Employing Model-Eliciting Activities in Cybersecurity Education

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INTRODUCTION

College cybersecurity courses should ensure that activities employed can engage students in learning and allow translation from conceptual knowledge to practice. We propose to use model-eliciting activities (MEAs) to develop students' representational fluency in the cybersecurity domain. The cybersecurity topic chosen for the MEA implementation was Hyper-Text Transfer Protocol Secure (HTTPS). The MEA developed, "Migration to HTTPS", comprises core concepts of HTTPS and their application on a real-world cybersecurity tasks.

MEA → Real-word scenarios → Open-ended problems → Teamwork → Model → Active learning

OBJECTIVES

- Illustrate how design principles were applied to construct a "Migration to HTTPS" MEA, along with the justifications of how learning objectives were aligned with the assessment procedures.
- Explain how the MEA was implemented followed by presenting the results of our pilot study.
- Determine the implications of the MEA in teaching and learning in Cybersecurity education.

METHOD

The activity was pilot tested with a group of 18 students from a three-year program equivalent to a third-year Electrical and Computer Engineering, who participated in a five-hour workshop in cryptography.

Migration to HTTPS Challenge

Task

LOVABLE is conscious of the importance of protecting buyers' financial transactions and personal data.
The company requires you to write a detailed report that:
1. Determine how to secure the communication between the server and the web browser and clearly detail how to implement your solution.
2. Define optimal integration with legacy systems.
3. Outline viable and optimal encryption methods.
4. Delimit process of redirect users from HTTP to HTTPS.
5. Identify common issues and vulnerabilities of the https protocol and how to troubleshoot them.
6. Identify what sections of the LOVABLE's website need to use HTTPS.
7. Estimate cost of the HTTPS implementation.
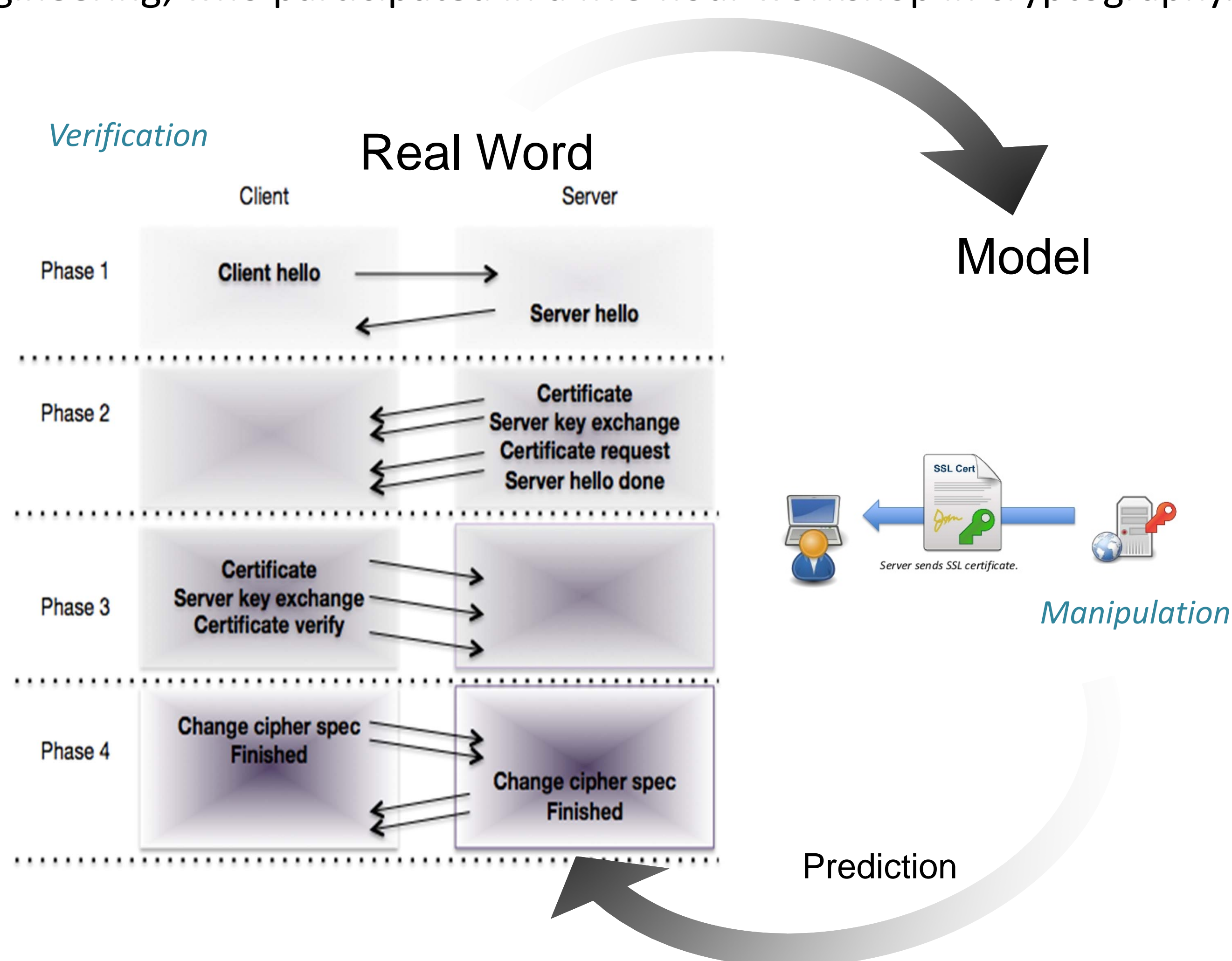
Assumptions
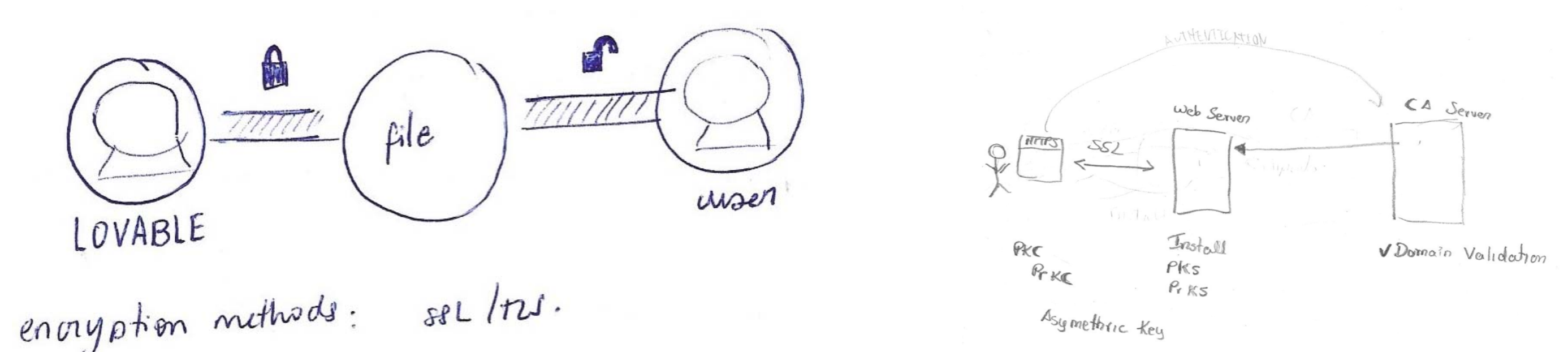The company website poses a DNS/DB secure.

RESULTS

Figure 2. Participants' Models
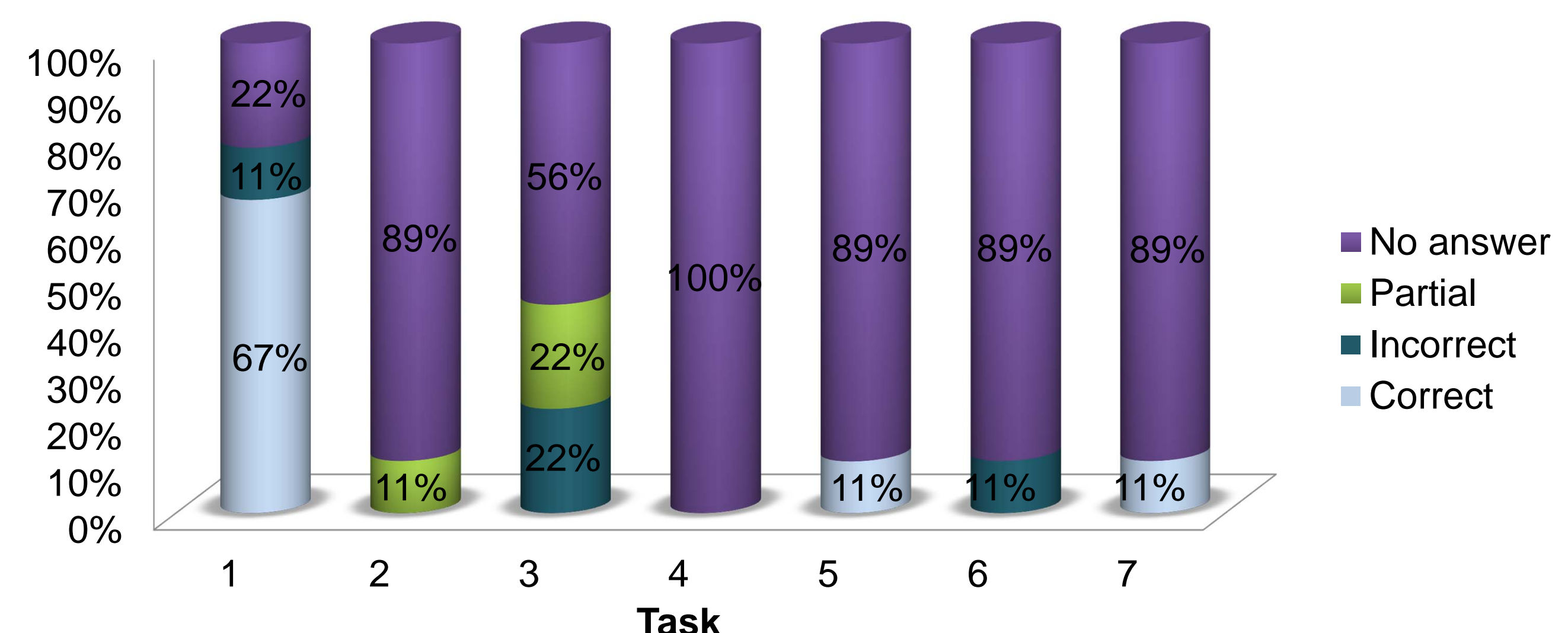

Figure 1. **Modeling cycles**

Figure 3. **Responses Accuracy**

CONCLUSIONS

MEA implementation can be used as a new resource to enrich learning outcomes in cybersecurity education. Participants' mental models of the topic show several misconceptions related to basic concepts of cybersecurity. Text-based answers, and graphic-based answers unveiled many conceptual gaps of between perceived concepts and the actual knowledge.