CERIAS

The Center for Education and Research in Information Assurance and Security

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

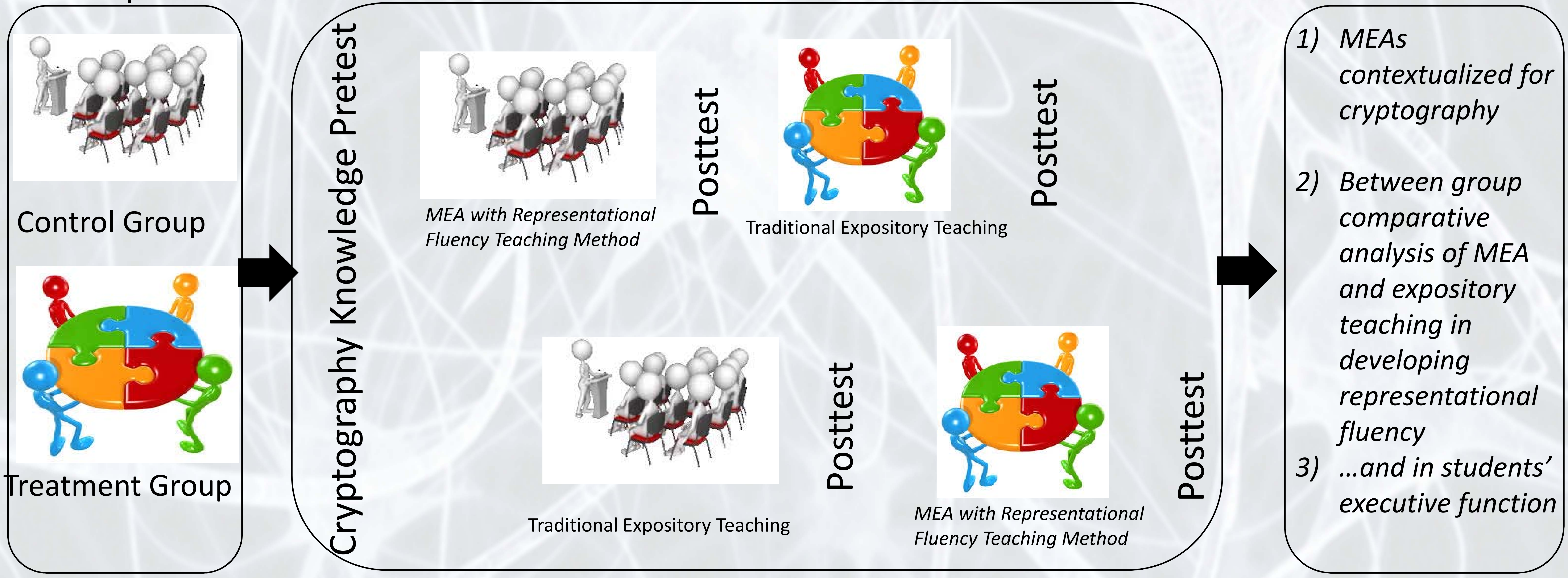
1 *What is the efficacy of model-eliciting activities (MEA) for developing representational fluency contextualized on cryptography concepts and practices? MEAs challenge students to build and test conceptual models using six principles: model construction, the Reality Principle, self-assessment, model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

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

DESIGN AND METHODS:

Participants:

Outcomes:



Control Group

Treatment Group

Cryptography Knowledge Pretest

MEA with Representational Fluency Teaching Method

Posttest

Traditional Expository Teaching

Posttest

Traditional Expository Teaching

Posttest

MEA with Representational Fluency Teaching Method

Posttest

1) *MEAs contextualized for cryptography*
2) *Between group comparative analysis of MEA and expository teaching in developing representational fluency*
3) *…and in students' executive function*

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