Name(s)	Project Number
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Project Title

Determining the Effectiveness of Video Games in Cybersecurity Education

Abstract

Objectives
Cybersecurity is this generation's biggest challenge, and when 95% of cyber attacks are based on human error, educating the general public about online safety needs the highest priority. Mistakes like clicking links in phishing emails are based in habits from a young age, suggesting that cybersecurity education should begin with elementary school students. During a cybersecurity lecture, only a few students seemed actively engaged, but upon transitioning to a game, they were not only engaged but excited to learn. This disparity prompted an investigation of the effectiveness of different teaching methods, specifically various types of video games compared to the more conventional lecture. The objective was to determine what features make a game effective in cybersecurity education. The hypothesis was that a game that was individualized and interactive would be the most successful at teaching cybersecurity, and the game Cyber Champion was designed with this in mind.

Methods
Cyber Champion was developed with a text editor in JavaScript. During lessons, a projector was needed to display lecture slides and laptops for students to play games. The overall study included 3 stages with improvements to Cyber Champion based on findings after each stage. Cybersecurity lessons were given in classrooms, library sessions, and focus groups. Qualitative data of the teacher's perspective was gathered by observing the students' engagement and learning based on criteria like questions asked or level of discussion and responses. After classroom lessons, quantitative data of the student's perspective was gathered through a survey.

Results
91% of students learned more after receiving the same content in a game format. 93% of students preferred both the game and the lecture rather than either individually.

Conclusions
The results verified the importance of an interactive and individualized game, but also highlighted the need for discussion and a reward system, and content relevant to all ages. This was implemented through a variety of new features, such as an improved tutorial, achievement system, and discussion prompts on Game Over pages. In addition, it distinguished the role of educational video games as a supplement to the lecture, rather than a replacement. These findings can then expand to any cybersecurity lesson and can shape how educational curricula are created in the future.

Summary Statement

I determined that educational video games must be interactive, individualized, motivating, and promote discussion to be the most effective at teaching cybersecurity and developed a game to accomplish this.

Help Received

Some other students helped deliver lessons and reach out to schools.