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Teachers on the Leading Edge: A Place-Based Professional Development Program for K-12 Earth Science Teachers[1]

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Teachers on the Leading Edge (TOTLE) is an Earth Science teacher professional development program featuring Pacific Northwest active continental margin geology. To engage middle-school teachers and students, TOTLE workshops: (1) invite novice learners to geophysical studies of tectonics, earthquakes, and volcanoes; (2) provide access to EarthScope research; and (3) explain geologic hazards as understandable aspects of living on the "leading edge" of the North American continent. Fundamental concepts and observations progress from global patterns, to regional context, and then to local applications. For example, earthquakes are concentrated near tectonic plate boundaries such as the Cascadia subduction zone between the Juan de Fuca and North American plates. Earthquake hazards include liquefaction and landslides that are affected by regional and local geology. And relative earthquake hazard maps provide comparisons of hazards on county, city, and neighborhood scales. Inquiry-based field investigation of coastal ghost forests and Cascadia tsunami geology stimulates learning about Cascadia great earthquakes and tsunamis and provides a case study of scientific discovery. Field studies of volcanic mudflow (lahar) deposits from Mt Hood and Mt Rainier highlight volcanic hazards to rapidly increasing populations that live near recently active Cascade volcanoes. We emphasize the importance of infrastructure engineering and emergency preparedness in preventing geologic hazards damage, injuries, and deaths in order to: (1) demonstrate how Geoscience research leads to improved engineering designs that mitigate hazards; (2) align lessons with national and state K-12 science education standards that focus on science, technology, and societal connections; and (3) avoid fatalism and develop a culture of geologic hazards awareness among future citizens of the Pacific Northwest.

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