

***The Importance of Tangible Teaching in Earth Sciences: A Need  
for Changes in Existing Curricula***

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## Abstract

Existing K-8 Earth Science curricula often require a middle school level understanding. Fourth grade students are able to grasp complex earth science concepts with tangible evidence. Given the complex, abstract modeling activities needed to comprehend geosciences, what is the most effective way to teach and understand these complexities? What should teachers do with curricula that do not provide enough tangible evidence?

Teaching geosciences must not only mirror the language distinction between fifth grade students' ability to *know* and *describe* and eighth grade students' ability to *identify* and *explain* geological processes, but must also be enhanced with tangible evidence. Only then will it become increasingly clear that changes on the earth's surface can be slow and gradual (such as weathering and erosion, glaciers, etc.) or sudden and catastrophic (such as earthquakes, tsunami, etc.). Curricula units must be designed to develop interest in subjects that many students do not have access to and/or receive on a regular basis with real-life evidence. Emphasis on inquiry based curricula, increased hands-on experiences, and student accessibility to tangible evidence coupled with science standards that reflect such an emphasis make teaching and learning more accessible to a greater audience.

From the results of this study I recommend the following five actions to integrate tangible evidence into earth science curricula and challenge students to grapple with complex geoscience modeling. First, teachers must seek tangible examples and/or outcrops in the surrounding environment (including the urban environment). Further, teachers must advocate classroom excursions to such locations on a regular basis to supplement classroom learning; school administrators must provide such opportunities and recognize the importance of tangible evidence in the classroom (and should be encouraged to provide additional classroom help on a regular basis). Second, teachers must adapt curricula as needed to increase student understanding, especially as it pertains to local understanding of the immediate environment. Third, collaborated field trips between differing classroom teachers provide myriad opportunities to combine learning targets. Fourth, in the absence of immediate exposure to outcrops schools can construct an artificial outcrop from existing rocks in situ and/or external sources and fabricate an artificial rock outcrop where physical field trips to naturally occurring exposures are difficult to access. Lastly, integration of technology suggested by the Apple Education iLife Project provides myriad opportunities of student assessment as well as their own creativity to exceed expectations.