

Chapter 23

A Practical Exploration of Cybersecurity Faculty Development With Microteaching

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ABSTRACT

The growth and development of cybersecurity jobs and careers have created a need for new skilled faculty that can effectively teach the appropriate content to students at all levels. Often instructors are hired based on their academic credentials and professional experience without the use of assessment and faculty development methods to discover if these instructors can teach effectively or even improve the way they teach. Effective instructors have the ability constructively adjust teaching approaches when students are excelling or struggling based on skillful observation and constant assessment. If a student learns something with great ease, perhaps that approach would be of benefit to others. Part of what helps novices develop expertise here is their explicit attempt to understand how and why something works for students. The implementation and use of microteaching can provide a quality improvement approach to help cybersecurity instructors on all levels improve their ability to teach effectively.

DOI: 10.4018/978-1-6684-3554-0.ch023

BACKGROUND

Cybersecurity is a relatively new field of study when compared to other fields such as mathematics, biology, chemistry, and physics (Burrell & Nobles, 2018). As such, the field is collectively deficient and lags behind other areas in the quality of instruction and engagement of students in the classroom (Burrell & Nobles, 2018). The cybersecurity domain is growing increasingly complex requiring cybersecurity and information security professionals and associated specialists to evolve to keep pace with the technological revolutions continuously (Cabaj, Domingos, Kotulski, & Respício, 2018). Researchers postulate that 182 universities and colleges with Center of Academic Excellence in Information Assurance Certifications in the U.S. teach different undergraduate curricula (Cabaj, Domingos, Kotulski, & Respício, 2018). A 2013 report compared reputable universities in the U.S. and China and noticed a distinct difference between the curricula (Cabaj, Domingos, Kotulski, & Respício, 2018). The study revealed that China-based universities focused on telecommunication security while institutions in the U.S. concentrate on enterprise risk security (Cabaj, Domingos, Kotulski, & Respício, 2018). Over the past two decades, colleges and universities have struggled to adequately prepare cybersecurity professional due to rapid changes in the cybersecurity space, which includes recruiting enough students to sustain the ever-growing demand for computing professionals (Burrell et al., 2015).

By 2020, approximately half of Science, Technology, Engineering, and Mathematics (STEM) related jobs and more than 60% of all new STEM positions will be in computing fields (Burrell & Nobles, 2018). For those students pursuing computer science as a career path, there is a wide range of thoughts on how and what should be taught (Burrell et al., 2015). This is observable in the sub-field of cybersecurity, where the range of teaching methodologies and content varies dramatically between universities (Burrell et al., 2015). Recent growth and changes in cybersecurity continue to evolve so rapidly that educators struggle to update course material that will effectively prepare students to pursue advanced degrees and careers in cybersecurity (Burrell et al., 2015).

Unfortunately, many students lack exposure to cybersecurity concepts at the K-12 level (Burrell et al., 2015). Studies have shown this lack of exposure and a variety of misconceptions that students have about cybersecurity are factors in students not choosing to pursue degrees in the field (Burrell & Nobles, 2018). There are several reasons these issues exist. Computer science is currently not considered to be a core subject by many educational bodies and thus is not a high priority for school districts (Burrell et al., 2015). This leads to a lack of positions for teachers with cybersecurity skills, which in turn leads to a lack of training for teachers either during their college education or as part of their continuing education after they enter the workforce (Burrell et al., 2015).

Simply stated, there is a need to find ways to increase the number of students that choose to enter cybersecurity academic fields (Cheung et al., 2011). For those students who do choose cybersecurity as their career path, there is a wide range of opinions on how and what should be taught (Cheung et al., 2011; Burrell et al., 2015). This is observable in the sub-field of cybersecurity, where the range of approaches and content varies dramatically between universities (Burrell & Nobles, 2018).

Recent growth and changes in this field have occurred so rapidly that educators have not had the time to assess whether they are teaching this material in a manner that will promote student success in the classroom and encourage students to continue to pursue degrees and careers in the field (Burrell et al., 2015). Cybersecurity is currently not considered to be a core subject by many educational bodies and thus is not a high priority for school districts (Burrell et al., 2015). This leads to a lack of positions

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