



Description: Students work in teams to complete a WebQuest about the geologic history of the Rio Grande and produce a team presentation displaying what they learned.

A WebQuest is a lesson format designed by Bernie Dodge at San Diego State University. This lesson follows that specific format. A WebQuest provides students with a task which can be accomplished using the World Wide Web. Specific web addresses are provided to help guide student research. However, the lesson is loose enough to require students to use research, critical thinking, and synthesis skills to complete the task. Students create a presentation after web research is completed.

Objective: Students will understand:

- that New Mexico is a unique geologic area;
- that the Rio Grande Rift runs north–south through New Mexico and is actively spreading;
- that earthquakes and volcanoes in New Mexico are related to the Rio Grande Rift, as well as other reasons;
- the Rio Grande followed the rift: the river did not cut a valley but rather filled in the rift; and
- the Rio Grande Rift provides the geologic setting for the Rio Grande and the bosque.

Materials: computers with Internet access (minimum one for each team).
PowerPoint, HyperCard, or Netscape or similar software
construction paper
markers, scissors, glue

27. WebQuest: Geologic History



Grades: 6–12

Time: preparation: 10 minutes
activity: three or four class periods

Subjects: science

Terms: *Rio Grande Rift, earthquake, earthquake magnitude, volcano, cinder cone, shield volcano, composite volcano, caldera, ash flow, dome volcano, lava flow, aquifer, sediment*

**Procedure:**

Preparation:

1. Make sure computers are available, working, and connected to the Internet.
2. Assign students to teams of three.
3. Make copies of WebQuest student activity pages.

Doing the activity:

1. Introduce the concept of a WebQuest. Directions are included on the student activity pages.
2. Provide students with a time-line for completing the WebQuest. For example: Day 1—Read the WebQuest and prepare note pages. Day 2—Do web research. Day 3—Do web research. Day 4—Get together as a team and answer “Everyone” questions and design presentation. Day 5—Finish presentation.
3. The teacher should act as a facilitator, helping to trouble-shoot technology problems, asking leading questions, and helping students organize their work. This is a student-centered activity.

Assessment:

Presentations—see student activity pages.

Extensions:

Have students give oral presentations or show their web or PowerPoint presentations to other students who did not complete the WebQuest.

Teacher Answers to Questions in WebQuest



Volcanologist

1. Why is New Mexico called the Volcano State?
New Mexico has examples of every type of volcano. New Mexico has a large number, variety, range of preservation, and best examples of volcanoes.
2. What type of volcanoes are in New Mexico?
Types of volcanoes include cinder cones, stratovolcanoes (composite), shield volcanoes, calderas, ash flows, domes, and lava flows.
3. Why does New Mexico have so many volcanoes?
The Rio Grande Rift is thinning the crust, making it easy for magma to rise through the crust to the surface.
4. Where will the next volcano likely erupt in New Mexico?
The next volcano might be near Socorro, New Mexico, where a magma body apparently exists close to the surface.
5. Bonus Question: What other places in the world might be like New Mexico in terms of volcanic structures and activity?
The mid-ocean ridges, Iceland and East Africa.

Seismologist

1. Does New Mexico have earthquakes? If so, how big are they?
Yes, New Mexico has earthquakes. Most are fairly small (magnitude 1–3), but some large quakes have occurred in the past century (magnitude 5–6), and there is evidence of very large earthquakes (magnitude 7) in geologic history.
2. What are some reasons why New Mexico has earthquakes?
The Rio Grande Rift is still active, rising magma near Socorro, oil and gas drilling, pressure from large bodies of water (Heron and El Vado reservoirs).
3. What causes earthquakes?
Earthquakes are caused by release of energy in the Earth's crust.
4. Where do earthquakes usually happen? Why?
Large earthquakes are most concentrated near plate boundaries where tectonic plates are moving relative to each other, but earthquakes can happen anywhere.
5. Bonus Question: What other area of the world might be like New Mexico, in terms of earthquakes, volcanism and general landscape?
The East African Rift is much like the Rio Grande Rift, but the East African Rift is actually pulling apart a little faster now than the Rio Grande Rift.

Hydrologist

1. Where did the sediment come from that forms the aquifer?
The sediment was eroded off the rising Sandia Mountains and other nearby mountains and from volcanoes. The sediment was washed into the Rio Grande Rift and filled up the deep trough.



2. How did this sediment get here?
Small streams and rivers from the west, as well as the early Rio Grande, washed the sediment into the deep Rio Grande Rift.
3. What did the Rio Grande follow in setting its course?
The Rio Grande followed the Rio Grande Rift.
4. How is the Rio Grande different from a river that cuts a valley?
The Rio Grande did not cut its valley. The Rio Grande followed the trough of the Rio Grande Rift. The Rio Grande filled up the rift with sediment instead of cutting down, although it has cut its present-day channel.
5. Bonus: What is wrong with the information given about the size/volume of the aquifer in the Albuquerque Environmental Story page?
The page says that the aquifer is an underground lake that has large quantities of water. It implies that there is an unlimited supply of water under Albuquerque. We now know that drinkable water is limited and we should not take its supply for granted.

Everyone

1. What is the linear feature that the Rio Grande follows that runs north–south through New Mexico?
The Rio Grande Rift runs north–south and is pulling the crust apart. The center of the Rift is dropped down relative to the sides to form a trough. The trough is mostly filled in with sediment.
2. What is the relationship between this feature and volcanoes, earthquakes, and rivers?
Earthquakes happen when energy is released from the crust as the rocks in the crust move along a fault. Volcanoes form when magma comes up through the relatively thin crust at the center of the rift. Rivers and streams have filled the trough with sediment. The Rio Grande follows the course of the rift.
3. How did this feature form?
The Rio Grande Rift is a result of spreading and thinning of the continental crust in this region (see History of the Rio Grande Rift in this chapter). The rift continues to form actively today.

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WebQuest: Geologic History

Introduction

Most rivers cut the valley through which they run, but the Rio Grande is very different. We might call it the Rio Grande Valley, but is it really a valley? How did the river get here? The Rio Grande is a unique river in a very unique place.

The Task

You and your teammates need to find answers to the following set of questions. You will use the World Wide Web to research the answers. Once you find the answers, you need to organize the information into an easy-to-follow presentation that explains the geologic history of the Rio Grande. You have a choice of the following options for presenting your answers.

1. Make a poster that has appropriate drawings and information.
2. Make a computer presentation, either as a web-page, PowerPoint slide show or a hyper-studio slide show.
3. Make a picture book.

Each person on your team will have a role and a specific set of questions to research. These are the roles:

Volcanologist: researches the volcanoes of New Mexico and finds out why New Mexico has so many volcanoes.

Seismologist: researches earthquakes in New Mexico and finds out why New Mexico has earthquakes.

Hydrologist: researches the aquifer and the sediments along the Rio Grande and finds out how they were deposited.

Process and Guidance

Each person will use the Internet to answer the questions assigned to her/his role. Follow this procedure.

1. Write down each question that pertains to your role at the top of a separate piece of paper.
2. Visit each web site listed for your role. When you find information that helps answer a question, write down the information on the piece of paper marked with that question. Include drawings. Write down the name of the web site from which you got the information so that you can go back to it if necessary. This part should take two class periods.

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3. When everyone is finished researching, each person presents his/her questions and answers to other members of the team. Look for similarities in answers. Answer the “Everyone” questions. You may need to go back to some of the web sites for answers. Begin to put all the answers together to form a story that explains how the Rio Grande was formed and why.
4. Together, choose one of the presentation formats. Design your presentation. Write in your own words and make your own drawings. Do not copy from the web sites. Remember, each team member must contribute text and drawings that pertain to his/her role and questions. Each team member must sign the parts she/he contributed in order to get full credit for the presentation.
5. Grade your other teammates on a sheet of paper and turn it in (unsigned). Be sure to explain your grade (give examples).
5 = Team member was easy to work with, did all the work assigned, and was a positive team member.
4 = Team member did all the work assigned and was mostly a positive team member.
3 = Team member did all the work assigned but had to be told what to do and how to do it.
2 = Team member only did some of the work assigned and was not a positive member of the team.
1 = Team member hardly did anything.
0 = Team member did nothing.

Questions

Volcanologist

1. Why is New Mexico called the Volcano State?
2. What type of volcanoes are in New Mexico?
3. Why does New Mexico have so many volcanoes?
4. Where will the next volcano likely erupt in New Mexico?
5. Bonus Question: What other places in the world might be like New Mexico in terms of volcanic structures and activity?

Seismologist

1. Does New Mexico have earthquakes? If so, how big are they?
2. What are some reasons why New Mexico has earthquakes?
3. What causes earthquakes?
4. Where do earthquakes usually happen? Why?
5. Bonus question: What other area of the world might be like New Mexico, in terms of earthquakes and plate tectonics?



Hydrologist

1. Where did the sediment come from that forms the aquifer?
2. How did this sediment get here?
3. What did the Rio Grande follow in setting its course?
4. How is the Rio Grande different from a river that cuts a valley?
5. Bonus: What is wrong with the information given about the size/volume of the aquifer in the *Albuquerque Environmental Story* page?

Everyone

1. What is the linear feature that the Rio Grande follows that runs north–south through New Mexico?
2. What is the relationship between this feature and volcanoes, earthquakes, and rivers?
3. How did this feature form?
4. When did this feature form?

Resources

Volcanologist

<http://www.nmmnh-abq.mus.nm.us/nmmnh/nmmnh.html>

Click on Research and then click on Volcanoes of New Mexico.

<http://www.cabq.gov/aes/s1picgeo>

Seismologist

<http://tremor.nmt.edu>

<http://pubs.usgs.gov/publications/text/understanding.html>

Be sure to read the part about Africa.

<http://www.iris.edu>

Click on the Seismic Monitor. You should be able to determine where most earthquakes occur.

Hydrologist

<http://www.cabq.gov/aes/s1geol.html>

<http://www.cabq.gov/aes/s1picgeo.html>



Assessment

You will receive a team grade and an individual grade. Team grades will be based on the overall completeness and appearance of your presentation. Team grades will also include how well your team worked as a team. Individual grades will be based on your research notes and your contribution to the team.

Team Grade = 40 points

Completeness: 20 points

All questions are answered.

Questions are presented in an easy to read/follow format.

Information is correct.

“Everyone” questions are answered completely and correctly.

Appearance: 20 points

Presentation is neat and pleasing.

Presentation includes original pictures and text.

Presentation is in easy-to-read format.

Individual Grade = 60 points

Research Notes: 20 points

Each question has a note sheet.

Each question shows evidence of research from web sites

Each question has proper web site documentation.

Presentation Answers: 20 points

Answers are in original words and pictures.

Answers are correct and show understanding.

Contribution to the Team: 20 points

Student contributed fairly and equally to the team.

Student contribution to the presentation is signed.

Other team members grade your work.

Conclusion

Most people who live in New Mexico do not know why their state is so unique. New Mexico has many geologic features that are unusual and fascinating. Now you can explain some of those features to your neighboring New Mexicans, and you know how and why the Rio Grande formed.

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