Problem Based Learning (PBL) in Cybersecurity

Project GEN1222
Alastair Irons, Harjinder Lallie, Paula Thomas, Paul Stephens
Background Presentation

• Share the findings of the HEA project
  – Rationale for using PBL
  – Changes to student learning
  – Pragmatics
  – Ongoing research to gather views from stakeholders (students, educationalists, practitioners employers) on the effective use of PBL

• Still time to get involved
  – Final workshops
  – Using / testing /evaluating PBL materials
  – Provide feedback to inform model
  – Due to be completed Sept 1\textsuperscript{st} 2017
Objectives of Project

• To provide shared PBL materials for HEI cyber security community
  – Develop and share resources to be used in PBL
• To contribute to the current cybersecurity curriculum debate by developing and disseminating guidance on effective pedagogy
• To evaluate PBL as a method in teaching and learning in cybersecurity
• To explore opportunities for future collaboration
• To provide a forum for discussion and debate in teaching and learning issues and opportunities in cybersecurity
Using PBL in Cybersecurity

• We appreciate that the transition from conventional teacher centred education to problem-based learning can be tricky
• A true understanding of PBL will only come with time and by students and academics engaging in the process
• Our use of PBL is designed to improve the efficiency of cybersecurity education and to help students develop the wide range of skills needed to be a cybersecurity professional
  – Including team work, making judgments and developing as life long learners
Rationale for Using PBL in Cybersecurity

• Reduce ‘information overload’ and stop students from learning huge amounts of unnecessary theoretical detail

• Address perceived weakness in traditional ‘didactic’ teaching methods

• Improve students’ control over their learning by providing more opportunity to be self directed, to locate what they need to know and give them possession of their learning

• Improve students’ interpersonal skills
Why important professionally?

• Make undergraduate education a platform for life long learning
  – Cybersecurity is a field where professionals will need to continually build on and update their knowledge in accordance with ongoing developments in technology

• Cybersecurity professionals must be able to
  – make judgments when faced with uncertainty
  – have the confidence to react quickly to situations
  – be able to work both as part of a team and independently.
Alternate Approach

• Project has decided to use approach to embed PBL in existing contextualised modules

• Alternate approach discussed at workshops started with generic PBL module and tried to fit cybersecurity into it
Materials

• Case studies for PBL in cybersecurity
• Scenarios for PBL cybersecurity
• Teaching guide in using PBL in cybersecurity
  – To use materials
  – To develop own materials
  – To create learning environments
• Student learning guide to PBL as a learning tool
• VX Walkthroughs
• Accessible through website
PROBLEM BASED LEARNING IN CYBER SECURITY

WHAT IS PBL? FIND OUT!
What it is?

Knowledge and skills acquired through a series of contextual problems can be defined as Problem Based Learning. It encourages student engagement as active participants in managing their learning requirements, giving students the opportunity to take responsibility for their learning and encouraging them to actively engage in shaping their learning and teaching requirements.

EXPLORE SCENARIOS

Scenarios

- **CT5040**
  - Gregory's Scenario – A National
  - This scenario will be coming

- **Coming Soon!**
  - This scenario will be coming

- **Coming Soon!**
  - This scenario will be coming

- **Coming Soon!**
  - This scenario will be coming
Collection of Data

• Trying to measure effectiveness of PBL
  – Summative performance
  – Student engagement
    • Formative / summative
  – Student confidence
  – Smiley face – this is common across 4 partners

• Collecting data at different levels from level 4 to 7

• Range of PBL interventions
  – Single session (component of module)
  – Week long activity (component of module)
  – Longer period (3 weeks-ish) (component of module)
  – Semester (module)
  – Complete level / year
  – Whole programme
Initial Feedback from Students

• Warwick
  – Use of standard module feedback and indication that scenario based PBL exercise was supportive of exercise

• Gloucester
  – See graph

• Sunderland
  – See graph

• Canterbury
  – Longitudinal data collection in progress
Component Review - Gloucester

- PBL Interesting: 4.5
- PBL enjoyable: 4.5
- PBL increase relevance: 4.5
- Learned from peers: 4.5
- PBL make technical easier: 4.5
- Learned as much as lecture: 4.0
- Thoroughness of learning: 4.5
- Time compared to other: 2.5
Confidence Measure pre and post PBL

Problem Solving  Skills Develop  Groupwork  Independent Learning  Make Judge  Knowledge Application  PBL Overall  N = 30
Summary

• Project took time to get started so now looking at finish later in 2017
• Initial findings are that PBL helps students learn in a different way
• Initial findings suggest that PBL facilitates deeper learning
• Takes time to get students used to approach
• PBL tools appear to be “common sense” but actually quite difficult for students