EDUCATING ELEMENTARY CHILDREN THROUGH ARCHITECTURE

AN INTERACTIVE ARCHITECTURE LEARNING UNIT FOR ELEMENTARY STUDENTS

UTAH CENTER *for* ARCHITECTURE

LESSON 03 - STRUCTURE/SCHOOL

TIES TO CURRICULA (SCIENCE)

Building Structures: Basic structural concepts including loads, supports, gravity, tension, and compression.
Nature and Materials: Basic discussion of the composition and characteristics of building materials including earth, metal, wood, glass, and plastic.
Scientific Method: Ask a question, hypothesize/investigate, test, analyze, share your results.

SUMMARY

In this lesson, we will talk about physical structure relating to buildings. Physical structure is what holds up the weight of a building. Like in social structures, many building materials and shapes are combined to make up a structural member that is stronger than the sum of the materials that went into creating it. Knowing how materials react under different conditions is an important part of architecture, for example some materials can be very strong when it is cool, but can lose their strength when subjected to intense heat. Bending materials into different shapes can increase or decrease their strength, also.

MATERIALS

Classroom/Teacher:

- identical textbooks for each group (this is to be held up by their structure - not too heavy)
- tape **

Architect/Volunteer:

- Handout 3.1 (copies for each group)
- Handout 3.2 (copies for each student) **
- ream of construction paper
- blank sheet of paper (for each student)

** optional

LESSON DISCUSSION - STRUCTURES *(10 MINUTES)*

Discuss various different types of materials that are common in modern day construction (e.g. wood, concrete, steel) and the different ways they can be combined to produce a distinctive structure. Talk about different structural elements (e.g. column, beam, cantilever, arch, dome, buttress, etc.). Consider demonstrating or drawing some of these elements or showing images of them and structures that have created unique buildings around the world.

LESSON ACTIVITY 1 - TRIANGULATION *(25 MINUTES)*

Organize students into their Box City groups. Pass out a copy of **Handout 3.1** to each group and have them select a group scribe. Distribute one piece of construction paper to each student. Challenge students to try to hold up a textbook with one piece of folded construction paper. The structure must be freestanding as it holds the weight. You can decide whether to let the students use tape, paper clips, staples, etc. Show the students that folding the paper (like an accordion) into a series of triangles could make it strong enough to hold a book. Simultaneously, the students are required to use the scientific method during their experimentation with Handout 3.1 (take a moment to define "scientific method" with hypothesis and trial and error if necessary with class). You might consider doing an example together as a class. Have them test an idea for each person in their group.

Although the students can/should be encouraged to try different approaches, they must team select a final solution. Have the groups share their final solutions with the rest of the class. If time allows, you might have student groups attempt to stack as many books as possible onto their solution. Discuss why some ideas held up the books better than others.

BOX CITY ACTIVITY - SHAPE, FORM, SIZE *(15 MINUTES)*

Ask the students to think about their buildings that they are going to create. Hand out blank pieces of paper and instruct them to sketch what kind of form they want their building to take relating to the different types of structure that have been discussed. This exercise will allow them to draw out ideas of what shape their building is going to take. Encourage exploration with forms that are "outside the box". Have students start drawing a simple floor plan/sizing their building, or even start selecting the boxes and materials they plan to use.

ACTIVITY 2 (OPTIONAL) - STRUCTURE MEETS FUNCTION *(10 MINUTES)*
Give **Handout 3.2** and a piece of construction paper to each of the students. Have students answer questions about structure and triangulation through matching, free response, and an individual folding project. (This is the part of the lesson where the students get to express ideas that may not have come out in the group setting.)

RESOURCES
Architecture in Education: A Resource of Imaginative Ideas and Tested Activities
Foundation for Architecture, Philadelphia; Edited by Marcy Abhau with Rolaine Copeland and Greta Greenberger

HANDOUT 3.1

INSTRUCTIONS

For each piece of paper you fold, answer the following questions.

1. Our Idea: _____

   Our Hypothesis (Why we think this will work - our best guess): _____

   _____

   _____

   Did it hold up the book? _____

   If not, why not? (best guess) _____

2. Our Idea: _____

   Our Hypothesis (Why we think this will work - our best guess): _____

   _____

   _____

   Did it hold up the book? _____

   If not, why not? (best guess) _____

3. Our Idea: _____

   Our Hypothesis (Why we think this will work - our best guess): _____

   _____

   _____

   Did it hold up the book? _____

   If not, why not? (best guess) _____

4. Our Idea: _____

   Our Hypothesis (Why we think this will work - our best guess): _____

   _____

   _____

   Did it hold up the book? _____

   If not, why not? (best guess) _____

HANDOUT 3.2

INSTRUCTIONS

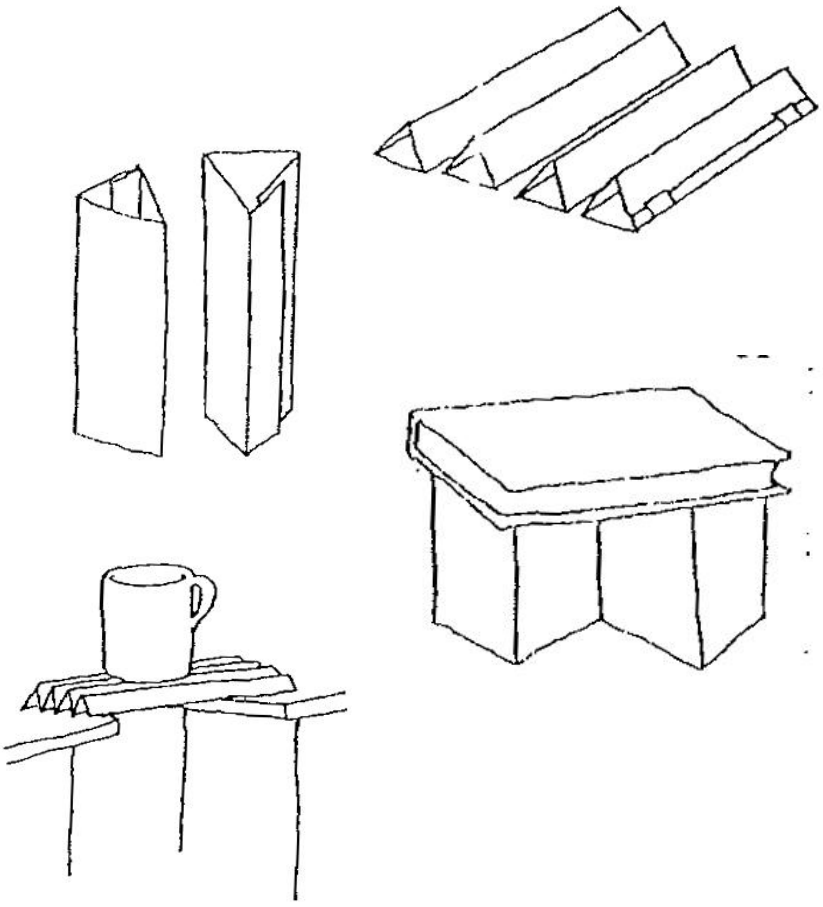
1. Draw a line between the structural need on the left and the structure that you think best meets it on the right. Your best guess is fine.

• Best for holding up a large mass (like the rock sculpture at Gallivan Center or a nest on top of a phone pole).

• Best for spanning a canyon like a bridge.

• Best for holding up the second floor of a building.

• Best for holding up a roof.



2. In the space below, draw YOUR OWN IDEA about what kind of folded piece of paper would hold up the most weight.

3. Fold the attached piece of construction paper into the idea you drew in the space above. Stack as many books as possible onto your structure. Record the number of books held.