Bend it or Break it!

Credits: Elizabeth Gall & Laura Moribe, University of Tennessee Extension

Skill Level

5th grade

Learner Outcomes

Youth will be able to define folds and faults as they occur in the Earth's crust.

Youth will be able to identify two landforms and/or events that occur from folding or faulting.

Education Standard(s)

CCSS.ELA-Literacy.SL.5.1.C

CCSS.ELA-Literacy.SL.5.4

GLE 0507.7.1

Success Indicator

Model the scientific process of folding and faulting.

Communicate results about folding and faulting activity to classmates.

Life Skill(s)

Teamwork

Communication

Tags

STEM, science, geology, faults, folds

Time Needed

35 minutes

Materials (per group)

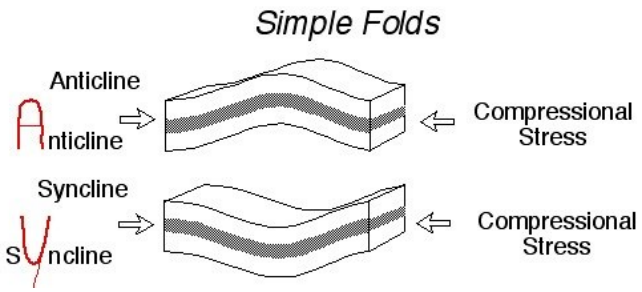
- 4 different colors of play dough or clay
- 2 pine boards (8" x 4" x 1"), corrugated cardboard or plastic
- Ruler

Background

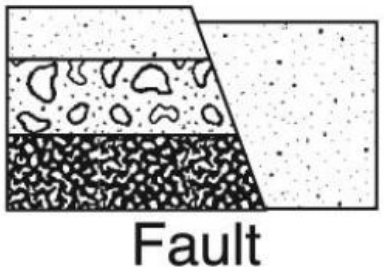
Note: Background information is provided here; facilitators do not distribute to the learners. It can be discussed briefly after youth have completed the experience.

The Earth's surface is composed of tectonic plates that are constantly moving. As the plates move relative to one another, they experience different types of forces. One kind of force is referred to as tension. Tension occurs when the plates are pulled apart causing either an elongation or a breakage in the crust. Tension forces can cause volcanic islands or mid-oceanic ridges to form. Another kind of force is referred to as compression. Compression occurs when the plates are pushed toward each other causing them to crash. Compression forces can cause mountains to form or earthquakes to occur depending on how the Earth's crust reacts to the force.

When the Earth's crust is pushed together via compression forces, it can experience geological processes called folding and faulting. Folding occurs when the Earth's crust bends away from a flat surface. A bend upward results in an anticline and a bend downward results in a syncline. However, the exact behavior of the material is dependent upon the type of material itself.



Source: University of Georgia



Source: Kansas 4-H

Faulting happens when the Earth's crust completely breaks and slides past each other. Whether the Earth's crust experiences a fold or fault will depend on the material it is made out of in that area. A fold is more likely to happen with flexible material and it is what causes mountains to form, whereas a fault will happen with more brittle material and is what causes earthquakes to occur.

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Introduction and Opening Questions

What happens when you squeeze together flexible material like plastic or a sponge? What happens when you pull a sponge apart? Now think of what happens when you squeeze together brittle material like glass or eggs—do they bend or do they break?

Experience *(use the Experiential Learning Model and encourage critical thinking and the use of science abilities and skills)*

Preparation:

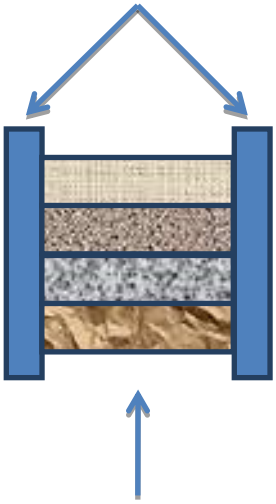
- ◊ Explain to youth that they will be learning about **folds** and **faults** and give them a very brief definition/ description of each (for example, a fault is when part of the earth's crust breaks due to pressure and a fold is when the earth's crust folds upwards or downwards due to pressure).
- ◊ Explain to youth that they will be learning about these structures by constructing **models**. Facilitator should mention that 1) a model is used to represent a real-life structure on a smaller scale, and 2) models are beneficial because they help explain what we observe and allow us to predict what may happen.

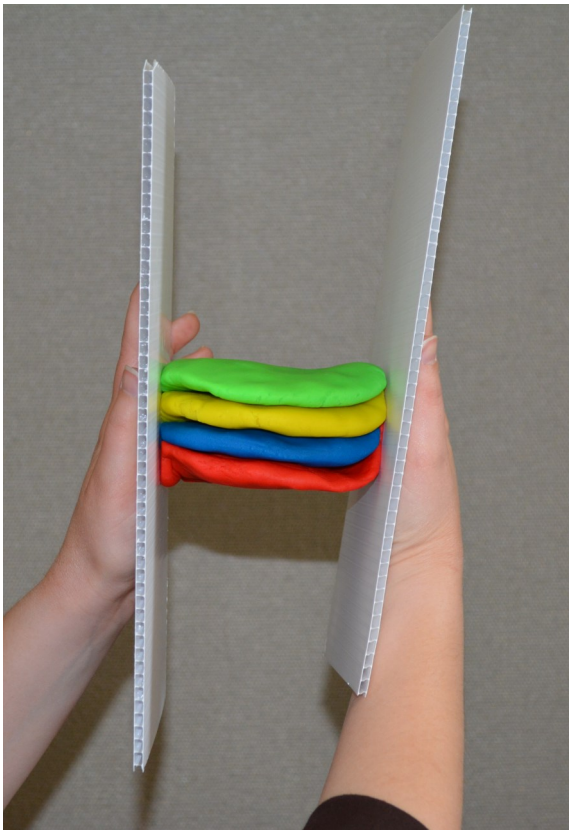
Activity:

1) Divide youth into groups of three or four.
2) Hand each group a ruler, four different colors of play dough or clay, and two pine boards.
3) Instruct each group to roll out the different colors of clay into 6" by 6" flat layers that are 1/2-1" thick, depending on materials used. *(Facilitator should demonstrate what the flat layers will look like once they are flattened.)*
4) Have each group stack the different-colored layers on top of each other on a flat surface *(the different-colored layers represent rock layers)*.
5) Then have each group place their layered block of play dough or clay between their two vertical pine boards (as indicated by the pictures on page 3) and have them slowly squeeze the layered block of play dough or clay by pushing the two pine boards together from the sides. *(In this step, youth are modeling compression which occurs when Earth's crust is squeezed together.)*
6) Ask youth to STOP squeezing when they have pushed their layered play dough or clay about 1 inch on each side.

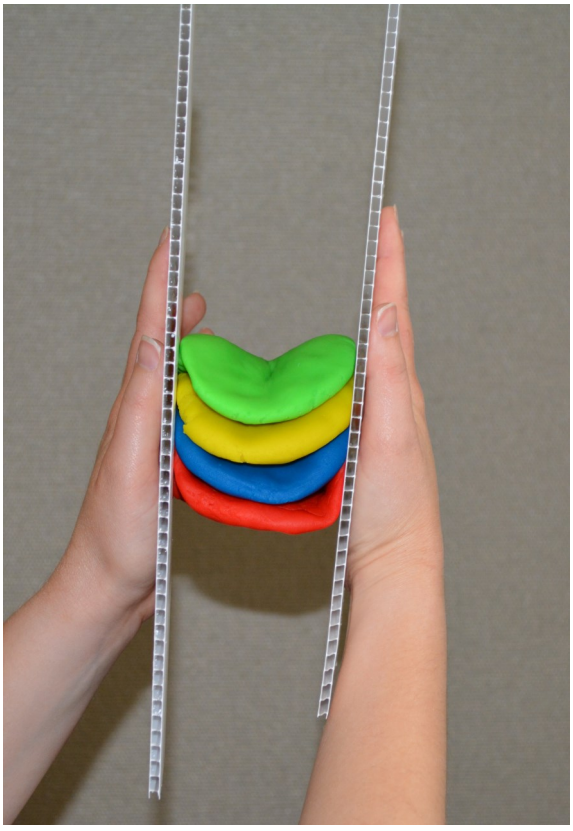
Experience (Continued)

7) Have youth record on the Student Handout (Question #1) what their layered play dough or clay looks like now that they have squeezed it together. *(Results will vary among groups but each group should either get a syncline [bend downwards] or anticline [bend upwards].)*
8) Now ask youth to think of real-life formations that form due to compression forces. *(For example, mountains and valleys could form due to compression forces.)*
9) Have youth flatten out their block of play dough or clay back to its original form.
10) Instead of squeezing the layered block of play dough or clay have the youth pull on the sides with their hands. *(In this step, students are modeling tension which occurs when Earth's crust is pulled apart.)*
11) Ask students to think of real-life formations that occur as a result of tension forces.
12) Have youth record what happened when they pulled the layered block apart.
13) Have youth complete Questions #2-4 on the Student Handout.
14) When everyone is finished, have groups share their results and conclusions with the class by working through the Talk it Over section.





Before Compression



After Compression

Talk It Over...

Share…

1) What happened when you squeezed the play dough or clay together?
2) What happened when you pulled the play dough or clay apart?
3) What is one advantage of using a model?

Process…

1) What is the difference between compression and tension forces?
2) How do folds and faults form?
3) How did a model help explain the different forces that the Earth's crust experiences?

Generalize…

1) Can you think of a landform you have visited or seen that has formed as a result of a fold occurring in the Earth's crust?
2) What are other ways you have used models to understand a scientific concept?

Apply…

1) How can your knowledge of compression/ tension forces and folds/faults help you safely handle flexible/brittle materials in the future?
2) In what ways can a model help predict whether folds or faults may occur in the future?

Term and Concept Discovery

Model—a smaller 3 dimensional representation of a real life structure
Compression—a force that squeezes objects together
Tension—a force that pulls objects apart
Folds—any bend away from a flat surface
Faults—a break in the rock layer forming the Earth's crust, where the two pieces slide past one another

Appendix

Term and Concept Discovery (cont.)-

Syncline– a bend downward in the Earth's crust due to compression forces

Anticline- a bend upward in the Earth's crust due to compression forces

Standards:

CCSS.ELA-Literacy.SL.5.1.C—Pose and respond to specific questions by making comments that contribute to the discussion and elaborate on the remarks of others.

CCSS.ELA-Literacy.SL.5.4—Report on a topic or text or present an opinion, sequencing ideas logically and using appropriate facts and relevant, descriptive details to support main ideas or themes; speak clearly at an understandable pace.

GLE 0507.7.1—Compare geologic events responsible for the earth's major geological features.

Resources:

Adapted from: Dymacek, B. & DeGood, A. (no date). *Kansas 4-H Geology Notebook: The Earth's Changing Looks.* Retrieved from: http://www.kansas4-h.org/p.aspx?tabid=558

Bend it or Break it!

Student Handout

Name: _____

1) What happened when you squeezed the layered play dough or clay together? (You may write out or draw your results in the space below.)

2) What are some examples of landforms that could results from compression forces?

3) What happened when you pulled the layered play dough or clay apart? (You may write out or draw your results in the space below.)

4) What could tension forces produce on the surface of the planet?