

Title: Paper Towel Structure**Grade level targeted: (5-8)****Writer and e-mail address: Jamie Hall (Jdhall@wcpss.net)****Goals/Standards:****NC Goals and Standards**

Goal 4: *The learner will conduct investigations and use appropriate technologies to build an understanding of forces and motion in technological designs.*

National Standards (5-8)

Content Standard B: As a result of their activities in grades 5-8, all students should develop an understanding of motion and forces and transfer of energy.

Content Standard E, Science and technology: all students should develop abilities of technological design and understandings about science and technology.

Success Indicator:

Each group's structure should be able to hold at least 15 pounds. When all structures are completed you can test to see which structure holds the most weight.

Engagement:

You will build a structure using only paper towel tubes and masking tape. Your structure must be no taller than 4 feet. The structure must be made so that it has a platform that will hold weight.

Materials:

1. Paper towel tubes (each group should have at least 30)
2. Masking tape
3. Scissors
4. Platform (can be made from a variety of materials, wood, plastic, cardboard)
5. Pictures of bridges,

Procedure:

1. Show students some pictures of some types of architecture such as bridges, arches, buildings, the Eiffel Tower, castles, cathedrals, churches, etc... Talk about the similarities that are reoccurring in the pictures. In particular the shapes of the structures. Such as triangles, or squares.

2. Have students draw a sketch of what they want their structure to look like. After sketching their structures have students share their sketches. Have students discuss and predict whether or not they think there structures will hold the appropriate amount of weight.

3. Students will build a structure out of paper towel tubes. Students are able to cut the paper towel tubes in any way they feel appropriate. As they are building they should

think about the strength of the structure and also building a platform that will hold at least 25 pounds.

Follow-up

1. Share what you did.

- A. What were you thinking about while you were building your structure?** (answers will vary)
- B. Did you change any of your plans as you were working?** (ask what students changed and why)
- C. As you were working with your structure did you come up with any strategies to stabilize your structure?** (answers will vary)
- D. What kind of platform did you choose for your structure?** (wooden, plastic, or other material)

2. Process what's important.

- A. What type of shapes did you use in your structure?** (triangles, squares, rectangles, other)
- B. Why did you use these shapes?** (strength, attractiveness)
- C. Why do you think your structure will hold at least twenty-five pounds, and how much total weight do you think it will hold?** (answer should state something about how the triangle is the strongest shape to build with)

3. Generalize to your life.

- A. How would this relate to your every day life?** (your house, construction sites)
- B. How can you apply this to buildings as they are being built?** (you can use the shapes and the building design to make strong structures or buildings that will withstand certain types of weather such as tornados or hurricanes)
- C. Why would you not want to make an agreement with the lowest bidder?** (the structure may not last long, it could be hastily built, it may not withstand tornados or hurricanes)

4. Apply what you learned.

- A. What did you learn that you can apply to architecture?** (the strongest structures are built with strong materials and are reinforce by using architecturally strong shapes such as a triangle)
- B. In what way would you design a building or structure?** (answer will vary)
- C. Why is it better to build structures with high quality materials?** (to withstand nature, high winds, tornados, hurricanes, hail, snow)

Extension Activities:

- A. Younger students may be given a specific model to build.
- B. Older students may be challenged by requirements of building their structure with a certain amount of paper towel tubes, shortening the height of the structure or increasing the amount of weight the structure will be able to hold.

Resources:

Royal Institute of British Architects. "Architecture.Com ." . 10/17/2004. RIBA . 10/17/2004 <<http://www.architecture.com>>.

"Photovault.com." . 10/22/2004. Wernher Krutein Productions Inc. and Photovault. 10/22/2004 <<http://www.photovault.com/Link/Vehicles/Cars/Bridges.html>>.

"Pics4learning." . 10/19/2004. Tech4learning and Orange County Public Schools Technology Development Unit. 10/19/2004 <<http://pics.tech4learning.com/index.php>>.

Ching D.K., Francis. [A Visual Dictionary of Architecture](#). New York : Wiley, New Ed Edition, 1996.

Glossary:

Arches- A structure, especially one of masonry, forming the curved, pointed, or flat upper edge of an open space and supporting the weight above it, as in a bridge or doorway.