Earthquakes with Code Standards Alignment

Earthquakes with Code: Standards Alignment

*The **Earthquakes with Code Modules** addresses the following performance expectations, disciplinary core ideas, science and engineering practices, and crosscutting concepts as identified in the Next Generation Science Standards.*

Performance Expectations (PEs)	*Middle School* **MS-ESS3-2.** Analyze and interpret data on natural hazards to forecast future catastrophic events and inform the development of technologies to mitigate their effects.
	High School **HS-ESS3-1.** Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity.
Disciplinary Core Ideas (DCIs)	**ESS3.B: Earth and Human Activity: Natural Hazards.** "Some natural hazards are preceded by geological activities that allow for reliable predictions; others occur suddenly, with no notice, and are not yet predictable. By tracking the upward movement of magma, for example, volcanic eruptions can often be predicted with enough advance warnings to allow neighboring regions to be evacuated. Earthquakes, in contrast, occur suddenly; the specific time, day, or year cannot be predicted. However, the history of earthquakes in a region and the mapping of fault lines can help forecast the likelihood of future events" –From *A framework for K-12 Science Education: practices, crosscutting concepts, core ideas* (NRC, 2012, p. 193).
Science & Engineering Practices	1. **Asking questions** about what hazards and risks exist as a result of an earthquake for people who live near the epicenter. 2. **Using computational models (simulations)** to visualize the movement of GPS stations over time and determine the hazards and degree of risk throughout California and the surrounding region. 3. **Planning and carrying out investigations using block-programs** to study (1) tectonic plate movement along the San Andreas fault, (2) trends in the velocity of land around the San Andreas fault, (3) how land around a fault deforms due to plate movement, (4) how deformation rate maps can be used to predict future hazards and impacts throughout California, and (5) what the risk of a specific damage is for a specific location. 4. **Analyzing and interpreting deformation rate maps** to identify risk associated with earthquakes for specific locations. 5. **Using computational thinking** to plan and code investigations of the earthquake cycle by setting variables and constants, and creating loops and functions under varying conditions. 6. **Constructing arguments from evidence** obtained from deformation rate maps and risk assessments to justify the claims made to answer the investigation questions.
Crosscutting Concepts	**Patterns.** GPS velocity patterns reveal areas with large differences in the speed of land movement and locations with the greatest potential for an earthquake. Using deformation rate patterns to identify and estimate risks.

The Concord Consortium

Computer Science (CS) Standards

Note: The following are CS Standards developed by the Computer Science Teachers Association based on the K-12 Computer Science Framework.

Core Concepts	
Data & Analysis	• **3A-DA-11** (Grade 9-10). Create interactive data visualizations using software tools to help others better understand real-world phenomena. • **3B-DA-05** (Grade 11-12). Use data analysis tools and techniques to identify patterns in data representing complex systems. • **3B-DA-06** (Grade 11-12). Select data collection tools and techniques to generate data sets that support a claim or communicate information.
Algorithms & Programming	• **1B-AP-09** (Grade 3-5). Create programs that use variables to store and modify data. • **1B-AP-10** (Grade 3-5). Create programs that include sequences, events, loops, and conditionals. • **1B-AP-11** (Grade 3-5). Decompose (break down) problems into smaller, manageable subproblems to facilitate the program development process. • **1B-AP-12** (Grade 3-5). Modify, remix, or incorporate portions of an existing program into one's own work, to develop something new or add more advanced features. • **1B-AP-15** (Grade 3-5). Test and debug (identify and fix errors) a program or algorithm to ensure it runs as intended.
Impacts of Computing	• **1B-IC-18** (Grade 3-5). Discuss computing technologies that have changed the world, and express how those technologies influence, and are influenced by, cultural practices. • **3A-IC-24** (Grade 9-10). Evaluate the ways computing impacts personal, ethical, social, economic, and cultural practices. • **3A-IC-26** (Grade 9-10). Demonstrate ways a given algorithm applies to problems across disciplines.

Core Practices	• Recognizing and Defining Computational Solutions • Developing and Using Abstractions • Creating Computational Artifacts • Testing and Refining Computational Artifacts • Communicating About Computing