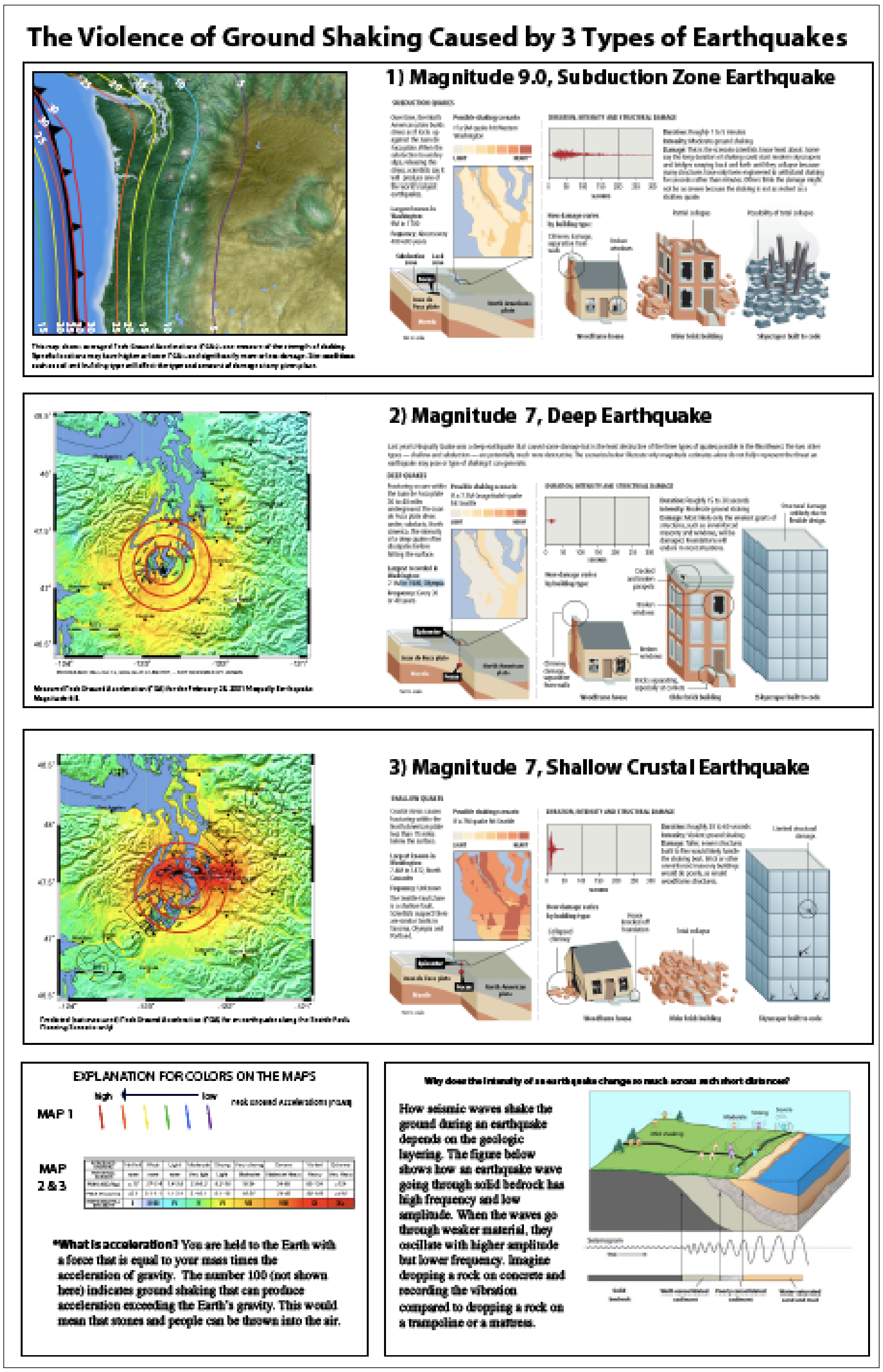
Activity—Types of Pacific NW Earthquakes & the BOSS Model:

The Violence of Ground Shaking Caused by 3 Types of Earthquakes

Building failure doesn't just have to do with the magnitude of an earthquake.
(See previous BOSS model activity to learn about resonance and buildings during earthquakes.)

The BOSS Model helps students understand that different size and shape buildings have different "resonant frequencies". In general, small buildings (e.g. single-family homes) will be shaken more violently by short-period ground shaking with the ground oscillating back and forth every one or two seconds. This short-period ground shaking is a characteristic of earthquakes on crustal faults, like the Seattle or Portland Hills Faults. The ground-shaking maps for these earthquakes show that the ground will shake very violently in areas near the epicenter of a crustal earthquake. Small structures, like single-family



Science Standards
(NGSS; pg. 287)

- Motion and Stability—Forces and Interactions: HS-PS2-1, MS-PS2-2
- Energy: MS-PS3-1, MS-PS3-2, HS-PS3-2, MS-PS3-5
- Waves and Their Applications in Technologies for Information Transfer: MS-PS4-1, HS-PS4-1, MS-PS4-2
- Earth's Systems: HS-ESS2-2
- Earth and Human Activity: HS-ESS3-1, MS-ESS3-2
- Engineering Design: HS-ETS1-1, HS-ETS1-3

This poster is on this DVD in the folder called:

5. Maps & Posters
> EarthquakeScenarioPoster_SeattleNisqually.pdf

homes, would sustain significant damage, if located near the epicenter. Thus single-family houses are analogous to the short block of the BOSS model.

An additional important characteristic of earthquakes on crustal faults is that ground shaking will last for only about 10 to 20 seconds. Generally speaking, this short duration of ground shaking means large structures will not oscillate nearly as much as they would if the ground shaking lasts for a longer time interval. Thus, large structures are analogous to the tall block of the BOSS model that does not oscillate very much when you shake the BOSS model so that the short block oscillates in large swings. Larger buildings (e.g. sky scrapers and bridges) will be shaken more violently by long-period ground shaking in which the ground oscillates back-and-forth every ten or twenty seconds.

Surface waves from a great Cascadia Subduction Zone earthquake will oscillate the ground with periods of 10 to 20 seconds. *PLUS,* the duration of ground shaking will be four to six minutes! Thus large structures experiencing ground oscillations produced by a great Cascadia Subduction Zone earthquake are analogous to the tall block of the BOSS model. The combination of long-period and long-duration ground shaking caused by a great Cascadia Subduction Zone earthquake will excite even very large structures into violent shaking that will last for several minutes. Large amplitude oscillations lasting several minutes are bad news for large structures. Engineering bridges and large buildings to withstand such ground shaking is a major engineering challenge!