A Model of Plate Faults

Lesson Concept Movement at plate boundaries produces different types of faults: normal, reverse/thrust, and strike-slip.

Link Forces in the Earth (tension, compression, shearing) from lesson 6.2 cause stress at plate boundaries. Lesson 6.3 using a fault model to demonstrate different types of faults. Fault models link to how rock layers can indicate the type of fault in lesson 6.4.

Time 100 minutes (two to three class periods)

Materials

Whole Class

Dynamic Planet Map USGS

Individual

H1 Fault Model

Crayons or colored pencils

Scissors

Tape or glue

Metric ruler

Notebooks

Advance Preparation

1. Duplicate handout for model H1 (Fault Model) on card stock.
   Optional: Make a large classroom model faults with students.

Engage ***(10 minutes) Fault types are associated with specific types of stress and plate movements.***

Procedure:

1. Ask students to think pair share: What do you know about faults? Where are faults found? Share ideas and chart on K-W-L chart.
2. Ask partners to discuss the following questions: What kind of fault is the San Andreas Fault? Why might people say that California is likely to "fall off into the Pacific Ocean"? What kind of faults would you expect to find in the Himalaya Mountains? What kind of faults would you expect to find along the Mid-Atlantic Ridge? Chart responses on K-W-L.
3. Explain that faults are often (but not always) found near plate boundaries and that three different types of faults are associated with specific types of plate movements.

Explore I ***(20 minutes) Normal faults are associated with divergent (tensional) boundaries.***

Teacher Note: While normal faults are associated with divergent (tensional) boundaries, you can probably find all types of fault movement associated with each type of plate boundary. Thrust faults are often associated with convergent (compressional) boundaries. Strike-slip faults are often associated with transform (sliding) boundaries. The box model represents all faults and the teacher may wish to make a large demonstration model of the box.

4. Ask students to construct a fault model using the **H1 (Fault Model).** Instructions to students: Ask students to color the model according to the color key provided.
5. Demonstrate how to cut and assemble the fault model. Fold each side down to form a box with the drawn features on top. Tape or glue the corners together. This box is a three-dimensional model of the top layers of the Earth's crust.
6. Lead a discussion using the following questions: What does the top of the model represent? How is the top like the surface of the earth? What do the sides represent?
7. Ask students to discuss with a partner what might the dashed lines might represent? Share out.
8. Ask students to cut along the dashed lines. What do the two sides represent?
9. Ask students to observe the model from the side (cross-section) and locate points A and B. Ask students to move point A so it is next to Point B. Discuss the changes on the top view with your partner. This movement is called a “normal” fault.
10. Ask students to discuss with a partner how the model of the side view and top view represents a normal fault.
11. Ask students to use their notebooks and draw the side view and the top view of the model of a normal fault. Describe the movement of a normal fault in your own words.

Explain I ***(10 minutes) Sections of the crust move apart, rocks are stretched until they snap, causing one rock to move down along a sloping crack.***

12. Lead a class discussion including these questions: Which way did point B move relative to point A? What happened to rock layers X, Y and Z? Are the rock layers still continuous? What likely happened to the river? The road? The railroad tracks?
13. What kind of pressure caused this fault? Think about the clay models we made. Discuss with a partner whether it was tension, compression or shearing? How do you know?
14. Ask partners to discuss what makes a “normal fault”? Ask students to label drawing of the normal fault done in step 8.

15. Ask students to explain in their notebooks how they know movement is a normal fault.

Explore II ***(10 minutes) Thrust/Reverse faults are often associated with convergent (compressional) boundaries***

16. Ask students to develop a model of a thrust fault. Ask students to locate points C and D on your model. Move point C next to point D. Observe the cross-section of your model. Discuss with a partner how is this different from the normal fault?
17. Ask students use their notebooks to draw the thrust fault as represented by the model they have just moved.

Explain II ***(10 minutes) Rocks are compressed as they come together, causing one block to move up along a sloping crack as the other moves down.***

18. Lead a class discussion including these questions: Which way did point B move relative to point A? What happened to rock layer5s X, Y and Z? Are the rock layers still continuous? Ask partner students to discuss: What likely happened to the river? The road? The railroad tracks?
19. What kind of pressure caused this fault? How is it different or the same as the "normal" fault? Discuss with a partner whether it was tension, compression or shearing? How do you know?
20. Ask partners to discuss what makes a "thrust fault"? Ask students to label drawing of the thrust fault done in step 17.
21. Ask students to explain how they know movement is a thrust fault and it is same and different from a normal fault movement.
22. Explain an example of a thrust fault is the fault in which the Northridge earthquake occurred. The thrusting movement raised the mountains in the area by as much as 70 cm. Ask students to demonstrate how high the mountains raised.

Explore III ***(10 minutes) Strike-Slip faults are often associated with transform (shearing) boundaries***

23. Ask students to show a model of a strike-slip fault. Locate points F and G on your model. Move the pieces of the model so that point F is next to point G.
24. Ask students to use their notebooks to draw an overhead view of the surface and a side view as it looks after movement along the fault.

Explain III ***(10 minutes) Rocks grind against each other as they move horizontally past each other in opposite directions. Pressure builds up along the fault until the rock breaks.***

25. Lead a class discussion including these questions: If you were standing at point F and looking across the fault, which way did the block on the opposite side move? What happened to rock layers X, Y and Z? Are the rock layers still continuous? What likely happened to the river? The road? The railroad tracks?
26. What kind of pressure caused this fault? Discuss with a partner whether it was tension, compression or shearing? How do you know?
27. Ask partners to discuss what makes a "strike-slip fault"? Ask students to label drawing of the strike-slip fault done in step 24.
28. Ask students to explain how they know movement is a strike-slip fault.
29. Ask students if the strike-slip movement can go either left or right? Explain a strike-slip fault can be described as having right or left-lateral movement. If you look directly across the fault, the direction that the opposite side moved defines whether the movement is left-lateral or right-lateral. Ask students to practice a right or left lateral movement with models.
30. Display a map of the San Andreas Fault in California. Ask students to discuss with a partner whether the fault is a right-lateral or left lateral fault. How do you know?

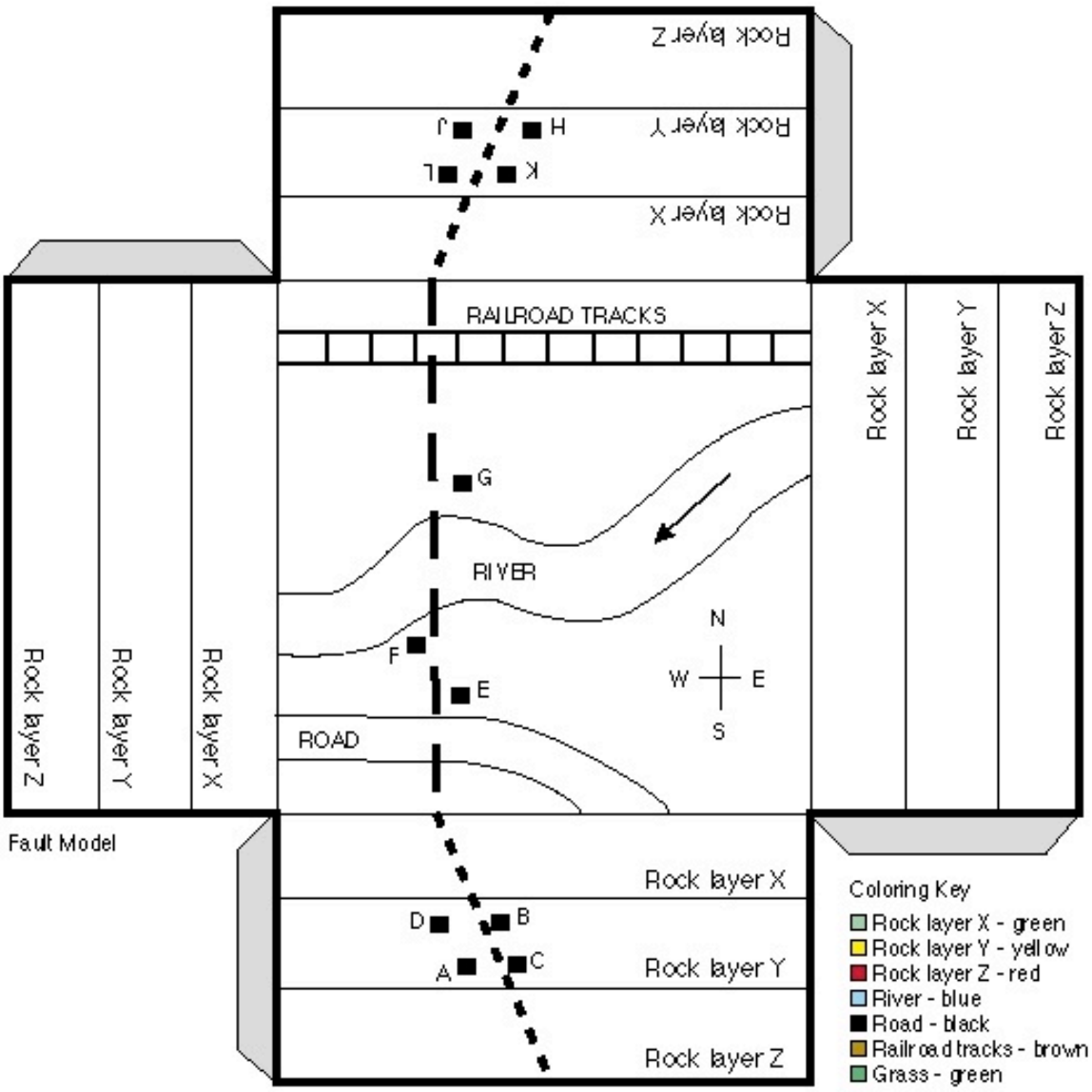
Extend ***(10 minutes) Maps/models are representations of Earth or a region of Earth. A map's scale is a ratio for comparing distances on the map to distances in the real world.***

31. If the scale used in this model is 1 mm = 2 m, how many meters did the earth move when the strike-slip fault caused point F to move alongside point G? Ask partners to measure their models to determine how many meters the Earth moved. Discuss how you know.

Evaluate ***(10 minutes) Movement at plate boundaries produces different types of faults: normal, reverse/thrust, and strike-slip.***

32. Ask students to use their fault model and explain the three types of faults to their partners.
33. Ask students to write an exit slip that explains what you know for sure about the three types of faults and what you are not sure about.

Teacher Note: Briefly review exit slips to determine areas of confusion for the next lesson(s).


Rock layer Z
Rock layer Y
Rock layer X
H
J
K
L
RAILROAD TRACKS
Rock layer X
Rock layer Y
Rock layer Z
G
RIVER
F
E
ROAD
N
W
E
S
Rock layer Z
Rock layer Y
Rock layer X
Fault Model
Rock layer X
Rock layer Y
Rock layer Z
D
B
A
C
Coloring Key
Rock layer X - green
Rock layer Y - yellow
Rock layer Z - red
River - blue
Road - black
Railroad tracks - brown
Grass - green