

T104. It's About Time: Teaching the Temporal Aspects of Geoscience (Posters)

TEACHING GEOLOGIC TIME AND RATES OF LANDSCAPE EVOLUTION WITH DICE, SANDBOXES AND CUTTING-EDGE THERMOCHRONOLOGY

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Debates over natural resource consumption and the validity of religious and scientific views of Earth history hinge on the public's conception of geologic time and rates of Earth change. Teaching these concepts effectively remains a challenge to educators in a variety of settings. We present labs designed to help students internalize these concepts using dice, sandboxes, stopwatches, and cutting-edge thermochronologic research to study landscape evolution, and illustrate how the basic models can be adapted to challenge students in grades 9-16 with kinematical, auditory and visual learning styles and diverse backgrounds.

Landscape evolution provides a convenient framework for understanding geologic time and rates because students can observe how processes like erosion and deposition shape their surroundings, even in urban settings. In order to describe landscapes qualitatively and quantitatively, students build 3-D sandbox models based on topographic maps and design and stage a "virtual adventure race." Sandbox landscapes are used to illustrate erosional processes, the role of water in sediment transport, relief change, and how erosion exhumes rocks from depth, while local examples are used to discuss landscapes as transient or steady over different time- and length scales. To convince students that the observed processes act over millions of years to shape Earth's surface, quantitative dating tools are introduced. Dice experiments illustrate radioactive decay and the shape of the age equation curve, and ^{14}C dating, geochronology and thermochronology are introduced as "stopwatches" that start when a plant dies, a crystal forms, or a rock nears the surface and cools to a certain temperature.

The sandbox model and thermochronometer "stopwatches" are combined to measure erosion rates at a point, uniform and spatially variable erosion, and rates of landscape change. Ultimately, model rates (cm/hour) calculated from stopwatch times on the order of seconds can be related to geologic rates (km/My) calculated from real million-year-old samples.

Key Words: geoscience education, landscape evolution, laboratory exercises, grades 9-16, thermochronology

Presentation Format: Poster

Discipline Categories: Geoscience Education, Geomorphology