Building Structures

Science Film Festival Knowledge Through Entertainment

FILM

GUB Explorer Channel - Building with Peas

KEY OBJECTIVES

1. To define what a structure is.
2. To identify the strength of a structure as its ability to hold a load.
3. To demonstrate problem-solving techniques such as brainstorming
4. To explain that different shapes have different strengths.
5. To understand and realise that triangles are the strongest shape and recognize them since they are found in most built structures.

INTRODUCTION

A structure is a solid that has a shape, size, and purpose.It holds a load.A bicycle has a certain shape and size. It is built securely so we can sit on it ,our weight is accommodated and it can take us places.There are three basic types of structures:

- **Solid /Mass structures:** A structure, natural or manufactured, that is made by the piling up of materials,they are held firmly in place by their own weight
- **Frame structures:** A type of structure in which a skeleton of materials supports the weight of the other parts.It allows most of the inside of the building to be empty space.
- **Shell structures:** A type of structure that obtains its strength and rigidity from a thin, carefully shaped outer layer of material and that requires no internal frame.Examples an egg / igloo.

The shape of a structure affects how strong it is. Rectangles, arches, and triangles are the most common shapes used to build big structures.

TOPICS

Conceptual design
sustainable life cycle analysis
architecture
urban planning
design
construction

KEYWORDS

Structures
design
mass structure
shell structure
frame structure
shapes

LEVEL

Early Learner
primary

RESOURCE TYPE

Experiment

INTENDED AUDIENCE SIZE

Small group

MODE OF DELIVERY

Live

TIME FOR ACTIVITY

45-60 min.

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GUIDING QUESTIONS

- What structural shapes have you tried that aren't working?
- What structural shapes or methods are you planning to include in your final design?
- What have you found about this structure that will help your design meet the challenge?

MATERIALS/PREPARATION

- 40 Gummy bears
- 20 Toothpicks
- Hardcover book
- Ruler
- 2 Paper towels

TASKS/PROCEDURE

For this experiment, try these challenges:

Challenge 1: Build the tallest tower you can with the toothpicks and gummy bears provided on the paper towel using 10 toothpicks and 20 gummy bears. Measure how high and how wide is your building and record. The instructor will collect the readings from the students and announce how high is the tallest structure/building. The instructure can introduce timing, how fast a student can come up with the tallest structure.

Challenge 2: Build different structures with gummy bears and toothpicks on the paper towel. Use 20 gummy bears and 10 toothpicks.

1. Start by building a cube by connecting the toothpicks to the gummy bears.
2. Once your cube is made, test your structure by placing the book on top.
3. If your cube is not successful, try building another shape, such as a pyramid.
4. Build 3 pyramids out of the toothpicks and gummy bears.
5. Try spreading them out and placing the book on top.
6. Continue to adjust your structures as needed until they can support the book

FOSTERING DISCUSSIONS

Some shapes have more strength than others. Triangles give more support than squares when building structures. Triangles are used a lot in construction of things like bridges. An engineer can test many different solutions and each time they redesign it, the solution can get better. The triangle is the strongest as it holds its shape and has a base which is very strong. The triangle is common in all sorts of building supports and trusses. It is strong because the three legs of a triangle define one and only one triangle. If all three sides are made of rigid material, the angles are fixed and cannot get larger or smaller without breaking at the joints, unlike a rectangle, for example, which can turn into a parallelogram and even collapse totally. If you take a rectangle and place one diagonal piece from corner to corner, you can make that strong and stable, too, but doing that makes two triangles!! Think about it! So yes, it is the strongest shape

SAFETY INSTRUCTIONS

Be careful not to poke yourself with the toothpicks.

AUTHORS AND SOURCES

Submitted by Discovery Centre Kenya

- extension.psu.edu/programs/betterkidcare/early-care/tip-pages/all/creating-xtructures-common-and-uncommon-ideas
- www.designingbuildings.co.uk/wiki/Types_of_structure
- littlebinsforlittlehands.com/building-with-jelly-beans-easter-stem-and-engineering-for-kids/