aim of the Moon Base is for players to use all the skills they have learned to stop an alien invasion. The Moon Base has three training levels that are step by step guides to the basics of programming.

Later levels teach students skills in:

- Programming cryptography
- Debugging
- Files
- Functions
- Loops
- Sockets
- Strings

CyberStart Players in Michigan

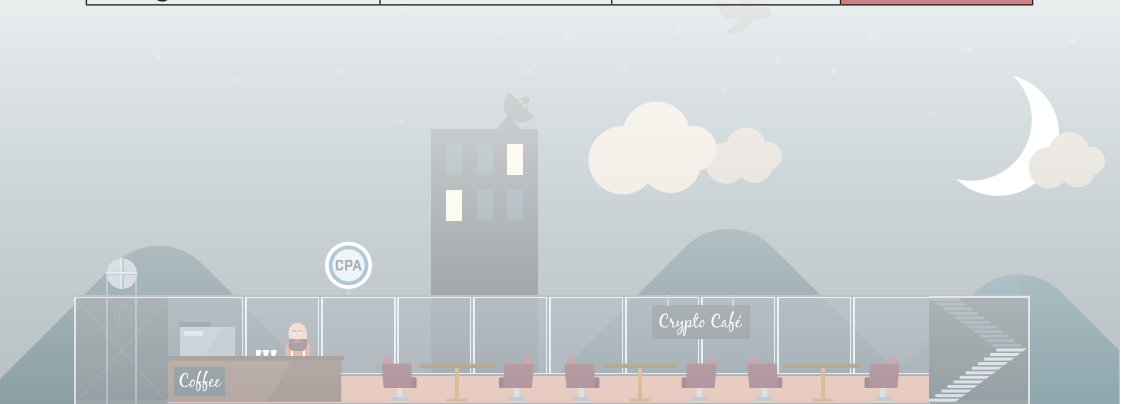
Key	
**	In the top 100 and awarded a scholarship
*	Awarded a scholarship

Last Name	First Name	School	Top 100/ Scholarship
Cai	Yu	Michigan Technological University	
Carrara	Daniel	Michigan Technological University	
Cisco	Kyle	University of Detroit Mercy	
Corser	Robert	Spring Arbor University	*
Cullifer	Ginger	DePaul University	
Cushard	Jessica	Eastern Michigan University	
Danna	Tyler	Sault Area High School	
Dunlap	Stuart Ellis	Homeschool	
Faraj	Ali	University of Michigan, Dearborn	
Flickema	Adam	Eastern Michigan University	*
Fortner	Darian	University of Michigan Dearborn	
Ghebredngl	Nahom	East Lansing High School	
Goosen	Joshua	Central Michigan University	
Gwinner	Caleb	Spring Arbor University	
Hattrick	Noah	Spring Arbor University	
Huffman	Andrew	Genesee Christian School	
Johnson	Candace	Central Michigan University	
Kaminga	Dalton	Michigan Technological University	
Kpachavi	Yannick	Ferris State University	
Lee	Wellington	University of Michigan	
Martinez	Emmanuel	Spring Arbor University	
McCubbin	Adam	Grand Ledge High School	
Metzger	Ben	Michigan Technological University	
Mitchell	Phil	Spring Arbor University	
Moulton	David	Graduate	
Nostros	Kronno	Lake Orion High School	
Poindexter	Matthew	Central Michigan University	
Popovich	Kevin	Davenport University	
Raub	Tristan	ITT Technical Institute	
Richards	Dylan	Central Michigan University	**
Risinger	Ashley	Davenport University	
Rossow	Nathan	Central Michigan University	*
Savich	Mel	University of Michigan	
Schuette	Kyle	Eastern Michigan University	**
Spiller	Kiersten	Spring Arbor University	*
Taubitz	Trevor	Michigan Technological University	
Wilks	Jordin	Central Michigan University	
Williams	Dylan	Ferris State University	
Witt	Bret S	Davenport University	**
Zoltowski	Alex	Central Michigan University	*

Strengths & Weaknesses

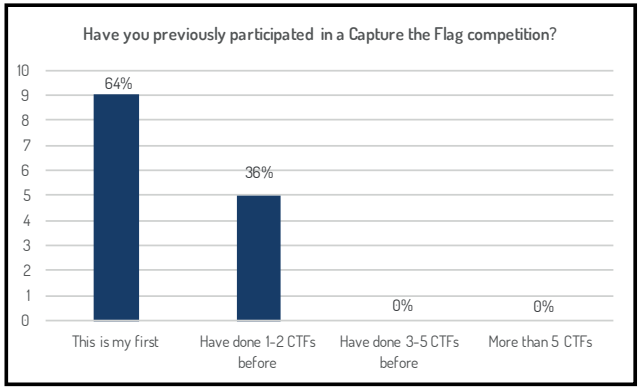
Headquarters Base categories	State average (%)	Seven state average (%)	Difference (%)
Linux	24.09	20.97	14.91
Web application	33.38	30.84	8.24
Forensics	32.48	28.03	15.89
Binary	9.21	9.21	0.01
Cryptography	48.78	44.83	8.82
Programming	18.99	16.19	17.26
Open-source intelligence	70.81	68.40	3.52

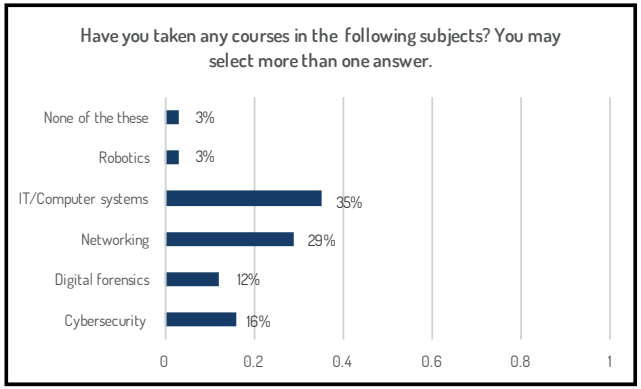
Moon Base categories	State average (%)	Seven state average (%)	Difference (%)
Cryptography	12.5	8.11	54.12
Debug	26.09	23.53	10.87
File	17.83	12.83	38.90
Functions	28.26	22.46	25.83
Loops	8.70	7.42	17.20
Sockets	15.49	11.31	36.98
Strings	4.35	6.55	-33.63



Student Feedback - Previous Knowledge

A survey sent to everyone who played the CyberStart Game asked players for feedback on their previous knowledge, what they had learned, and what they enjoyed most about the program.





These charts demonstrate that most students who played CyberStart Game in Michigan had never been exposed to a Capture the Flag style teaching method. Knowing this, it is encouraging that 60% of players made it through to the CyberStart Game.

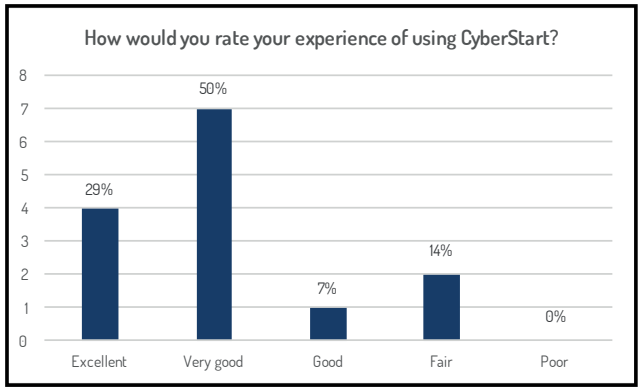
However, players from Michigan did have quite a lot of experience in other relevant cybersecurity subject areas - in particular computer systems and networking. This showed that there is a strong group of students keen to build upon their existing knowledge. One of the benefits of CyberStart is that it engaged with this group and developed their interest in cybersecurity. This in turn is likely to accelerate their entry into the profession and fast-track Michigan's next generation of cybersecurity experts.

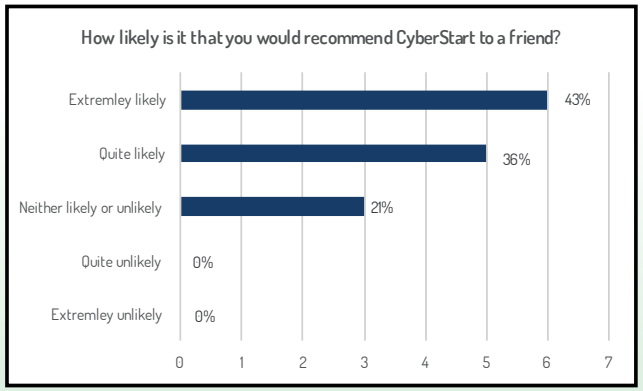
It is encouraging to see that students who had no previous experience were able to engage with the CyberStart tool and progress as well as students already interested in the industry with a basic foundation of knowledge.

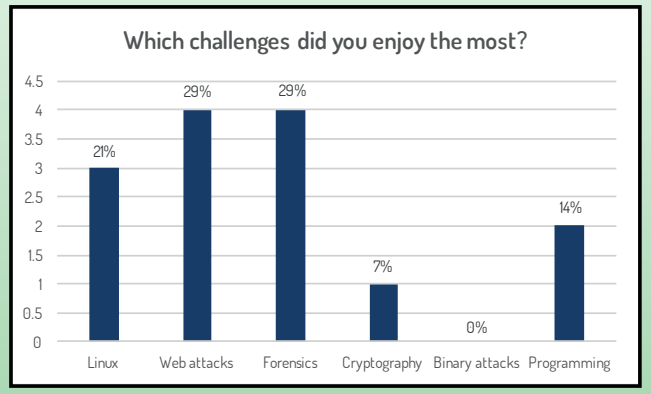
Example of Majors of CyberStart Participants:

- Computer science
- Robotics engineering
- Computer systems
- Information assurance
- Digital forensics
- Computer networking

Student Feedback on CyberStart





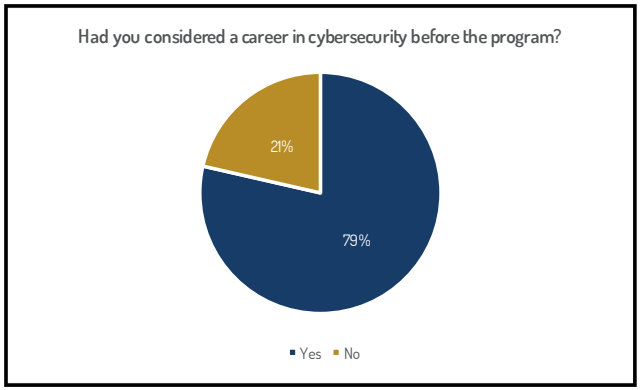


The response to the tool has shown that the training and teaching in CyberStart has engaged the instinctive ways people learn and identified those who naturally think like a cybersecurity practitioner. These encouraging results reflect the enourmous success of the program in engaging with a variety of ages, genders and skill level.

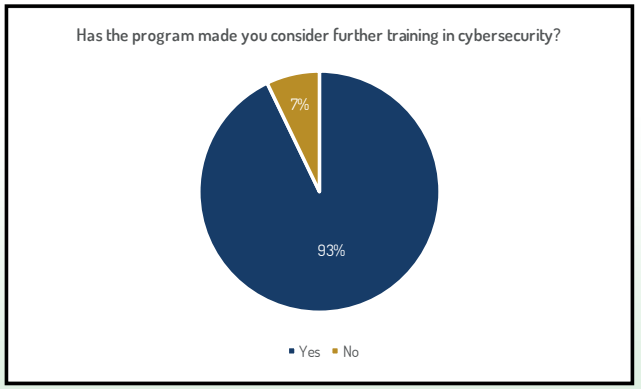
The students' response to the game has been exciting: 79% of students rated the game either "excellent" or "very good" with 79% saying they would recommend the program to a friend. Not a single player rated the game "poor" or said it was unlikely they would recommend it to a friend.

Students in Michigan were most engaged with web attack and forensic challenges.

Student Feedback on Career Impact



100% of students who answered "no" to considering a career in cybersecurity in the past are now considering further training.



The aim of the CyberStart program is to grow Michigan's cyber-capable workforce and promote cyber security as an exciting and recognized career. These graphs support our mission and present a group of young people who are now on the right path to a cyber security career.

Of the CyberStart participants in Michigan, 79% of players were already interested in a career in cybersecurity before the program. After the program, this number increased. 93% of players are now considering further training. This is encouraging when looking at the future of cyber security professionals in the state.

In addition, 21% of students had never considered a career in cyber security before playing the CyberStart Game. After completing challenges in a variety of cyber security disciplines, 100% of these students are now considering further training in the area. This is an exciting program result that shows a real step change in reducing the skills gap in Michigan.

"Thanks so much for sponsoring such an amazing program. This program was better at teaching me some of the basics than any high school computer teacher I had. You are able to do hands on challenges to test your knowledge and it allows for that critical thinking aspect of yourself to come out. Thank you again."

Nathan Rossow, Central Michigan University, College Sophomore

"Thanks! CyberStart has been a lot of fun so far, and it's an exciting test of abilities that I haven't been able to learn at school. Increasing awareness for cybersecurity is always good."

Noah Hattrick, Spring Arbor University, College Senior

"I really appreciate this program and think it is a great way for someone to test their skills or to get people interested in cyber security who otherwise wouldn't be."

Robert Corser, Spring Arbor University, College Junior

"Thank you for providing this great learning opportunity."

Phil Mitchell, Spring Arbor University, College Senior

"Thank you. This program allows students and young adults the opportunity to explore the world of network security. By exposing them to this line of work, students may develop a vested interest in the field and pursue a career."

Dalton Kaminga, Michigan Technological University, College Freshman

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