Forces of Change

Lesson Synopsis:
This lesson will introduce geographic terminology about the earth, the internal forces of plate tectonics, and the external forces of erosion and weathering and natural hazards.

TEKS:

3 Geography. Such as student understands how physical processes shape patterns in the physical environment (lithosphere, atmosphere, hydrosphere, and biosphere), including how Earth-Sun relationships affect physical processes and patterns on Earth’s surface. The student is expected to:

3B Describe physical environment of regions and the physical processes that affect these regions such as weather, tectonic forces, wave action, freezing and thawing, gravity, and soil-building processes.

4 Geography. The student understands the patterns and characteristics of major landforms, climates, and ecosystems of Earth and the interrelated processes that produce them. The student is expected to:

4B Relate the physical processes to the development of distinctive land forms; and

8 Geography. The student understands how people, places, and environments are connected and interdependent. The student is expected to:

8C Describe the impact of and analyze the reaction of the environment to abnormal and/or hazardous environmental conditions at different scales such as El Niño, floods, droughts, and hurricanes; and

19 Science, technology, and society. The student understands the impact of technology and human modifications on the physical environment. The student is expected to:

19B Analyze ways technological innovations have allowed humans to adapt to places shaped by physical processes such as floods, earthquakes, and hurricanes.

Process TEKS:

21 Social studies skills. The student applies critical-thinking skills to organize and use information acquired from a variety of sources including electronic technology. The student is expected to:

21A Use historical, geographic, and statistical information from a variety of sources such as databases, field interviews, media services, and questionnaires to answer geographic questions and infer geographic relationships;

22A Design and draw appropriate maps and other graphics such as sketch maps, diagrams, tables, and graphs to present geographic information including geographic features, geographic distributions, and geographic relationships;

22B Apply appropriate vocabulary, geographic models, generalizations, theories, and skills to present geographic information;

22C Use geographic terminology correctly;

GETTING READY FOR INSTRUCTION

Performance Indicator(s):
- Construct a diagram of a physical landform and give an oral presentation in order to show the internal and external forces that affect change in that landform. (3B; 4B; 8C;19B)

Key Understandings and Guiding Questions:
- Physical forces cause change in the Earth’s landscape over time which alter the human landscape and force adaptations and modifications to the environment.
  - What types of forces of change are present in the physical environment?
  - How do these forces affect human population?

Vocabulary of Instruction:
- Plate tectonics
- Subduction
- Sea-floor spreading
- Transformation
- Faulting
- Erosion
- Weathering
- Deposition
- Lithosphere
- Biosphere
- Hydrosphere
- Atmosphere
- Pangaea

Materials:
- Pictures of internal and external forces
- Diagnostics, animations, or videos of Plate Tectonics
- Large computer paper or construction paper

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• Map pencils and markers  
• Information on at least 10 landforms around the world

Resources:
- [http://www.geosociety.org/educate/LessonPlans/s_tecton.htm](http://www.geosociety.org/educate/LessonPlans/s_tecton.htm)  
- [http://www.classzone.com/books/earth_science/terc/navigation/visualization.cfm](http://www.classzone.com/books/earth_science/terc/navigation/visualization.cfm)  
- [http://www.learner.org/resources/series78.html](http://www.learner.org/resources/series78.html)  
- [www.usgs.gov](http://www.usgs.gov)  
- Handout: Landform Diagram Instructions  
- Handout: Forces of Change  
- Handout: Plate Tectonics  
- Handout: External Forces

Advance Preparation:
1. If technology is available, gather animations and diagrams from educational websites. Animations help students visualize the internal and external forces. Videos are also helpful. If technology is not available, find transparency overheads that use diagrams, or draw the diagrams yourself. You will need diagrams for the layers of the Earth, subduction, spreading, transformation. You will also need to make transparencies or graphic organizers for the board to display the information to students for Days 1 and 2 of this lesson.
2. Copy handouts.
3. Print off articles and other materials to give students information about their landform. It is important for students to have specific information about the processes that create and change their landform.

Background Information:
Changes in the Earth’s physical landscape are happening all the time around us. Whether the change is coming from internal forces or external forces, or whether it is a drastic change caused by tsunamis or the gradual change caused by erosion, change is constant and affects human settlement.

INSTRUCTIONAL PROCEDURES

<table>
<thead>
<tr>
<th>Instructional Procedures</th>
<th>Notes for Teacher</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ENGAGE</strong></td>
<td><strong>NOTE:</strong> 1 Day = 50 minutes</td>
</tr>
<tr>
<td>Show students pictures of earthquake aftermath, volcanic eruptions, flooding, weathering, etc. Ask the students what “force of change” are present in each picture.</td>
<td>Suggested time: ½ Day</td>
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<tr>
<td>Give students the “Forces of Change” K-W-L-H chart and ask them to write what they know about the forces that are listed on the chart. Also ask them to write what they would like to find out about those forces.</td>
<td>For 5-10 minutes, show pictures and maps that illustrate tectonic (internal) forces and erosion/weather (external) forces. The pictures are to stimulate the students’ thinking.</td>
</tr>
<tr>
<td>Create the “Forces of Change” chart on chart paper and have the students share what they know and want to know.</td>
<td>This is an excellent website for pictures and maps. <a href="http://www.usgs.gov">www.usgs.gov</a></td>
</tr>
<tr>
<td><strong>EXPLORE</strong></td>
<td><strong>Handout:</strong> Forces of Change</td>
</tr>
<tr>
<td>Before letting the students work on the diagram, check for understanding on Lithosphere, Atmosphere, Biosphere and Hydrosphere from the previous lesson.</td>
<td>Suggested time: ½ Day</td>
</tr>
<tr>
<td>Do you think that these forces effect human populations? Why or Why not?</td>
<td>A formative assessment idea could be a Four Corners activity. Have chart paper with the words Lithosphere,</td>
</tr>
</tbody>
</table>
Instructional Procedures

- Physical geography is really about how these four systems interact. Which of these systems is related to what we’ve discovered about weather and climate?"
- Have the students use their textbook to create a diagram of the Earth and have them label and color: Inner Core, Outer Core, Mantle, Crust, lithosphere, atmosphere, biosphere, and hydrosphere. Students should illustrate these terms using map pencils. The students should work on the diagram for the remainder of class and complete it as homework.
- How do you think all of these systems relate to forces of change?

EXPLAIN

- Instruct students to get out their Earth diagrams.
- Now we’re going to look primarily at the lithosphere and explore the different internal and external forces that shape the surface of the Earth. Then we’ll examine some of those shapes that occur and look at how they are formed and how they affect the physical geography of a place.
- Review that the inner core is very hot & solid, the outer core is extremely hot molten liquid, the mantle is a mix of liquid and solid, and the crust is the thin top layer of the Earth’s surface. Show a transparency or diagram as you review. Have the student use their diagrams as well, and quiz students as you go about the different layers.
- Who remembers learning about Pangaea? (Review that scientists believe that at one time there was one huge super continent – Pangaea – that broke apart and has separated into the current seven continents. There will be some who know more details than others – let them explain what they know. Make corrections as needed.)
- Introduce Plate Tectonics: This belief is known as the theory of what? (Continental drift). In fact, the whole surface of the Earth is believed to be on thirteen (or 14, depending on the classification system you use) moving plates, that fit together to form the surface of the Earth and are constantly shifting. This theory of continental drift is the basis for how scientists and geologists explain things like how mountains are formed, and this is the theory of plate tectonics. (Show a transparency or diagram of the plates if possible.)
- There are three basic kinds of movement along plate boundaries. Some plates push against each other, some plates push away from each other, and some plates slide alongside each other. Different types of landforms are formed by the different types of movement. Give the students the handout: Plate Tectonics and have them fill in the appropriate information about each type of movement.
- What happens after these landforms are created?" “Are there other forces that change the ways they look?"
- Give the students the handout: External Forces. Cover erosion, weathering and deposition. Be sure to emphasize that these forces are at work on the surface and generally causing gradual change (except during a flood or other natural hazard event).
Instructional Procedures

ELABORATE

- Post this question on the board: How do forces of change affect human populations. For example: "How does an earthquake affect people living in Southern California?"
- Pair up the students and have them generate a list of ways the forces of change affect human populations.
- Using a round robin technique have the students share their lists in order to create a master class list. Put the master list on chart paper or the board.
- Have the pairs look at the list that was created by the class and create a key understanding. Such as: Physical forces cause change in the Earth’s landscape over time which alter the human landscape and force adaptations and modifications to the environment.

EVALUATE

- Put students in groups of 2-3 and assign them a specific landform (ex: Andes Mountains). Give them the handout: Landform Diagram Instructions to follow.
- Provide the students access to articles or encyclopedias that will give them information about the location of the landform and forces that cause the landform/change the landform.
- Allow the students to work in groups for the remainder of the period creating an informational diagram about their landform. If they do not complete their diagram in class, the students will need to complete it at home.
- On Day Four, students will give a 3-5 minute presentation to the class on their landform. Students will need to name and locate their landform to the class and tell the class about the internal and external forces.
- For the last 10 to 15 minutes of class, allow students to complete the Forces of Change chart to further assess what they have learned.

Notes for Teacher

- boundary. (Please make sure to refer to the answer key)
- Have students complete the handout: External Forces during the discussion.
- Depending on the students’ background knowledge, plate tectonics (internal forces) and external forces may be covered in one day. However, if the students need more time, external forces can be covered on the third day.
- Suggested time: ½ day
- Round robin technique: Go around the class and ask each pair to contribute one of the items on their list. Do not allow students to repeat things that are already listed. Keep going around the room until all items are listed on the class list.

- Suggested time: 1 ½ day
- The diagrams do not need to be elaborate, but do need to be neat and include specific information about location, internal and external forces. The information on the diagram can be hand-written by a group member with neat handwriting. The student should draw an illustration of the landform, label it, and display the requested information on the diagram.

Handout: Landform Diagram Instructions

- Possible landforms: Rocky Mountains, San Andreas fault, Himalayas, Hawaii Islands, The Rift Valley, The Grand Canyon, The Appalachian Mountains, the Arches, Mt. Hood (or another volcano) Note: many of these landforms are in the U.S. so students should have some familiarity with them.

- A good site for information: www.usgs.gov. You can search the USGS for information about the landforms although sometimes the information is technical. Use the Landform Diagram Instructions to grade students’ diagrams and presentations.
Landform Diagram Instructions

What is your landform? _________________________________________
Where is it located? ____________________________________________
What internal forces are at work?
_____________________________________________________________________
_____________________________________________________________________
__________________________________________
What external forces are at work?
_____________________________________________________________________
_____________________________________________________________________
__________________________________________

Use this checklist to make your landform diagram:

____ 1. Draw a picture of your landform in the center of the diagram (15 pts).

____ 2. Label your landform with neat writing either above or below the picture (5 pts).

____ 3. Find the location of the landform and write the location below the name of the landform (5 pts).

____ 4. Find out what external and internal forces are involved in the creation and change of your landform. On the diagram, list and define those forces (25 pts).

____ 5. Neatness and accuracy (20 pts).

____ 6. Oral presentation- Be prepared to tell the class the name of your landform, where it is located, and the external and internal forces that affect your landform (15 pts).

____ 7. Group participation and cooperation (15 pts).

FOR TEACHER
TOTAL SCORE: ________
Points were counted off for:
### Forces of Change

<table>
<thead>
<tr>
<th></th>
<th>What I Know</th>
<th>What I want to find out</th>
<th>What I learned</th>
<th>How can I learn more</th>
</tr>
</thead>
<tbody>
<tr>
<td>Earthquakes:</td>
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<tr>
<td>Volcanoes:</td>
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<td>Flooding:</td>
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<tr>
<td>Erosion &amp; Weathering:</td>
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<tr>
<td>Plate Tectonics</td>
<td>Subduction</td>
<td>Spreading</td>
<td>Transformation</td>
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<td>What is this movement?</td>
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<td>Draw an Illustration</td>
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<td>What type of landforms does it cause?</td>
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<td>What are some examples?</td>
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<tr>
<td>What are some Natural Hazards?</td>
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</table>
## Plate Tectonics – Teacher Key (Possible Answers)

<table>
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<tr>
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<th>Subduction</th>
<th>Spreading</th>
<th>Transformation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>What is this movement?</strong></td>
<td><em>Heavier sea plate dives beneath the lighter continental plate</em></td>
<td><em>Sea plates pull apart</em></td>
<td><em>Plates slide past each other or pieces of the same plate move at different speeds</em></td>
</tr>
<tr>
<td><strong>Draw an Illustration</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>What type of landforms does it cause?</strong></td>
<td><em>Mountains</em></td>
<td><em>Undersea mountains or ridges</em></td>
<td><em>Faults, escarpments, or cliffs</em></td>
</tr>
<tr>
<td><strong>What are some examples?</strong></td>
<td><em>Andes Mountains</em></td>
<td><em>Mariana Trench</em></td>
<td><em>San Andreas Fault</em></td>
</tr>
<tr>
<td><strong>What are some Natural Hazards?</strong></td>
<td><em>Volcanoes</em></td>
<td><em>Undersea volcanic mountains</em></td>
<td><em>Earthquake</em></td>
</tr>
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### External Forces

<table>
<thead>
<tr>
<th>What is this force?</th>
<th>Erosion</th>
<th>Weathering</th>
<th>Deposition</th>
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<tr>
<td>How does it change the physical surface?</td>
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<td>What type of landforms does it affect?</td>
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</thead>
<tbody>
<tr>
<td><strong>What is this force?</strong></td>
<td><em>Transportation/removal of pieces of rock or soil through wind, glaciers or water</em></td>
<td><em>Breakdown of rock and other materials into smaller pieces</em></td>
<td><em>Dropping off or deposition of rock particles in a new location</em></td>
</tr>
<tr>
<td><strong>How does it change the physical surface?</strong></td>
<td><em>Wears away Earth’s surface</em></td>
<td><em>Large masses of rocks are physically broken down or chemically altered</em></td>
<td><em>Changes the shape of the land</em></td>
</tr>
<tr>
<td><strong>What type of landforms does it affect?</strong></td>
<td><em>Mountains, coastlines, etc.</em></td>
<td><em>Mountains, caves, etc.</em></td>
<td><em>Valleys, basins, etc.</em></td>
</tr>
<tr>
<td><strong>What are some examples?</strong></td>
<td><em>Answers will vary</em></td>
<td><em>Answers will vary</em></td>
<td><em>Answers will vary</em></td>
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