

# Information Assurance and Security Education on Undergraduate Computing Degree Programs\*

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## ABSTRACT

A set of Information Assurance and Security hands-on learning modules is developed and open to the public. Topics include networking security, database security, defensive programming, web security, system fundamentals, mobile security, malware detection using Machine learning, and big data analytics on network intrusion detection. The design follows hands-on case-based pedagogical model, which yields a satisfaction rate up to 92.5% for self-learners.

## CCS CONCEPTS

**Applied computing** → **Education** → Interactive learning environments

## KEYWORDS

Information Assurance and Security; Education;

## 1 INTRODUCTION

Over the last decade, the use of computer devices for both personal and business purposes have exploded. Along with these activities are cybersecurity threats. However, information assurance and security (IAS) are less addressed in education. This has resulted in four urgent issues: 1) how to improve IAS curriculum under already tight credit hours in computing programs, 2) how to efficiently educate students to secure software, 3) a shortage of cybersecurity workforce nationwide,

and 4) a lack of faculty expertise in security education. This project aims to develop efficient low-cost hands-on interactive learning materials with open sourced learning platforms to study/teach IAS at colleges, especially in degree programs such as Computer Engineering (CE), Computer Science (CS), Information Technology (IT), Information Systems (IS), and Software Engineering (SE).

In attacking the aforementioned urgent issues, our contributions in this project over the past 5 years include 1) design and development of an isolated networked learning platform using portable devices and reverse tethering for security testing, 2) Collaboration with 40 instructors over 28 universities via faculty development workshops, 3) Engagement of 33 students attending in student training workshops, 4) 7 webinars with a variety of IAS topics, and 5) Implementation of 13 undergraduate courses infused the developed IAS learning modules. It is estimated that over 1500 students impacted by this project directly or indirectly.

## 2 METHODS AND RESULTS

The closest pedagogical model to our approach is Case-based learning (CBL), a well-known approach used across disciplines in which students apply their knowledge to real-world scenarios, promoting higher level of cognition in their learning. It has been reported that CBL is very effective in achieving learning outcomes. Each of our developed learning modules is self-contained to ease adoption in a suggested course, open to the public at <https://sites.google.com/site/iasoncs/>.

We have had 13 courses implemented the proposed learning modules with a satisfaction rate ranging from 81.82% to 92.5%. The students are asked to learn by themselves with a supplied learning module and the post-test survey question is “The PLab online tutorials help me understand the topics.” This is very encouraging as the developed learning modules provide life-long self-learning as well.

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