Teaching strong security habits through cybersecurity competitions
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Overview
According to the United States Computer Emergency Readiness Team, the number of reported cybersecurity incidents and vulnerabilities have steadily increased this past decade. Identifying the dire need for improvements in security training and awareness, federal efforts such as the National Initiative for Cybersecurity Education (NICE) exist to accelerate the learning and cyber awareness skills development of the American public. Other programs exist such as capture-the-flag (CTF) competitions which “gamify” security and evaluate competitors’ skills in core competencies essential to offensive and defensive cybersecurity. We propose conducting research focused on developing methodologies for effectively communicating the impact of strong security habits through cybersecurity CTF competitions. CTFs inherently provide a scoring mechanism for evaluating competitors’ skills; by experimenting with various instructional techniques, we aim to understand which methods yield the highest CTF scores and understanding. Our target audience is students in grades 9-12 as well as undergraduate and graduate college students, with the belief that instilling sound cyber practices early will build future capacity for the security of our nation.

Intellectual Merit
The digital arms race between attackers and defenders has been ongoing for over 30 years with no end in sight. The ability for miscreants to reuse old attack tools and methodologies against victims supports the fact that current security awareness training is largely ineffective. Research that will illuminate proven ways to teach strong security habits and understanding will improve the public’s cybersecurity posture and help eliminate the root cause of rudimentary cyber attacks and malware campaigns. The research also wants to measure the efficacy of winner-takes-all and equal-sharing approach by randomizing two approaches across various formats and target audience.

Broader Impact
Teaching strong security practices through cybersecurity competitions as part of a STEM+C educational program will have wide-reaching impacts throughout our nation. Cultivating a future workforce that is security-savvy will provide businesses with employees that understand threats and are resistant to common attacks like phishing and installing malware. From this same group of security-savvy citizens, the nation will reap the benefits of pioneering new defensive techniques that will ensure America’s continued prosperity in the face of the ever-increasing sophistication of our adversaries.