√GEOMATH

HiLo: Places Are Much More Than Just Elevations on a Map

Students use cooperative strategies to learn important lessons about disagreements on the best use of natural resources, while also practicing skills in subtracting and ordering integers.

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Grade Level	6 -7
Duration	2 class periods

National Geography Standards	Arizona Geography Strand	Other Arizona Standard
ELEMENT FIVE: ENVIRONMENT AND SOCIETY **16.** The changes that occur in the meaning, use, distribution, and importance of resources	**CONCEPT 5** **Environment and Society** PO 7 Compare different points of view and research on environmental issues. .	**Mathematics Common Core Standards** **The Number System** 6.NS.5. Understand that positive and negative numbers are used together to describe quantities having opposite directions or values (e.g., temperature above/below zero, elevation above/below sea level, credits/debits, positive/negative electric charge); use positive and negative numbers to represent quantities in real-world contexts, explaining the meaning of 0 in each situation. 6.NS.6. Understand a rational number as a point on the number line. Extend number line diagrams and coordinate axes familiar from previous grades to represent points on the line and in the plane with negative number coordinates. a. Recognize opposite signs of numbers as indicating locations on opposite sides of 0 on the number line; recognize that the opposite of the opposite of a number is the number itself, e.g., -(-3) = 3, and that 0 is its own opposite. c. Find and position integers and other rational numbers on a horizontal or vertical number line diagram; find and position pairs of integers and other rational numbers on a coordinate plane. 7.NS.1. Apply and extend previous understandings of addition and subtraction to add and subtract rational numbers; represent addition and subtraction on a horizontal or vertical number line diagram. c. Understand subtraction of rational numbers as adding the additive inverse, $p - q = p + (-q)$. Show that the distance between two rational numbers on the number line is the absolute value of their difference, and apply this principle in real-world contexts. **Standards for Mathematical Practice** 6. MP. 4. and 7.MP.4. Model with mathematics.

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ELA Common Core Standards
6-8 Reading Standards for Literacy in History/Social Studies
6-8.RH.1 Cite specific textual evidence to support analysis of primary and secondary sources.
Integration of Knowledge and Ideas
6-8.RH.7 Integrate visual information (e.g., in charts, graphs, photographs, videos, or maps) with other information in print and digital texts.
6-8 Writing Standards for Literacy in History/Social Studies, Science, and Technical Subjects
Text Types and Purposes
6-8.WHST.1 Write arguments focused on *discipline-specific content*.
a. Introduce claim(s) about a topic or issue, acknowledge and distinguish the claim(s) from alternate or opposing claims, and organize the reasons and evidence logically.
b. Support claim(s) with logical reasoning and relevant, accurate data and evidence that demonstrate an understanding of the topic or text, using credible sources.
c. Use words, phrases, and clauses to create cohesion and clarify the relationships among claim(s), counterclaims, reasons, and evidence.
d. Establish and maintain a formal style.
e. Provide a concluding statement or section that follows from and supports the argument presented.
Production and Distribution of Writing
6-8.WHST.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
6-8.WHST.9 Draw evidence from informational texts to support analysis reflection, and research.

Overview

Far too much of geography education focuses on place names on maps, often peppered with elevations of mountains and lowlands. Rather than fight a natural desire to know the extreme highs and lows on Earth, this lesson has students research disagreements on the best use of natural resources in these extreme places. In addition, this lesson employs classroom kinesthetic manipulation of elevations through the use of an illustrated model or wall chart, while students practice skills in the subtraction of integers.

Purpose

In this lesson, students will use cooperative learning strategies to explore disagreements on the best use of natural resources. They will also work with positive and negative integers through the use of a wall chart and do a writing assignment.

Materials

Class set of the World Map back-to-back with Summary Chart of Elevations (laminated)

Class set of Student Posting Cards (laminated).

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Elevations above sea level should be copied on yellow paper, and elevations below sea level should be copied on blue paper.

HiLo Worksheet and Worksheet key

Sticky notes for posting locations on classroom world map.

Wall map of the world

HiLo map can be used by the teacher as an answer key to map locations

Yard stick or ruler

Objectives

The student will be able to:

1. Describe changing ideas and disagreements on the best use of natural resources at different places.

2. Subtract integers.

3. Order integers using a concrete model

Procedures

PREPARE IN ADVANCE: Classroom vertical wall chart. Write elevations on the chart using the "Posting Check Sheet." Hang the butcher paper or adding machine tape on a wall that is 7 feet high. The paper will need to be scaled in feet and inches from -4 feet through 0 feet and up to +3 feet.

Students should have had experience with positive and negative numbers.

SESSION ONE: JIGSAW GEOGRAPHY AND ORDERING INTEGERS

1. Divide the class into small groups of 2 to 4 students.

2. Provide each group with 1 (or more) jigsaw card(s).

3. Have students find the place described on their jigsaw card on the student map. They will need to show this location to the class.

4. Have students read the information on their card(s).

5. Each student in the group will accomplish different tasks:

    • A student should stick the Student Posting Card, for their jigsaw location, on the vertical wall chart using double stick tape

    • A student should place a sticky note (with place name and elevation written on it) on the wall map of the world, or the student should to be ready to show the location on an overhead of the student map.

    • A student will rehearse in their small group the "pro" position on resource use related to the place.

    • A student will rehearse in their small group the "con" position on resource use related to the place.

6. Each group will make a brief oral presentation to the entire class on the location, vertical elevation, and pro/con positions related to resource use.

    Tell the class that they should be taking notes on the oral presentations. They will have to write a brief essay on resource controversies at one of the places (they can write an essay about the place their group studied, or they can select a different place)

    If possible, display these photographs (e.g. on a T.V. monitor), and students can use the photographs while they are making their presentations.

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After each presentation, present the teacher material on ongoing solutions to the disagreements or engage the students in a class discussion of their ideas.

7. After the oral presentations, students will write an essay about the resource dispute at one of the locations presented. Students may use the essay sheet or may write on a piece of notebook paper. Students should include both pro and con positions on resource use.

SESSION TWO: HILO WORKSHEET
(WORKING WITH INTEGERS)
1. Return focus to the vertical wall chart. Not all of the elevations on the "summary of chart elevations" have been posted on the classroom wall chart. You ask students to post the remaining elevations. A "check sheet" of elevations will help make these additions go smoothly.

2. Help students see the difference between positive (above sea level) and negative (below sea level) elevations. Point out that sea level is 0 and that there is no -0.

3. Model how to find the difference or distance between different elevations.
- Model one problem above sea level.
  Example: K2 and Aconcagua,
  $$28{,}251 - 23{,}034 = 5227$$

- Model one problem below sea level.
  Example: Challenger Deep and Japan Trench
  Hint: Since both elevations are negative, ignore the negative signs, just subtract. The answer negative because the difference is below sea level.
  $$35810 - 28000 = -7810$$

- Model one problem comparing elevations above and below sea level.
  Example: Sun Devil Stadium and Badwater in Death Valley

Hint: To find the distance between these two locations show students that they must add the numbers because they have the cover the distance from Badwater to sea level and the distance from sea level to Sun Devil Stadium. Explain that if they drove to Badwater from ASU's Sun Devil Stadium, they would first have to drop 1150 feet in elevation to reach sea level. Then, they would have to drop another 282 feet. So they would have to drop a total of 1432 feet to reach Badwater.

Hint: In many math classes, students are taught a method to solve this type of problem (shown below). However it is helpful in the understanding of integers if students can visualize <u>why</u> they add. Ask students (or their math teacher) how they were told to solve this problem.
$$1150 - (-282)$$
$$1150 + 282 = 1432$$

4. Distribute the summary of chart elevations and HiLo worksheet. Have students complete the HiLo worksheet.

5. Use the answer key and have students correct their work. If necessary, discuss the correct way to solve each problem.

6. Discuss as a class methods students used to find the difference between elevations.

Assessment
There are 2 assessments. One involves the jigsaw exercise. Students will write a brief essay after class presentations. Grade the essay with a six traits rubric for ideas and organization. In terms of content, be sure that both pro and con positions are presented. Mastery will be considered 4 or higher.

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The other assessment is a worksheet involving differences in elevations. Grade the worksheet with a key. Mastery is considered 11/14 or 80%.

Extensions

Show photographs and diagrams of the various places discussed in this lesson.

The home page for this lesson has a link to a separate webpage. Internet access is required. All of the photographs link to this CD.

Have students do more research on the cultural, historical and physical geography of the place they read about on their jigsaw card.

For more information about the cultural and physical geography of mountains students can read the NGS Reading Expeditions® book, *Mountains,* by Mary Tull. ISBN 0-7922-4562-8.

Sources

The photographs shown in website are courtesy of the author, Daniel Gilewitch, and the U.S. government (NASA, National Park Service, U.S. Geological Survey).

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