Global Earthquake Engineering: A STEM EDA Lesson and Activity (Curriculum Exchange)

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Course Summary
The Apply Earthquakes curriculum module is part of STEM: Explore, Discover, Apply (EDA), a three course elective sequence for middle school grades 6-8; each module typically lasts three weeks. In Apply Earthquakes, 8th grade students perform global earthquake engineering activities that address community needs. The Engineering Design Process (EDP) guides the students through the design and implementation of projects and concepts related to earthquake design. The end result is that students build a model structure using various materials such as balsa wood, cotton balls, and craft sticks to withstand earthquakes simulated by a shake table.

Target Grade Level(s)
Apply - 8th grade

Module Overview

1 Identify the Problem — As members of EWB-USA, you have traveled to a third world country to help with the reconstruction on of homes there after a devastating earthquake. As a global engineer, you must consider the earthquake resistant designs, as well as the needs of the community.

2 Research the Problem — Research these three main areas: consider the needs of the community, the geographic area of the region, and historical and real-time earthquakes.

3 Brainstorm Solutions — Develop three ideas broken down by the following: materials and price, design description, and overall design.

4 Choose a Solution — Use the following four categories to assess and rate each design: *Design Strengths*, *Design Weaknesses*, *Incorporated Design Research*, and *Shake Table Survival*.

5 Create & Develop a Prototype — Build a prototype for the design chosen in Step 4 and utilize the iterative nature of design.

6 Test & Evaluate the Prototype — Test the prototype on the shake table and evaluate its performance.

7 Improve & Redesign — Reflect on the performance of the prototype and suggest improvements and redesigns of the structure.

Course Implementation
Schools can implement the STEM EDA curriculum in a variety of ways: as an elective, after school program, or inserted into their existing classes.

Module Premise
Everyone in your group is a member of Engineers Without Borders USA (EWB-USA), a nonprofit humanitarian organization on that implements sustainable engineering projects globally.

Featured Topics
- The history of earthquakes
- Topography and making topographic maps
- The Richter scale
- Earthquakes around the globe

Materials
- Balsa wood = Wood logs
- Straws = Piping material
- Popsicle sticks = Lumber beams
- Paper clips = Wire
- Cotton balls = Fiberglass insulation
- Hot glue gun = Cement sealer applicator
- Hot glue sticks = Cement sealer

Building Model Constraints/Rules
The teacher should set some constraints for building the structure regarding dimensions, testing, and total costs spent on materials.

Engineering Design Process
This process is used to guide students through the STEM EDA curriculum while encouraging teamwork, critical thinking, and creativity.