New Approaches to Cyber Education (NACE) Workshop

Educate the Educators to Equip the Next Generation

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When considering the education needed to equip the next generation to become cybersecurity and privacy specialist we need to address who to educate, what to teach, and how to sustain the pipeline. Cybersecurity is a rapidly evolving arena of topics and mindsets. We need to concentrate our efforts in creating students that can think and react to this environment. In order to make our efforts fruitful we need to start in K-12 where we have the largest potential candidate pool and most malleable minds. Two main focuses are a basic understanding of technological topics. Essential core technology skills include programming and computer literacy, networking and internet connectivity, big data/data privacy and ethical issues exacerbated by the ubiquitous nature of technology. More importantly, students need to be comfortable with experimentation and experiential learning. In this fast paced milieu students and eventual practitioners must be self-motivated problem solvers that question norms, propose inventive solutions and out think the cybercriminal. As university academics we need to focus our efforts on preparing instructors with the necessary skills to make this happen. Our focus should be on training the trainers.

The question then becomes how do we create such students? Much of our current education is based on route memorization and lecture. Moving toward a more experiential learning experience is imperative to engender the skills needed for successful cybersecurity and privacy specialists. Therefore, the first task should be to educate the educators. According to the State of the States Report: State-Level Policies Supporting Equitable K-12 Computer Science Education (2017) "There are simply not enough adequately trained people to full the current need for information security analysts, hardware engineers, software developers, computer programmers, data scientists, and other STEM professionals (pg. 7, Stanton, et al. 2017)." For example, according to Code.org, only 241 schools in FL (22% of FL schools with AP programs) offered an AP Computer Science course in 2016-2017 (13% offered AP CS A and 16% offered AP CSP), which is 95 more than the previous year. There are fewer AP exams taken in computer

science than in any other STEM subject area. Additionally, Florida universities did not graduate a single new teacher prepared to teach computer science in 2016. This deficit indicates an area where assistance is needed in the form of tools and experiential learning materials and environments that are easily deployed by all faculty. These experiential learning materials could include project or game based lessons such as capture the flag, hackathon, or team competitions. Cyber ranges and other technical playgrounds are essential to facilitate these type of experiences in contained and safe settings. With these type of educational tools you are also advancing problem solving skill building. Organizations similar to DECA (Distributed Education Clubs of America) and the Whitehatters should be recruited to develop and hold national competitions to act as a resource, outlet, and incentive.

Another major motivator to attract and educate a diverse set of students to succeed in a variety of national and private sector positions is to ensure that students know the career paths an opportunities available to them. Increasing the visibility of positions, the skills required, salary ranges, daily activities, etc. will allow students to visualize themselves in the career path and drive enrollments. Not every student may choose a traditional 4-year university degree so there needs to be a variety of paths to acquire the necessary skills. These paths could include vocational training, community college, as well as the traditional 4 year university degree. All should employ High Impact Practices (HIP), namely, internship opportunities to gain hands on experience. Unfortunately, in the area of cybersecurity this can be difficult due to security issues with organizations. Alternatively, other HIP experiences could include case based learning, capstone courses or other settings that pose situational conditions to students that require problem solving and an opportunity to apply their learning via a culminating assignment.

To ensure that the education we provide is consistent and executable requires a concerted centralized structure of support. A centralized body would need to be responsible for establishing standards and curricula, promoting best practices, providing continuing education, and accreditation. They can also participate in the creation and hosting of national and international competitions and/or establish a national student organization.

While cybersecurity education cannot be expected to train for every platform it is imperative that academia and industry form partnerships. These partnerships should include externships for faculty to work with industry to develop curriculum and gain valuable field experience. To enable hands on training industry can collaborate with higher education to create environments, cyber ranges and other training materials to enhance student engagement and practical skill development. Corporations and cyber application developers are uniquely positioned to supply expertise and fund/donate technology. Academia can then generate, possibly in partnership with industry, lessons and curricula that utilizes the corporate supplied technology and use cases.

In summary, to ensure that we keep pace with the ever-changing and rapidly growing need for a cyber-ready workforce we need to work collaboratively with K-12, industry, and upper level academia. This public-private partnership will blend classroom learning with workplace experiences. We need to train the trainers on technologies and cyber trends to facilitate this learning. More importantly, we need to expand and facilitate experiential learning to promote student's problem solving skills, encourage persistence and integrate their knowledge into a contextualized experiences.

References

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BIO

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Her research interests include electronic commerce, pricing models for information goods, information and prediction markets, social networking and cyber ethics. Her research has been published in the MIS Quarterly, Production and Operations Management, the Journal of E-Commerce, INFORMS Journal on Computing, Decision Support Systems and presented at national and international conferences.

Jones holds a BS in business administration from the University of Illinois, Chicago, and earned a PhD from the University of Florida. She joined USF in 2003, having previously taught at the University of Michigan, the University of Florida, and Santa Fe Community College. Her professional service includes roles as a reviewer for numerous academic journals. She is a member of Beta Gamma Sigma.