Learning Objective: Seafloor Spreading and Subduction

NGSS Standard: MS-ESS2.B Maps of ancient land and water patterns, based on investigations of rocks and fossils, make clear how Earth's plates have moved great distances, collided, and spread apart.

Objective:
Students will be able to:

1. Demonstrate that movement of the seafloor causes it to continually change.
2. Explain that seafloor movement is a cyclical process.
3. Understand the basic structure and composition of the seafloor.
4. Explain the relationship between seafloor age and position relative to a midocean ridge.

Time Required: 85 minutes

Materials Needed:

- Teacher computer with internet access
- Projector/Smartboard
- 1 computer/laptop/iPad per student with internet access
- 4 student desks
- 12 feet of bulletin board paper
- Seafloor Structure handout (attached)

Teacher Preparation:

- Create Playlist 1, a 40 minute playlist in Legends of Learning with the following games found in the Seafloor Spreading and Subduction learning objective:
  - *Seafloor Explorer 9*
  - *Seafloor Adventure*
- Create Playlist 2, a 10 minute playlist in Legends of Learning with 5 assessment questions from the Seafloor Spreading and Subduction learning objective
- Setup the Engage portion of the lesson before class arrives.
  - Cut the bulletin board paper into two 6 foot pieces
  - Line the four desks up in a row.
  - Place each sheet between the middle of the center two desks (example)
    - Have only a few inches of the paper showing when the class enters.

Engage (10 minutes):

1. Demonstrate basic seafloor spreading with the class using the bulletin board paper and desk setup.
2. Explain to the students what they see here is a model of the seafloor and what takes place at a mid ocean ridge.
3. Have two students slowly pull the paper away from one another (example)
4. Ask: What does the paper represent? Where do you think it is coming from?
   a. *New crust (seafloor) creation. It is coming from a volcano that is creating lava that hardens into the sea floor.*

5. When the students have pulled enough paper to reach the outer desks, have them pull the paper between the outer desk and the inner desk.
6. Ask: What is happening to the seafloor? Where do you think it is going?
    a. *It is sinking back in (subduction). The crust returns to mantle.*
7. Explain to students that this is a very slow process. Today they will be learning about the structure of the seafloor and the cyclical nature of its creation.

Explore (40 minutes):

1. Have your students sign in to Legends of Learning and enter your teacher code.
2. Launch Playlist 1 to your students.
3. As students complete *Seafloor Adventure 9*, students should fill out the Seafloor Structure handout. Students will be completing the first side of the handout with this game.
4. Assist students as needed during game play, pause playlist if you need to address content or questions to entire class.
5. Students will then move onto the second game *Seafloor Adventure*. As students play the game they should complete the Seafloor Creation and Destruction handout.
6. Assist students as needed during game play, pause playlist if you need to address content or questions to entire class.

Explain (20 minutes):

1. Review answers to the Seafloor Structure handout by filling in the diagrams on board or using Smartboard.
    a. Explain that seafloor spreading and movement is a cyclical process because it is constantly being created and destroyed. Refer back to the demonstration that you performed during the Engage portion of the lesson to demonstrate this.
2. Next, review the Seafloor Creation and Destruction handout by drawing the diagrams on the board/Smartboard.
    a. Explain that these are the specific ways that the seafloor is created or destroyed. Refer back to the demonstration that you performed during the Engage portion of the lesson to demonstrate this. Point out the specific points of creation and destruction and that they are called subduction (at the trench) and the mid-ocean ridge.
    b. Ask students to predict where old crust and new crust can be found on these diagrams. Have students label these areas on their diagrams.

Elaborate (5 minutes):

1. Explain to the students that the idea of seafloor spreading is a relatively new idea and wasn't discovered until the 1940's.
2. Show students the video clip: https://www.youtube.com/watch?v=GyMLlLxbfa4
3. Ask: What technologies did scientist use to discover seafloor spreading?
    a. *Sonar (depth sounder), core samples,*
4. Ask: How high is the mid-ocean ridge compared to the rest of the ocean floor?
    a. *"Mountains" with deep caves and trenches. Extremely high peaks that were once active volcanoes.*
5. Ask: What types of scientist help discover seafloor spreading and did they discover it

during a science experiment?

a. *Geologist. Discovered during the war.*

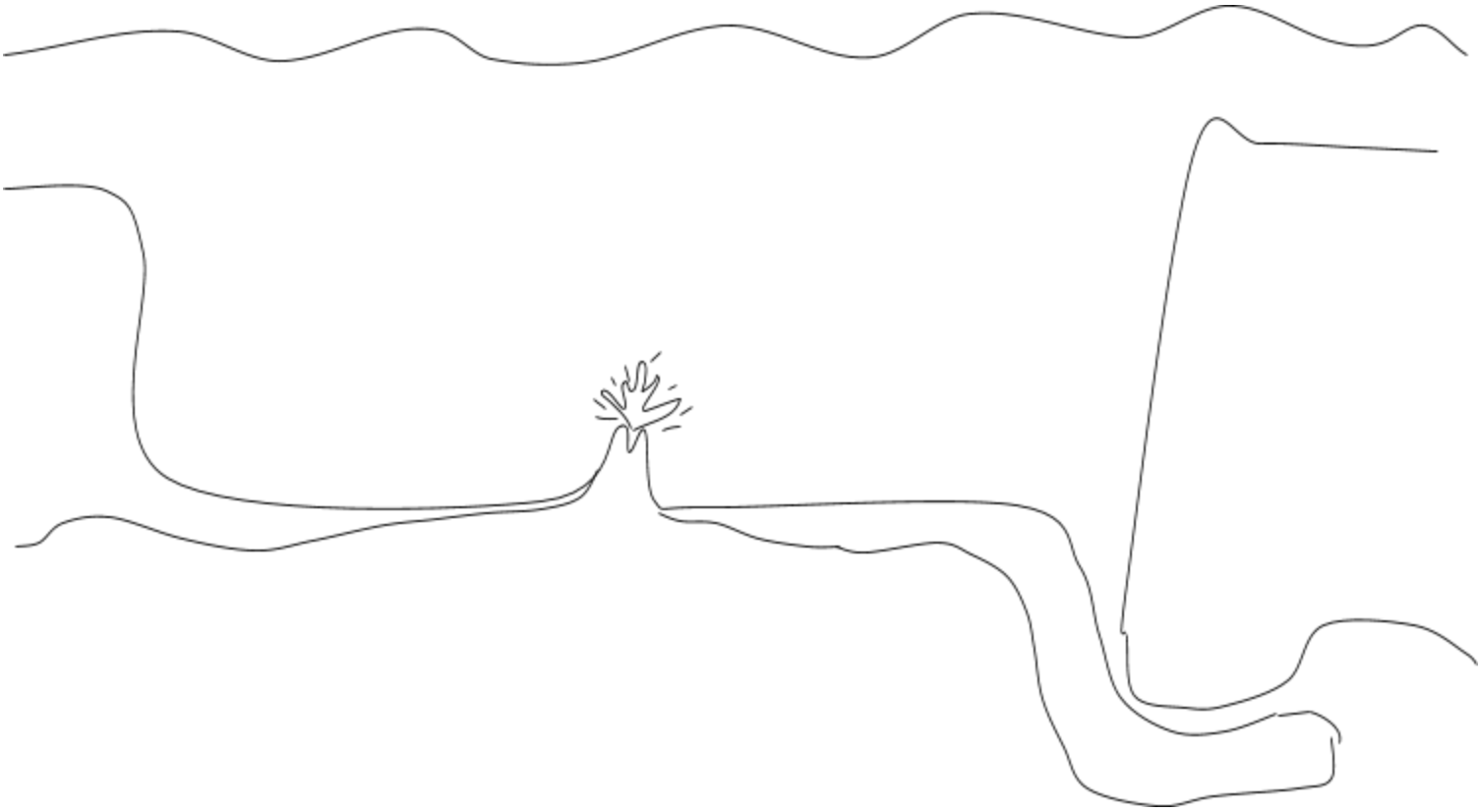
Evaluate (10 minutes):

1. Launch Playlist 2 to your students. When they finish the assessment questions, any time left is freeplay.
2. Analyze student results to determine what concepts need to be a focus for reteaching.

Seafloor Structure Name / Pd: _____

Directions: While playing the first game in Legends of Learning called *Seafloor Spreading 9*, fill in the diagram below.

Label the following:
abyssal plane, mid ocean ridge, volcano, younger seafloor crust (2 spots), older seafloor crust (2 spots), tectonic plates, use arrows to indicate the direction the plates are moving (3 total), trench, subduction.

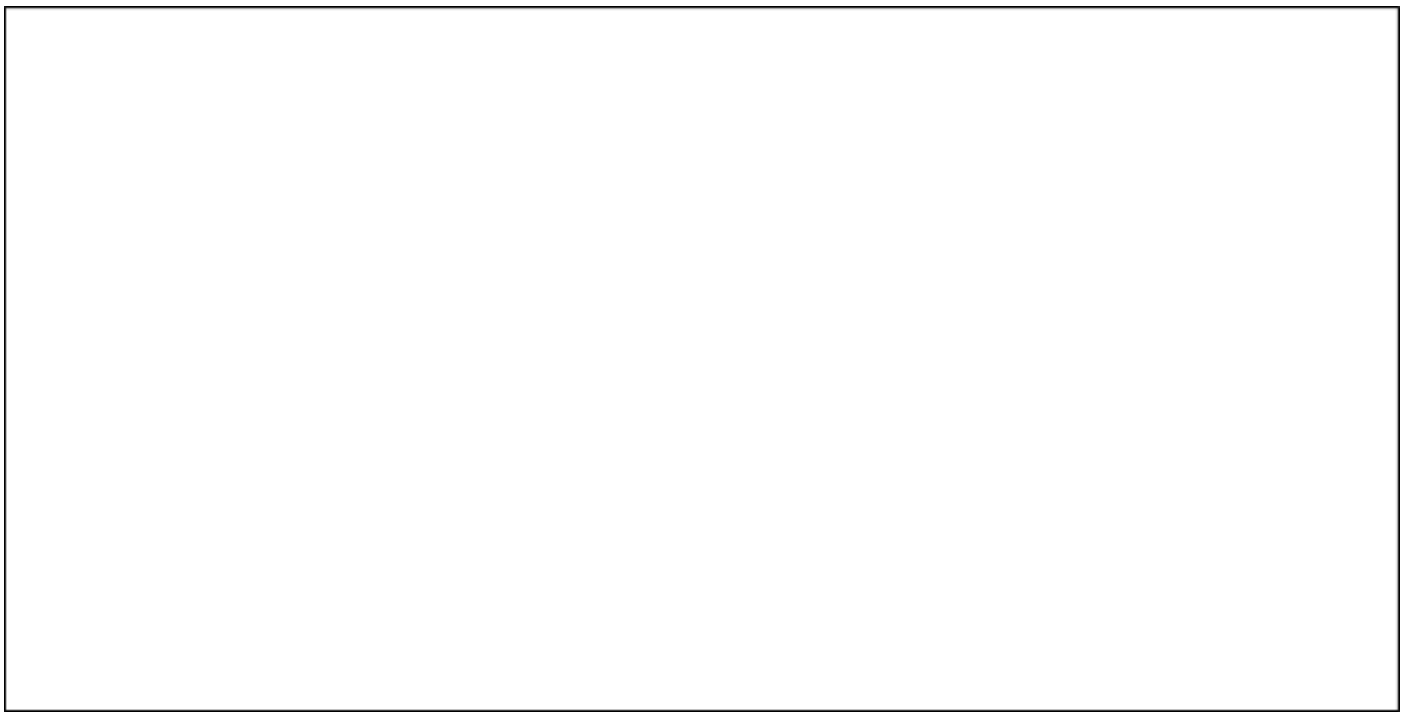


1. Starting with the midocean ridge; explain how the formation and destruction of the seafloor is a cyclical process.

Seafloor Creation & Destruction Name / Pd: _____

Directions: While playing the first game in Legends of Learning called *Seafloor Adventure*, fill in the diagrams below.

New Seafloor Creation



Old Seafloor Destruction