**The Big Idea!** Developing the Cybersecurity Mindset Using Representational Fluency and Model-Eliciting Activities

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**The Problem**

“...a desperate shortage of people who can design secure systems, write safe computer code, and create the ever more sophisticated tools needed to prevent, detect, mitigate, and reconstitute systems after an attack” (Evans and Reeder, 2010).

**The Goal**

Cybersecurity experts with not only deep technical skills, but also the capabilities to recognize and respond to complex and emergent behavior, as well as a “security mindset”, which includes mastery in using abstractions and principles, assessing risk and handling uncertainty, problem-solving, and reasoning; coupled with facility in adversarial thinking.

**Research Questions**

1. What is the efficacy of model-eliciting activities (MEA) for developing representational fluency contextualized on cryptography concepts and practices? MEAs challenge students to build and test conceptual models using six principles: model construction, the Reality Principle, self-assessment, model documentation, model share-ability and reusability, and effective prototyping.

2. What are quality characteristics of students’ solutions to the MEA-based cryptography challenges?

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**Participants:**

- **Control Group**
- **Treatment Group**

**DESIGN AND METHODS:**

<table>
<thead>
<tr>
<th>Participants</th>
<th>Cryptography Knowledge Pretest</th>
<th>Posttest</th>
<th>Outcomes:</th>
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<tbody>
<tr>
<td>Control Group</td>
<td>MEA with Representational Fluency Teaching Method</td>
<td></td>
<td>1) MEAs contextualized for cryptography</td>
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<td>Treatment Group</td>
<td>Traditional Expository Teaching</td>
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<td>2) Between group comparative analysis of MEA and expository teaching in developing representational fluency</td>
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<tr>
<td></td>
<td>MEA with Representational Fluency Teaching Method</td>
<td>Posttest</td>
<td>3) ...and in students’ executive function</td>
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