K-12 Outreach in Cybersecurity Education: Successes and Challenges

The University of Hawaii Maui College is investigating how to increase women and minority high school students cybersecurity. In a college early-admit pathway for Grades 11 and 12 students will prepare for jobs from Computer Support Specialist through level positions in Information Assurance.
Integrating e-learning technologies and industry-based cybersecurity curriculum: towards an early-admit high school-university model for collaboration. 
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Action Research Activity
An applied scholarly paradigm for continuous improvement in our teaching and learning techniques.

Subject: High School Women & Minorities (Early-Admit Program)
Object: Cybersecurity Education
Tools: E-learning Technologies and Support Learning Agents
Integrating e-learning technologies and industry-based cybersecurity curriculum: towards an early-admit high school-university model for collaboration. debran@hawaii.edu

Iterative Action Research Process
An applied scholarly paradigm for continuous improvement in our teaching and learning techniques.

Subject: High School Women & Minorities (Early-Admit Program)
Object: Cybersecurity Education
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Iterative Action Research Process
CYCLE 1: Plan-Action-Observe/Monitor – Evaluate/Reflect
REVISE PLAN
CYCLE 2: Action-Observe/Monitor – Evaluate/Reflect

Adopted from Lewin’s Action Research Cycle (Stephen Kemmis, 1988)
Methodology: How to motivate high school women and minorities in information security professions and their achievement factors?

- Using e-learning methodologies;
- Participating in hands-on competitions; and,
- Collaborating with local high schools, college/community mentors via promising academic support and social integration strategies.

Research in economic human capital and signal theories (Baptiste, 2001; Spence 1973), suggests cybersecurity is a viable college/career choice for students. Therefore need to know: “What would increase high school student’s interest in Cybersecurity careers?”
<table>
<thead>
<tr>
<th>Fall Semester</th>
<th>Spring Semester</th>
<th>Summer</th>
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<tr>
<td><strong>Fall 2016</strong></td>
<td><strong>Spring 2016</strong></td>
<td><strong>Summer 2016</strong></td>
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<td>ICS 101, ICS 169 and ICS 184</td>
<td>ICS 101 and ICS 110</td>
<td>(ICS 101 and ICS 169)</td>
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<td><strong>Spring 2017</strong></td>
<td><strong>Summer 2017</strong></td>
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<td>ICS 101, ICS 184 and ICS 171</td>
<td>ICS 101 and ICS 171</td>
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Iterative Deployment Process

Round 1 – Spring 2016 (Cohort 1)
Round 2 – Summer 2016 (Cohorts 1 and 2)
Round 3 – Fall 2016 (Cohorts 1 and 2)
Round 4 – Spring 2017 (Cohorts 1 and 2)
Round 5 – Summer 2017 (Cohort 2)
Adaption of concepts as evidence of learning communities.

Gender (N=41)

- Males: 32%
- Females: 68%
Adaption of concepts as evidence of the diverse learning communities.

Ethnicity (N=41)

- Part Hawaiian: 32%
- Filipino: 7%
- Caucasian: 5%
- Hispanic: 2%
- Japanese: 2%
- Thai: 2%
- Other: 3%

National Science Foundation
CYBERSECURITY
Successes and Challenges
What Have We Learned
Practice and Protocols

• Facilitate Evolutionary Use:
  • Help Faculty, Staff Partners and Students **Discover and Evolve** in the appropriate use of TECHNOLOGY in the educational collaborative processes.

• **Support the resulting Growth:**
  • Know that evolutionary adoption of technology will result in significant growth in Usage over time. **Actively Plan** to appropriately support technology, faculty, staff and students as they expand their horizons of Technology in collaborative process.

• **How to Engage/Motivate Students:**
  • Provide Financial Assistance (Tuition/Books)
  • Promote Stable Infrastructure (Laulima)
  • Provide High Touch Support (Team: Agent and Peer Mentors)
  • Provide Adequate Technology (DOE Classrooms)
  • Allow them to **discover and evolve** in the use of the Technology
Success: From Teamwork-as-object to Teamwork-as-outcome: a system-level view identifies long-standing contradictions; when these are addressed, here is an increase in morale.
Success: Thinking about extended learning activities as a collective system of human activity of learning.
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Web map for Spring Semester students (41 high school students) showing points of intersection across interest and converged of activities. The closer to the center of the web, the higher the rank of choice of following activities.

--More information about what the jobs might entail
--Access to more relevant classes to see if I would be good in
--Reassurance that I would earn a good living
--Opportunity to speak to current professionals about the pros and cons
--If any friends thought it was a cool careers
--If my parents thought it was a good career
--Nothing
The **OVERALL GOAL** of the study is to broaden participation in ongoing action research study to address cybersecurity issues that are critical for small businesses and one of special interest to Hawaii and other US rural communities.

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