

A Mixed-Method Study of Significant Learning Experiences with Cyber Ranges in Cybersecurity Education

Dr. Cheryl Beauchamp
cherbea@regent.edu
Department of Engineering and Computer Science
Regent University
Virginia Beach, VA

Dr. Holly Matusovich
matushm@vt.edu
Department of Engineering Education
Virginia Tech
Blacksburg, VA

Abstract

Cybersecurity breaches and attacks have not only cost businesses and organizations millions of dollars but have also threatened national security and critical infrastructure. Examples include the Ransomware attack in May of 2021 on the largest fuel pipeline in the United States and the February 2021 remote access system breach of a Florida water treatment facility which raised sodium hydroxide to a lethal level. Improving cybersecurity requires a skilled workforce with relevant knowledge and skills. Academic cyber ranges offer virtualized environments that support cybersecurity educators' needs to provide students with a safe, separated, and engaging environment. More and more academic programs utilize cyber ranges due to the perceived benefit of integrating them into their cybersecurity-related programs. The purpose of this study was to understand the educators who were using the Virginia Cyber Range and how they were using them for cybersecurity education. More specifically, the study examined their usage for alignment with a learning taxonomy to verify the usage contributed to successful and significant student learning. Results suggested that high school cybersecurity educators were the primary users. These educators had less formal cybersecurity education and experience compared to cybersecurity educators in higher education. The data also showed that cybersecurity educators primarily used cyber ranges for teaching and learning as opposed to providing feedback and assessment to meet learning goals and objectives.

Keywords: cyber ranges, cybersecurity education, significant learning experiences, integrated course design

An updated and full version of this manuscript appears at <https://cppj.info>