

Integrating Computational Thinking in an Elementary and Middle School Science Curriculum through Robotics

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Abstract.

Our goal is for pre-service teachers to create a robotic earthquake simulator that can promote the fundamentals of computational thinking (CT) while learning science concepts. The lesson plan we developed promotes the use of fundamental CT skills while using a hands-on inquiry-based approach. To accomplish this goal, we planned and designed a project utilizing robotics that can simulate earthquakes using the LEGO Mindstorms EV3 software. We constructed a LEGO model, then programmed the robot to display the impact of an earthquake. To incorporate an inquiry-based approach to instruction, we built different types of Lego buildings using several designs (e.g., different heights and widths) to be loaded on the cart to determine the structural integrity of those buildings relative to varying magnitudes of earthquakes. Through this experience we learned basic computational skills that can be implemented in future educational settings. The lesson plan we developed incorporated Next Generation Science Standards (NGSS), Common Core State Standards (CCSS), Science and Engineering Practices (SEP), and Cross Cutting Concepts (CCC) through a 5E lesson design. Pre-service educators will be able to use this lesson as the foundation for creating inquiry-based lessons in their future classrooms.

Keywords: Robotics; Computational Thinking (CT); Elementary Science: Earthquake Simulator; Preservice Teachers