Puzzle Based Learning for Cyber-Security Problems

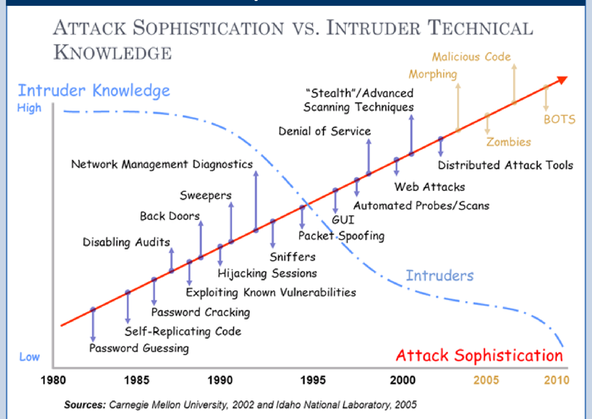
Sanjib Kumar Saha and Dr. Dipankar Dasgupta

Department of Computer Science

THE UNIVERSITY OF MEMPHIS | Center for Information Assurance

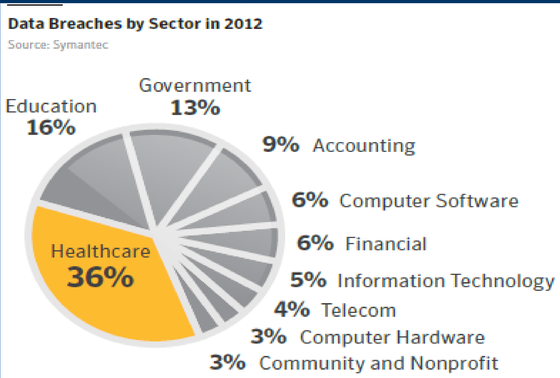
Cyber World: Security Threats

Attack Sophistication Trend



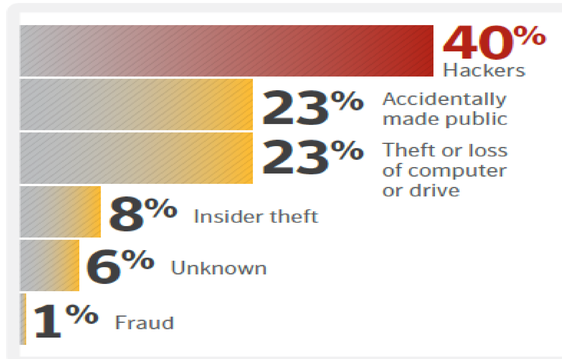
Sources: Carnegie Mellon University, 2002 and Idaho National Laboratory, 2005

Targeted Attacks



Source: Norton Report 2012

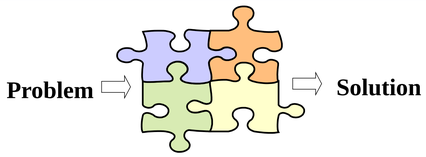
Causes of Breaches



Hackers continue to be responsible for the largest number of data breaches, making up 40 percent of all breaches.

Source: Norton Report 2012

Puzzle



*"A **puzzle** is a problem or enigma that tests the ingenuity of the solver." – Wikipedia*

- ***Generality*** - ***Simplicity***
- ***Eureka Factor*** - ***Entertainment Factor***

- ❖ **A new way of learning**
- ❖ **Better productivity than traditional learning -** About 500% (Ref: Michalewicz Z, Michalewicz M, Puzzle Based learning)
- ❖ **Increase critical thinking skills and participation**

Puzzle Based Learning

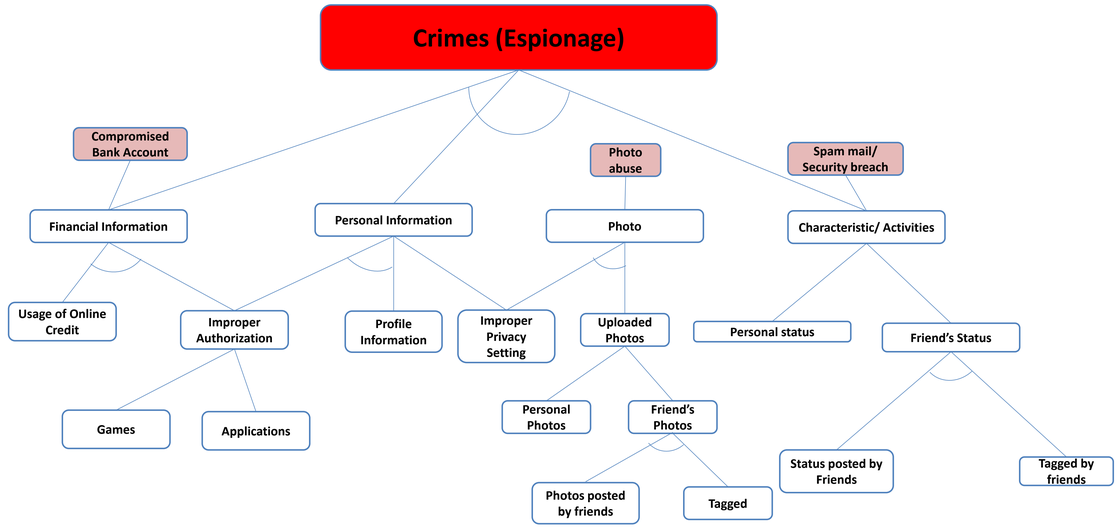
❖**Steps**

- ❖ Introduction of the topic through communicating lectures
- ❖ Interactive Story with problems
- ❖ Story can be lead to different directions in accordance to feedback to the problems

❖**Learning**

- ❖ Participants interactively communicate with the story and also the problem
- ❖ Challenges stimulate participants to use their reasoning and knowledge learned from classes
- ❖Participants become aware of the consequences of their responses as the responses leads the story ahead

Cyber Attack Landscape



Why Puzzles?

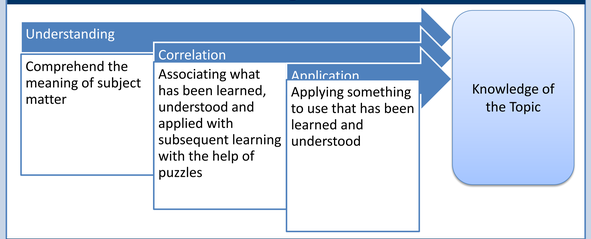
Puzzle Based Learning

- Critical Thinking
- Logical & Abstract Reasoning
- Domain Independent

Project or Problem Based Learning

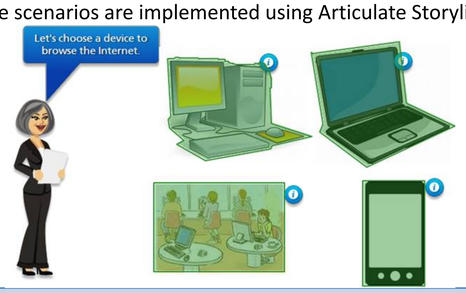
- Identifying the Question
- Dealing with Uncertainty
- Reasoning with Domain-specific Methods

Learning Process



Implementation

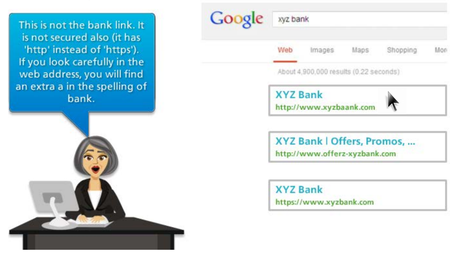
❖ Some scenarios are implemented using Articulate Storyline.



Guidance and Feedback

❖ Scenario with a story guides the user step by step.

❖ Users are provided with feedback based on their action.



Conclusion & Future Works

- ❖ Provokes the ***thinking process*** by providing challenges.
- ❖ ***Interactive process*** to engage participants in the story or the problem.
- ❖ Participants see the ***future consequences*** of their ***actions***, makes the learning process interesting.
- ❖ Full course design using this method is underway.

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