

Western Engineering Outreach

Jellybean Structures

SK- Grade 2

Meet Today's ENG HERO!

Tim Newson - Associate Professor with Western Engineering

Dr. Newson has a PhD in geotechnical engineering from the University of Wales in the United Kingdom. His research group is the Geotechnical Research Centre (GRC) at Western. Their area of focus includes soil mechanics, rock mechanics, foundation design, geo-environmental engineering, tunnels, underground structures, dams, and earthquake engineering. They are involved in many projects both as consultants and researchers.

If you want to learn more about Dr. Newson and the GRC, visit

<https://www.eng.uwo.ca/grc/>

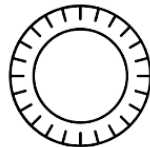
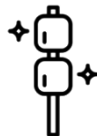


Learning Goal:

- Students will learn what a structure is and its ability to maintain stability and strength
- Students will consider how forces play a role in affecting the strength and stability of structures
- Students will understand about everyday structures and materials
- Curriculum Connections: Grade 1 - Materials, Objects, and Everyday Structures and Grade 3 - Strong and Stable Structures

Materials Needed:

- Jellybeans or mini marshmallows or jujubes
- Toothpicks
- Paper plates



Engineering and Science Connections:

Today we will be talking about structures!

What are some examples of some structures?

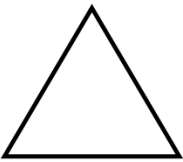
A structure is any solid that has a shape, size, and a purpose. Most importantly, a structure also holds something. Your house is a structure, the CN tower is a structure but so is a cup.

Introduction to Structures

Characteristics of Structures:

- Structures need to be strong and stable to be useful
- Structures must have both form and function
- Structures are affected by the forces acting on them (like gravity)

Strength of Shapes



Shapes with the fewest amount of sides will be the strongest because they have fewer points at which the shape is able to break. As the number of sides in the shape increases, the shape becomes weaker.

This means the strongest shape is a triangle!

Forces on Structures

Some of the forces that are acting on structures and need to be taken into account by engineers are the following:

- Gravity
 - The force that pulls us towards the centre of the Earth and keeps us on the ground
- Pushing and Pulling
 - In extreme weather situations like earthquakes and strong winds, these forces must also be taken into account so the structures can stay strong in all conditions

The larger a structure is, the stronger the gravitational force acting on the structure will be. To help large structures stand and stay strong and stable, they should be heaviest on the bottom. A stable foundation will create a stable structure! This is a key concept for civil engineers.

Video Recommendation: *Strong Structures with Triangles - Design Squad*

<https://www.youtube.com/watch?v=mBHJtWbsiaA>

Activity:

Before you start, think about the following questions:

- What is a structure? What are some examples?
- What are two things that can be used to make a house strong and stable?

Mission: Impossible

You have been delivered a very important package (at least 100g), but it is extremely volatile and cannot touch the ground or table under any circumstances! Time is of the essence, so you will need to use items you have on hand like jellybeans and toothpicks to create a structure that will hold the package off the surface of the table. The package must stay off the table for 5 seconds in order for the volatile contents to be deactivated.

Remember what you learned about shapes in order to make your structure as strong as possible! Use the jelly beans (or marshmallows or jujubes) as connectors between the toothpicks to create your structure.

Test your structure using a small box. Does it stand for 5 seconds? How can we fix any issues that arise...

What Did You Learn?



- What external force was working on our structures?
- How did you adjust your building to withstand the extra weight?
- What makes your structure strong and stable?
- How did the shapes you use in your structure affect its strength? Where do you see this in buildings designed by civil engineers every day?

Future Learning



- Redesign your building to contain as many triangles as possible and test again. Did anything change?
- How do engineers decide what shapes and materials to use in their structures?

Share your creations!

We would love to see what you made. Email as at discover@uwo.ca or tag us on social media.

Instagram: @westernueng

Twitter: @westernueng

Facebook: @westernueng

Thanks for discovering with us!

