Maintaining the Focus on Cybersecurity in UK Higher Education

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September 2019

Including cybersecurity in university education. We explore the progress to date.

# Introduction

Last month, a Harvard Business Review article postulated that ”*Every Computer Science Degree Should Require a Course in Cybersecurity*”[1], provocatively reporting how cybersecurity is eating the software world and systematically addressing the problem of security begins with educating software developers at scale. How could you argue with the intent of this suggestion? Alongside organisations such as the National Cyber Security Centre (NCSC), the BCS has been promoting this position for a number of years through its accreditation and policy activities and it is positive to see our concerns highlighted to a wider international audience. As our recent paper [2] argues, cybersecurity is too important to be left to specialists and hence is an essential inclusion in Computer Science, Software Engineering, and all other IT-related degree programmes.

This article explores some of the challenges raised in our paper, related to the teaching of cybersecurity in UK universities, and provides a progress report regarding BCS efforts to promote the development of cybersecurity knowledge in accredited degree programmes.

## Support and Resources

Let’s start by evaluating some of the resources that are used to support cybersecurity learning and teaching. Do they support the promotion of good cybersecurity practices? And are they regularly maintained and updated?

#### Databases

Databases form a core part of all computer science degree programmes. From a security perspective, SQL injection is still a major concern: number one in the Open Web Application Security Project (OWASP) Top 10, and has been in the Top 10 since at least 2003. A range of common undergraduate database textbooks were analysed as part of a 2019 project [3], showing that injection attacks are generally not covered; small wonder it continues to be an issue.

#### The Case of Java

Our related research from 2017 shows that Java is still the most commonly taught introductory programming language at UK universities. But many Java books generally do not cover security or depth, or applied to real-world contexts. If you want to know about security you need to look at the documentation of the package/API being used, and/or informal resources. [4] analysed this and Stack Overflow in particular. We also know our students love resources like Stack Overflow. Looking at the Spring Framework 53% of questions related to cybersecurity were dominated by authentication (45%). One example being, by default, Spring enables protection against cross-site request forgery (CSRF). But all the accepted answers to CSRF-related failures simply suggested disabling the check. There were no negative comments about this, and indeed a typical response is “*Adding* csrf().disable() *solved the issue!!! I have no idea why it was enabled by default* ”. Quite concerning!

#### Informal Resources

The web abounds with informal resources, such as tutorials and code snippets. We know these are very popular with the students we teach. How good are these? One investigation [5]] considered 30 popular tutorials and found six had SQL injection weaknesses, and three had Cross-Site Scripting (Number 7 in OWASP’s Top Ten) weaknesses. Looking for related code fragments on GitHub, found 820 instances of these fragments, of which 117 were verified manually to be vulnerable — 80% of which were vulnerable to SQL injection. Hardly encouraging.

## Who will teach the Cybersecurity?

Who is going to teach this? Cybersecurity skills are in short supply, in both industry and academia. The demand for cybersecurity skills in industry makes it difficult for academia to attract academics with knowledge, practical experience, research background and academic aspirations. As universities expand their cybersecurity provision it is not uncommon to find multiple jobs advertised at the same time.

# What is the BCS doing?

Enough of the challenges. What have we been doing about it? The BCS has been using the accreditation process to mandate formal inclusion of information security (2010) and then cybersecurity (2013) in accredited programmes.

Industry, higher education, government and the relevant professional bodies have collaborated on the production of a set of guidelines which are to the benefit of the various stakeholders and wider society as discussed in a previous issue of ITNow [6]. This work led to the production of reference guidelines (“*Cybersecurity Principles and Learning Outcomes*”) and established a baseline of common knowledge, example learning outcome domains for cybersecurity within degree programmes and guidance on embedding the concepts.

Since 2015, we have been expecting accredited degrees to be compliant with the cybersecurity guide- lines. Universities are visited on a quinquennial basis and a full cycle of accreditation visits has not yet taken place following this inclusion in requirements. What is being observed is that the majority of visited institutions have now either adjusted their curricula to extend the coverage of cybersecurity or have a plan in place to do so. However, a minority are requiring encouragement to do so.

From the start of the Autumn 2015 term, up to and including the Summer 2019 term, the BCS has carried out 82 accreditation visits including five international visits (2 in South Africa and 1 in Brunei, Cyprus, and Ireland) . The BCS identified action was required to address concerns related to cybersecurity at 23 institutions; thus, 59 institutions were already delivering cybersecurity in line with the BCS expectations.

Long-term actions (‘*At Threshold* ’ judgements) were expected from 14 institutions (six in 2015/16, three in 2016/17 and five in 2018/19). 13 of these judgments were across all programmes; one was specif- ically against a generalist masters programme only. This indicates that the BCS will expect adjustments to have taken place before the next accreditation visit. It was commonly the case that adjustments had been made to design of the programmes of study, however, the adjusted programme had not yet been delivered so the evidence base was incomplete in terms of how cybersecurity was assessed.

Short term actions were required from nine institutions; the outcomes of these actions were as follows: (*i* ) of the eleven UG programmes involved all were approved ‘*At Threshold* ’; (*ii* ) of the nine UG programmes involved, eight were approved and one refused; (*iii* ) of the five UG programmes involved,

all were approved ‘*At Threshold* ’; and (*iv* ) of the three UG programmes involved, all were refused; and (*v* ) a further five which at the time of writing the outcome is not known

Good practice was identified at three universities by the commendation:

“*The second-year project provides an opportunity for exploring security aspects in depth with an industrial use case.*”

“*Hacktivity and related learning and teaching approaches*”

“*Cyber Security Centre which permeates both the course and supports external links and opportunities for students.*”

# Looking Ahead

The BCS is improving the cybersecurity capacity in the UK by enhancing the education experience of the students on BCS accredited degree programmes. If you want to be reassured that the graduates you recruit have some cybersecurity knowledge, then seek a BCS accredited degree. There are challenges ahead in terms of enhancing the resources upon which the degree provision depends and developing the cybersecurity capacity within universities.

As a final rhetorical point, is it sufficient to leave to cybersecurity to Computer Scientist? Should it be solely the preserve of those who work with Tech? Or should it be everyone’s responsibility? We hope this is a conversation that will begin shortly.

# References

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