Integrating Web GIS in Earth Science Curriculum to Investigate Tectonics

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Environmental Literacy and Inquiry
http://www.ei.lehigh.edu/eli

DR K-12 Award 1118677

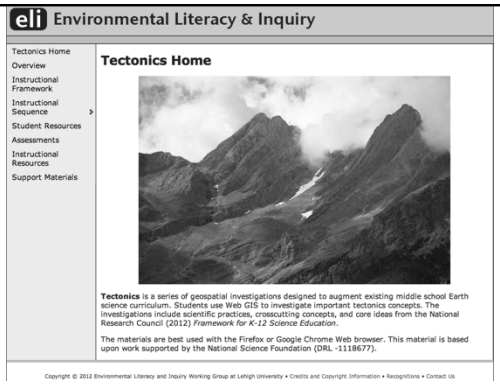
Project Features

- Tectonics investigations for curriculum enhancement
- Javascript Web GIS to be platform independent (i.e. tablets, laptops, cellphones)
- Interface design and customized data display
- Visualizations and tool features designed to enable spatial thinking
- Content and pedagogical supports for teachers to implement geospatial learning investigations

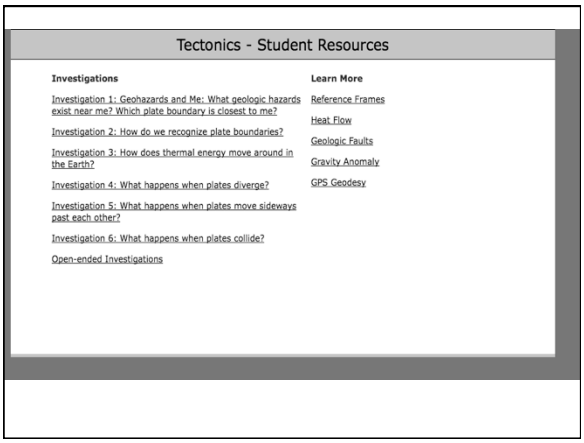
NGSS Disciplinary Core Ideas (Achieve, Inc., 2013) MS-ESS2 Earth's Systems; MS-ESS3 Earth and Human Activity	K-12 Framework Core Ideas (NRC, 2011)
• Construct an explanation based on evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales. • Analyze and interpret data on the distribution of fossils and rocks, continental shapes, and seafloor structures to provide evidence of the past plate motions. • Analyze and interpret data on natural hazards to forecast future catastrophic events and inform the development of technologies to mitigate their effects. • Construct a scientific explanation based on evidence for how the uneven distributions of Earth's mineral, energy, and groundwater resources are the result of past and current geoscience processes. Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment. • Ask questions to clarify evidence of the factors that have caused the rise in global temperatures over the past century.	**ESS1.C: The History of Planet Earth** **ESS2.A: Earth's Materials and Systems** **ESS2.B: Plate Tectonics and Large-Scale System Interactions** **ESS3.A: Natural Resources** **ESS3.B: Natural Hazards** **ESS3.C: Human Impacts on Earth Systems** **ESS3.D: Global Climate Change**

Research-based Curriculum

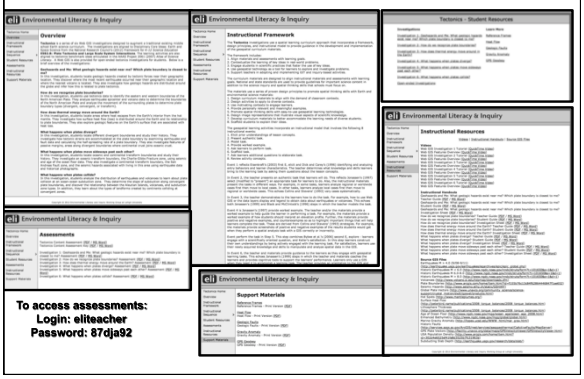
- Pilot testing and field testing in an urban school district (2 schools, 4 teachers,12 classrooms)
- Tectonics content knowledge measures
- Spatial thinking and reasoning measures
- Teacher implementation practice to assess fidelity of implementation and curriculum enactment—adherence to geospatial learning design model
- Classroom observations
- Post-implementation survey to assess pedagogical effectiveness of the educative curriculum materials



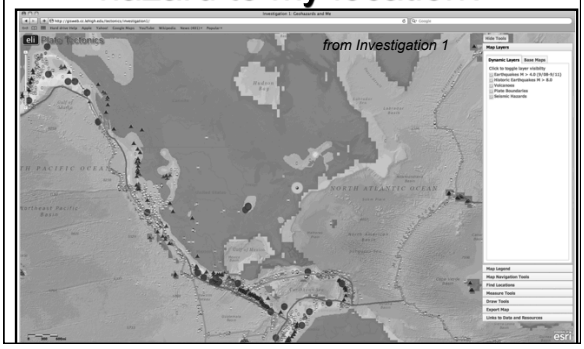
http:www.ei.lehigh.edu/eli/tectonics



Menus



Where's the nearest hazard to my location?



Where's the nearest hazard to my location?

How do we recognize plate boundaries?

How does thermal energy move around in the Earth?

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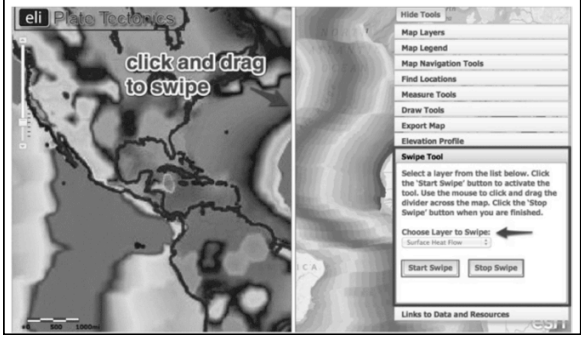
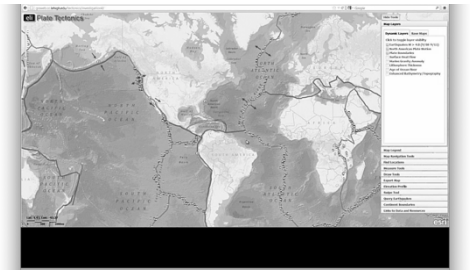
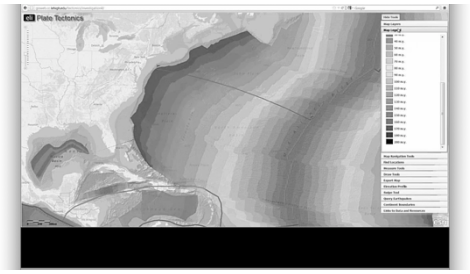


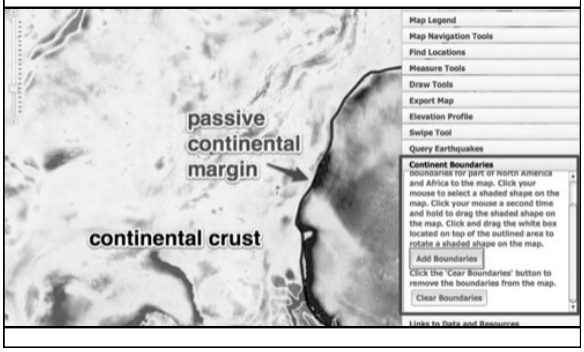
What happens when plates diverge?



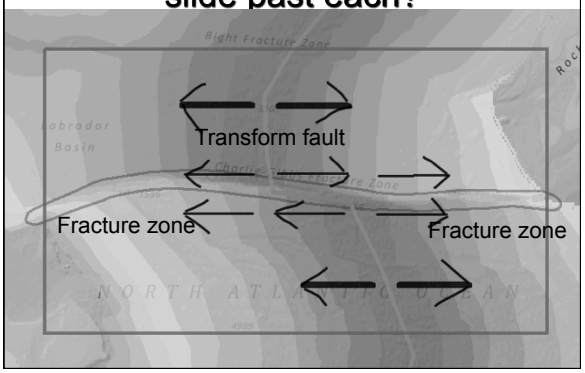
Half Spreading Rate



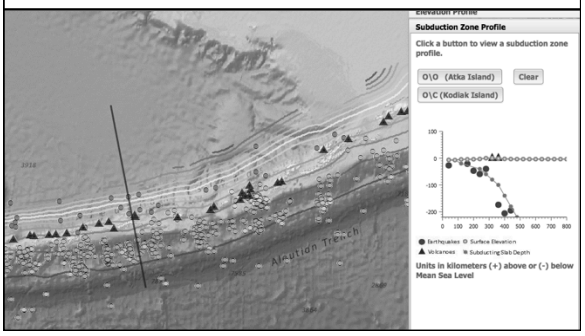
Continental Boundaries



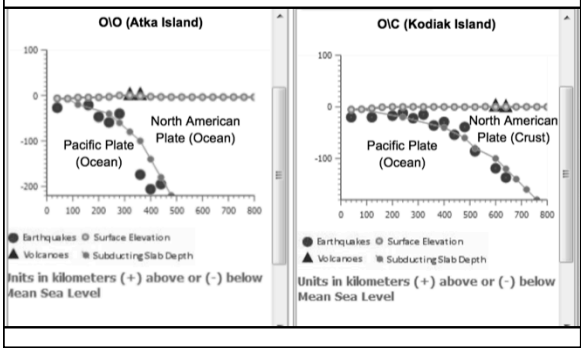
What happens when plates slide past each?



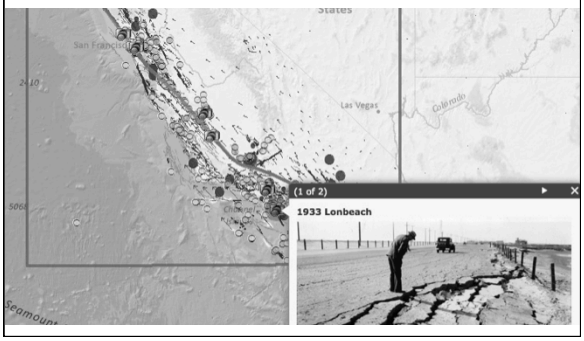
What happened when plates converge?



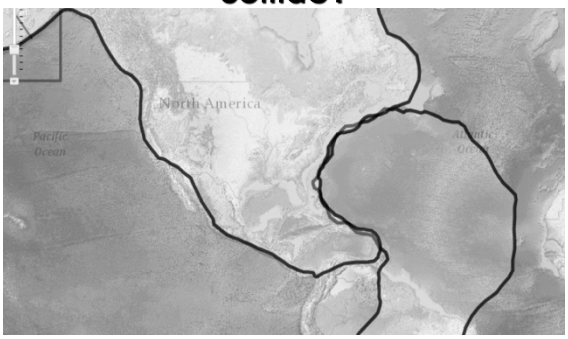
Subduction zone profiles



Investigating the San Andreas Fault Zone



What happens when plates collide?



Results

- **Significant student learning gains Tectonics content and geospatial thinking and reasoning skills**
- **High student engagement**
- **Ease of use for urban middle school teachers and students**
- **Well developed teacher support materials**
- **High fidelity of implementation in classrooms**

Questions or Comments?

http://www.ei.lehigh.edu/eli/tectonics

To access assessments:
Login: eliteacher
Password: 87dja92