Review of the Existing Game Based Learning System in Cybersecurity

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ABSTRACT

As the world is advancing in technology, there is an increasing trend in the number of malware attacks recorded. Estimated losses from cyber-crime and cyber espionage amount to hundreds of billions annually. The need to build, maintain, and defend computing resources is greater than ever before. Game-based learning are competitive, interactive lessons which allows the learner to have fun while gaining knowledge by using specific skills to achieve definite outcomes.

Keywords

Cybersecurity; Games; Players; Attacks; Defense; Pedagogy;

1. INTRODUCTION

Game based learning is commonly used as a method of learning in the society today. Eames defined this method of learning as the incorporation of games which could imply video games in instructions [1]. Games are often times played for the sole purpose of fun, for taking up challenges and to outplay the other opponents. With the evolvement of the various disciplines over time, there is a constant shift in the view of threats and vulnerabilities in cybersecurity today. Hence, it has become important to incorporate a game based learning system into the field of cybersecurity so as to engage the mind of the young adults thereby establishing a foundation of the skills required in information security and creating a form of passion within them to train them to become the next generation of cybersecurity professionals while having fun alongside. This presentation reviews the different applications used for game based learning system in cybersecurity and possible ways to improve on the existing systems.

2. LITERATURE REVIEW

Several studies on the game based learning system in Cybersecurity have highlighted its effectiveness and shown how skills and competencies are being improved through this learning process. The existing systems were classified into 3 different categories: Category 1 involves only the theoretical description of themes and concepts of cybersecurity without a representation of the actual gameplay. Game based systems in this category includes: Control-Alt-Hack, Stop That Post Game

[2] and Shadowrun Returns. Category 2 (One Player Game) involves the games played by one person where the individual would be tested based on the understanding of cybersecurity concepts introduced in the application. Game based systems in this category includes: CyberProtect, CyberAware and CyberCIEGE.[2]. Category 3 (Multi Player Game) involves competition between the different individuals or teams with reward based outcomes based on understanding of cybersecurity concepts. Game based systems in this category includes: CyberNEXS, InCTF (India Capture The Flag) and GenCyber.[2][3][4]

3. CONCLUSION

Based on the classifications of the existing games highlighted above, awareness, defensive and attacker strategies were drawn out as features to identify the contributions of the model to the field of cybersecurity. Valid tools have been developed to consolidate and enhance learning and the authors of each tools assessed their tools through the awareness, defensive and attacker strategies. The multiplayer game approach can be identified as one of the best interactive medium for game based learning in the field of cybersecurity. However, a collaboration of the above mentioned systems with better improvement on the scalability, flexibility and increased use of themes can equip and prepare students on cybersecurity education. An improvement on the existing game based learning system is recommended to include the added features on awareness, defensive and attacker strategies.

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5. REFERENCES

- [1] Eames, J. (2014). What Game-Based Learning Can Do for Student Achievement. EdSurge.
- [2] Gestwicki, P., & Stumbaugh, K. (2015). Observations and Opportunities in Cybersecurity Education Game Design. *IEEE Conference on Computer Games: AI, Animation, Mobile, Multimedia, Educational and Serious Games*. DOI:10.1109/CGames.2015.7272970.
- [3] Boopathi, K., Sreejith, S. & Bithin, A. (2015). Learning Cyber Security Through Gamification. *Indian Journal of Science and Technology*, Vol. 8(7), 642-649.
- [4] Raman, R., Lal, A. & Achuthan, K. (2014). Serious Games Based Approach to Cyber Security Concept Learning: Indian Context. Semantic Scholar.

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