MYSTIC MOUNTAINS: TEACHER GUIDE

Subject: Earth Science
Grade Level: Middle School
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Case Summary

A group of teenagers are taken to a mountaintop in North Georgia where they are to survive for one month with minimal supplies. How will they do it?

Credits

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Learning Objectives

At the end of the case, students will be able to:

1. Identify landforms (plain, mountain, mountain range, plateau)
2. Represent landforms, landform regions, elevation, contour intervals, depressions, relief, and slope on a topographic map
3. Construct and use a topographic map and key (scale and symbols)
4. Describe and use latitude and longitude
5. Identify natural resources
6. Identify items in a survival kit.
7. Describe how topographic maps are constructed (made by reports of travelers, airplane photos, satellite images, computer mapping)
8. Describe how landforms and other features of Earth's surface are represented on a topographic map.

Georgia Performance Standards

S7CS1. Students will explore of the importance of curiosity, honesty, openness, and skepticism in science and will exhibit these traits in their own efforts to understand how the world works. (NSES Content Standard A)

S7CS6. Students will communicate scientific ideas and activities clearly. (NSES Content Standard A)

S7CS7. Students will question scientific claims and arguments effectively. (NSES Content Standard A)

a. Question claims based on vague attributions (such as "Leading doctors say...") or on statements made by people outside the area of their particular expertise.

b. Identify the flaws of reasoning that are based on poorly designed research (i.e., facts intermingled with opinion, conclusions based on insufficient evidence).

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S7CS8. Students will investigate the characteristics of scientific knowledge and how that knowledge is achieved. (NSES Content Standard A)

Students will apply the following to scientific concepts:

a. When similar investigations give different results, the scientific challenge is to judge whether the differences are trivial or significant, which often requires further study. Even with similar results, scientists may wait until an investigation has been repeated many times before accepting the results as meaningful.

b. When new experimental results are inconsistent with an existing, well-established theory, scientists may pursue further experimentation to determine whether the results are flawed or the theory requires modification.

c. As prevailing theories are challenged by new information, scientific knowledge may change.

S6E3. Students will recognize the significant role of water in earth processes. (NSES Content Standard D)

S6E4. Students will understand how the distribution of land and oceans affects climate and weather. (NSES Content Standard D)

Assessment

Throughout the case, students research topics such as latitude, longitude, natural resources, landforms, topographic maps and related terms, and survival kit contents. At the end of the case, the earth science students are challenged to help the Survivor team by constructing a three-dimensional model of a two dimensional topographic map.

Several ideas for student products and forms of assessment are listed below, but not all of these have to be used by the authors.

1. 3-D representation of a 2-D topographic map
2. Completeness of topographic maps and keys
3. Student presentation of map and description of how topographic maps are constructed by professionals
4. Survival kit
5. Journals or "Confessionals" (containing facts, hypotheses, questions, and learning issues as well as researched information)
6. Self-evaluation and peer evaluation
7. Review questions (taken from textbook)
8. Quizzes and homework

Student groups are assessed by the quality of their model, self and peer evaluations, an activity on topographic maps asking them to apply their knowledge, and "confessionals," a journal modeled after the television show in which the students take notes on the case and create box charts (Figure 1).

Implementation Strategy

<u>Day 1</u>	
Read Scene 1	10 min
Data, Questions, Learning Issues (whole class)	15 min
Read Scene 2	10 min

Data, Questions, Learning Issues (whole class)	15 min
Research in computer lab/class work	40 min

Day 2
Continue group work on assessments.

- Students may be divided into groups of 5-6.
- This case can be used to introduce the topic of topographic maps, landforms, and natural resources which are both contained within most state curriculums for middle school earth science.
- This case can also be used to reinforce lectures on topographic maps, landforms, and natural resources or as practice for state assessment tests.
- Teachers can change the setting of the case to any location such as their own geographic location which may be near oceans, lakes, deserts, etc.
- Teachers will need access to a topographic map of the location they choose. This map will be distributed to the students after students perform research on Scene 1. The students tend to get excited about figuring out exactly where the Survivor Team is located, so when the map is presented to them, they can check their progress. They will need this in order for them to create their 3-D model of the 2-D topographic map.
- Teachers can inexpensively make "confessionals." We used scrapbook paper with nature scenes, folded them in half with 10 pieces of notebook paper, and stapled them at the fold. Teachers can also request that students simply purchase a notebook, and dedicate it to the Survivor Mountain Series cases.
- Following each scene, student groups should complete box charts (example below). This helps them to realize the problem and find ways to solve it. For this particular case, each student can create a box chart in his/her "confessional." Also, a group box chart is advantageous.
- After completing the box charts, student groups should assign learning issues (see box chart below) to each student. Each student will then research the learning issue using any resources available which could include internet searches, encyclopedias, library books, science textbooks, and more. After the researching is complete, all students will return to the group and report their findings after which the next scene will be distributed by the teacher.
- Handout the "Constructing a Map" page following Scene 2 Box Chart and Research

Case Notes

- This case was implemented in an 8th grade earth science class.
- For assessment, teachers can adapt the activities contained herein, delete activities, and/or add custom activities.
- Students really enjoy this hands-on experience. It allows them to be creative, use their art skills, socialize, and problem solve.
- Skills for working in a team are strengthened during the implementation of all problem-based learning cases.

Facilitator Guide:

FIG. 1 EXAMPLE BOX CHART AND DEFINITIONS OF TERMS: SCENE 1

FACTS - Coordinates (assigned by teacher) - Survivor setting is mountains - August; cool temperature - Bag found	**QUESTIONS** What's in the bag? Is the mountain really tall? Estimate of elevation? Can you see a river?
LEARNING ISSUES What is latitude/longitude? What natural resources are available in a mountain region? Latitude ___ and longitude ___ are where? What items are in a survival kit?	**HYPOTHESES** The bag contains items to help them survive. Natural resources may be available to help them survive.

Resources

Advameg, Inc. Georgia – Topography. (2007). Retrieved October 5, 2007 from http://www.city-data.com/states/Georgia-Topography.html

United States Geological Survey. USGS Education Map Catalog. Topographic map of United States (2007). Retrieved October 5, 2007 from http://education.usgs.gov/common/resources/mapcatalog/images/topography/elevation_usa.jpg