

Power: Hurricane Forces and Their Effect on Structures

WebQuest Description: You have been given the task to help New Orleans redesign their levee system so that they are better prepared for the next big hurricane. Through learning about structure design, material choice and force you will be able to design a levee that will withstand wind and water. This WebQuest will teach your group the information that you need to help you accomplish your tasks.

Grade Level: 6-8

Curriculum: Science

Keywords: New Orleans, levee, dam, structures, hurricane, flood, wind

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Introduction

As New Orleans residents you have been devastated by 2005's Hurricane Katrina. Frustrated by slow pace of the levee redesign and construction, you have decided to form committees to take matters into your own hands. You have taken your frustrations to the mayor and have been challenged to come up with a redesign yourself. The mayor has initiated a contest to all the groups to come up with the best levee redesign. Unfortunately, you and your group know very little about structures and the forces that affect them. Your task is to educate yourself and your group, design a new levee structure for the city and win the contest! Good luck!

Tasks

Your task is to redesign New Orleans failed levee system to withstand a Category 5 hurricane. You and your partner will each be given a role and two tasks that you will be in charge of as the leader. Both members will participate in each task but each person has one leadership responsibility. These roles are: Researcher and Presentation Coordinator. Your task is to coordinate the research on shapes materials, loads and forces. From this research your group will be able to decide on the best methods, materials and designs for your structures. During this time you are in charge of the computer navigation. You will decide who takes notes and how you will organize your research. The second part of your task is to organize your group's presentation to the city council. You will decide what your presentation will consist of and who will present which parts. You are in charge of computer navigation during this task. Design Engineer: The first part of your task is to decide on the best material, shape and method for your levee design. You will be in charge of designing your levees, doing any required tasks or further research. You will be responsible for asking for help from your partner. You will be required to draft two levee designs before making a final decision. You will be the final decision maker on which design you will choose. During this time you are in charge of computer navigation. The second part of your task will be to create blueprints of all three of your designs as well as a 3D visual of your final design on Google SketchUp. You will need to be good with computer technology for this task! Both of you will be in charge of making the 3D model of your levee. Your end result will consist of: Research notes Two draft blueprints A final design blueprint on paper and digitally represented on Google SketchUp A 3D model of your levee and surrounding area A presentation to City Council

Process

Complete all of the steps below carefully and completely. You will be given a check list to be sure that you have completed all of the tasks. Assign someone from your team to keep the check list and mark off each time your group accomplishes a task. Step One: Choose roles Each person chooses a role that they will be the leader of. This does not mean that they alone complete the task but that they are in charge of making sure it is done and making the decisions for it. This also means that they are in control of the lap top during this task. Once your roles are chosen, it is time to begin. Step Two: Research You must learn about structures before you can design them. Complete each activity below in order. Remember that you will hand in all notes, answers to questions etc. so keep them organized. Research leader, now is the time to choose others to help you record answers, read information etc. Types of Structures: You will need a Science and Technology Textbook on Structures from me. Take turns reading pages 8-18 and answer the questions on page 18. Do both Communicate and Check Your Progress. Types of Loads: Read pages 28-32 to learn about types of loads. Answer the Communicate (1,2 and 3) Questions on page 30. Loads Lab: Visit the following site <http://www.pbs.org/wgbh/buildingbig/lab/loads.html> to try the Loads lab. Make notes about what qualities you think your levee will need to have to allow it to withstand the forces of wind and water. Use these notes later to help with your levee designs. Internal Forces: Read pages 37-39. Complete Communicate #1 and 2. #1 might be a good job for your Drafts person! Forces Lab: Visit the following site <http://www.pbs.org/wgbh/buildingbig/lab/forces.html> to try the forces lab. Make notes about what kind of forces your levee will have to withstand or possess in order to be structurally sound. Shapes Lab: Visit <http://www.pbs.org/wgbh/buildingbig/lab/shapes.html> to learn about the strength of different shapes. Make notes about what shapes would be best to use for your levee design. Structural Shapes: Read page 50 and complete the Problem Solver on page 51. Toothpicks are available from me. Take notes on your results. Materials Lab: Visit <http://www.pbs.org/wgbh/buildingbig/lab/materials.html> to learn about the different materials that you can use for your levee. Make notes about the pros and cons of ALL materials to help you choose your levee material. Stress, Fatigue and Failure:

Read page 44. Turn to page 47 and do Communicate #3. After completing create the same kind of chain of events for what happened to the New Orleans levees. Dam Lab: Levees are basically small dams. Visit <http://www.pbs.org/wgbh/buildingbig/dam/basics.html> to learn about different types of Dams. Answer the following question in your book: What type of Dam(s) are the New Orleans levees? Think about the problems with this kind of dam and make notes in your book. Use these notes to decide what kind of Dam you think your levee design should be. Step Three: Design Your Levee Time for your Design Engineer to take over. Follow the following steps to design your levee. Look back at all the notes and information that you gathered during the research portion of the assignment. From these notes, create three different levee designs. Draw diagrams of each of the three designs. Use Science and Technology Structures pages 110 and 111 to show you how to properly create a diagram. Draw your diagrams using the Simple Sketch method and include a front view, side view and top view of your designs. All three can be on one paper. Use provided graph paper. BE SURE to use a ruler and pencil. Colour in your completed diagrams. Label all diagrams in pencil. Look at your designs and create a chart comparing the positives and negatives of each. Choose one design or combine qualities of all three and create your final levee design. Write a paragraph explaining why you think your design would be successful at protecting New Orleans from flood waters. What does your new design have that New Orleans does not currently have? Time to make a 3D computer generated model of your levee system. Use Google SketchUp to create model of your levee. Step Four: Build Your Levee Your group must now take the diagram of the levee that you have chosen and build a 3D model of your levee design. Follow these steps to build. Choose which material you would like to use for your model. Will it be wood? Cardboard? Clay? A combination? Choose the scale of your model. For example: 1 cm on the diagram = 5 cm on the model. Build a base for your model. Begin to build the model of your levee. You will want to include a representation of the water it is holding back (or real water!), the ground and maybe some house models to show how close to the people the levees are. Step Five: Present to Town Council Now your Presentation Coordinator can take over leadership. You must now prove to the mayor and town council that your group's levee design is worth the prize. Your presentation must include: An outline of everything that you learned from your research and how you applied it to your design. All three drafts of your levee design. Your 3D design on SketchUp. Your 3D live model of your levee system. You can choose how you would like to present your information but you will need to use a computer for your SketchUp model.

Evaluation

| Category and Score | Beginning 1 | Developing 2 | Very Good 3 | Exemplary 4 | Score |
|-----------------------|---|--|--|---|-------|
| Levee Design Diagrams | Minimal quality, resembles a sloppy copy. There is no organization and lacks a scale. | Shows signs of neatness. Lacks logical reasoning and organization. Scale is not always precise. | The layout is practical, neat, and organized. The scale is precise. | The layout is logical, neat, and organized. The scale is accurate. There are several details in the interior and exterior drawings. | %25 |
| 3D Model | The model did not follow the floor plan, and was poorly constructed. | The model was close in scale to the floor plan and was not well constructed. | The model was drawn to scale and followed the floor plan, but contained few details. | The model was created to scale following the floor plan and contained several details. | %25 |
| Group Participation | The group did not cooperate. | Most team members did not actively participate. | Most team members actively participated in a cooperative manner. | All team members actively participated in a cooperative manner. | %25 |
| Presentation | The presentation had no organization and teammates were not prepared. | The presentation could not be heard well, lacked organization, or did not involve all teammates. | The presentation flowed smoothly, could be heard clearly, and allowed everyone on the team to participate. | The team's presentation was flawless and the visuals were persuasive. | %25 |
| | | | | Total Score | %100 |

Conclusion

Conclusion Congratulations! You have just completed redesigning New Orleans' levee systems, saving them from years of worry and destruction. The Mayor will award you in the following ways: The group with the highest grade will get \$2000 each in Bonus Stinky Bucks The group with the second highest grade will get \$1000 each in Bonus Stinky Bucks The third highest grade will get \$500 each in Bonus Stinky Bucks The fourth highest grade will get \$200 in Bonus Stinky Bucks The fifth highest grade will get \$100 in Bonus Stinky Bucks The sixth highest grade will get \$50 in Bonus Stinky Bucks The remaining groups will receive an honorarium of \$25 in Bonus Stinky Bucks Any group that gets below 60% on this project will not receive any Bonus Stinky Bucks.

Teacher Page

Website implementation: Prior to embarking on this WebQuest we learned both about how hurricanes are formed. We

also watched the Nova documentary Hurricane Katrina: The Storm that Drowned a City. This DVD is available from amazon.com Target Grade: 7-9Saskatchewan Evergreen Curriculum Connections: Grade 7 Science: StructuresDownload Google SketchUp at http://sketchup.google.com/index.html Off line resources used: Science and Technology 7: Structures. Addison Wesley Longman Ltd. Don Mills, Ontario. 2000The photos used on this site are from the personal collection of the author. They were taken in July of 2008, three years after the hurricane.

Standards

Credits

Other