

WEGENER'S PUZZLING CONTINENTAL DRIFT EVIDENCE – 6TH GRADE

Overview

Although Alfred Wegener was not the first to suggest that continents have moved about the Earth, his presentation of carefully compiled evidence for continental drift inspired decades of scientific debate. Wegener's evidence, in concert with compelling evidence provided by post World War II technology, eventually led to universal acceptance of the theory of Plate Tectonics in the scientific community

Objectives

- Students will observe and analyze scientific evidence used by Wegener.
- Students will read and interpret maps and map symbols.
- Students will use the evidence to try to reconstruct the continents.
- Students will interpret the evidence to formulate a hypothesis.
- Students will defend their position on continental drift.

To start this activity the teacher will present background information on Wegener. Students will then be placed into groups of 2 to 3 and work to piece together continent cut-outs using this evidence. As students fit the continents together they find that isolated pieces of geologic information are no longer isolated. Groups describe what they have found, and must defend their conclusion by explaining how the evidence supports or refutes continental drift. [Materials available online at <http://volcanoes.usgs.gov/about/edu/dynamicplanet>]

Time frame

1-2 class periods. Time frame can vary according to how much work is done in class and how much is done as outside assignments.

National standards references

The National Science Standards:

- UC&P - Unifying Concepts and Processes
- A2 - Understandings about scientific inquiry
- D1 - Structure of the Earth system
- G3 - History of science

The National Geography Standards:

- STANDARD 1: How to use maps and other geographic representations, tools, and technologies to acquire, process, and report information.
- STANDARD 3: How to analyze the spatial organization of people, places, and environments on Earth's surface.
- STANDARD 17: How to apply geography to interpret the past.

Links across the curriculum

Geography - reading and drawing maps

Social Studies - History of science researchers, climate/culture of scientific community at the time of the research

Language Arts - Writing persuasive essays, presentations

Materials

For teacher:

- Teacher Copy of Wegener's Key to Continental Positions (can made into an overhead)
- *This Dynamic Planet* map;

For each student group:

- Student Map of the World Today
- Key to Wegener's Evidence sheet
- Student Puzzle Pieces
- Crayons or markers
- Scissors
- Glue or tape
- Paper

Reference to *This Dynamic Earth* & *This Dynamic Planet*

pp. 1, 5, 8-13; Includes the present positions and the shapes of the continents on the map.
<http://pubs.usgs.gov/gip/dynamic/dynamic.html>

Content background for teachers

- Continents do NOT fit together smoothly! The important concept of this activity is that the evidence matches up.
- Background on Alfred Wegener can be found on pages 5, 9 -11 in *This Dynamic Earth*.

Teacher instructions for activity

Briefly present background on Wegener. Stress that although others had recognized the fit of Africa and South America, it was Wegener who gathered other scientific data to support his theory.

- Divide students into groups of two or three. These small groups allow students to discuss the significance of different lines of evidence as they piece together the continental puzzle.
- Each group is given a cut-out sheet containing fossil evidence (Student Puzzle Pieces), the Key to Wegener's Evidence sheet, the Student Map of the World Today reference sheet, crayons or markers, and a pair of scissors.
- Groups label the continents or land mass on each piece. The students then color each

U.S. Geological Survey's Wegener's Puzzling Continental Drift Evidence
<http://volcanoes.usgs.gov/about/edu/dynamicplanet/wegener>

fossil type and the Key to Wegener's Evidence sheet. Then cut out the land masses from the evidence sheets.

- Have the students arrange the puzzle pieces using the Key to Wegener's Evidence to support their arrangement.
- The final puzzle configuration should be attached to paper with glue or tape.
- When finished, each group will present and defend their reconstruction.
- You may compare the students' reconstructions with Wegener's Key to Continental Positions about 250 million years ago (Teacher Copy)

Hints for solving the puzzle

- Have the students look for all the pieces with the fossil remains of Cynognathus and then put them together (South America and Africa).
- Then look for fossils that extend beyond the plate boundary such as the fern *Glossopteris* and the land-dwelling reptile *Lystrosaurus*. Put all of the continents with *Glossopteris* and *Lystrosaurus* near each other. Notice how two of the continents (Africa and Antarctica) have the end regions of *Lystrosaurus*. *Lystrosaurus* is the key to solving the puzzle. What happens to the other continent (India) if you put Antarctica next to Africa? The students must place India next to Africa to complete the puzzle.
- You can also use the Puzzle Outline Hint as a base for the puzzles.

Teacher answer key

It is okay if students don't get the "correct" answer or the same solution Wegener proposed. There is much information missing from the picture. For example, ancient shorelines were not the same as they are today due to changes in sea level and the tectonic process (continents colliding and pulling apart, causing rocks to be added or torn off). Scientists still debate the fine details of paleogeographic (ancient geography) reconstruction. It is far more important to have students grasp the concept of how scientists look for clues, or evidence, and put the pieces together to solve a problem.

Students should understand that using the shape of the continents to fit them back together is using one type of evidence. Using the presence of the same rock types is another form of evidence, and the presence of the same type and age fossils is yet another. Ask students if they can think of other types of evidence to search for that might be useful in solving their puzzle.

See also illustrations on pages 1 and 8 of *This Dynamic Earth*.

Assessment suggestions

Students evaluate Wegener's hypothesis based on the evidence they observe.

- Student groups each write a 'position paper' on whether the evidence they researched is compelling and conclusive enough for scientific acceptance of the Theory of Continental Drift.
- Each group then presents their conclusion as they would at a professional scientific

meeting, explaining their research and how they came to this conclusion. Other students are encouraged to ask probing (but polite!) questions.

- For self assessment, the teacher may hand out the Wegener's Key to Continental Positions.

Extensions

Assign students to two groups, those who have determined that the evidence supports the theory of continental drift, and those who believe that the evidence does not support the theory. Have these two groups debate their positions. For an interesting twist, put students into groups opposite to their view.

Ask students to think about continental reconstructions older than 250 million years ago. What would be the difficulties in creating a paleogeographic reconstruction of the continents 1 billion years ago?

Additional resources

A good animation of plate movement over time can be found at www.scotese.com.