

Tallest Tower		Grade 5 – Structures and Mechanisms
<h2>Lesson Plan</h2>	<p>Safety Notes</p>	<p>Be careful when building something tall – if your tower is above head level, only stand on stable, non-wobbly surfaces (e.g., a stepping stool) to build or ask a taller person for help.</p>
<p>Description Do you have what it takes to build the tallest tower? Learn what traits make a tower a tower and put your building skills to the test against internal and external forces.</p>		
<p>Materials</p> <ul style="list-style-type: none"> Any materials that would be useful for building a tower-like structure (e.g., stackable blocks (not LEGO), books, aluminum foil, playdough, plastic cups, newspaper, popsicle sticks, tape) A load to test your tower (such as a can of soup) A hair dryer 		
<p>Science Background</p> <p>What is a tower?</p> <p>A tower is a free-standing non-domestic structure that is much taller than it is wide. Some examples of types of towers are communications towers (e.g., cell phone towers, the CN tower), bell towers (e.g., the leaning tower of Pisa), water towers, fire towers, electrical towers. A lot of skyscrapers that we call towers are actually not true towers (e.g., office buildings and apartment buildings)— they are classified as buildings. Generally, as structures, towers aren't meant as living spaces for humans.</p> <p>To build a tower that is strong and stable, engineers must consider forces that act upon the tower. These forces can threaten a tower's ability to perform its function without collapsing or breaking.</p> <p>There are two main categories of forces that act upon a tower: internal and external.</p> <p>What are internal versus external forces? Internal forces are stresses that occur inside of your building material, such as tension (pulling forces) and compression (pushing forces). External forces are stresses that act upon a structure from outside of the structure. External forces include natural phenomena, such as gravity, wind, and earthquakes.</p>		

Activity Procedure

The goal of this activity is to build a tower that is as tall as possible, but also stable and strong enough to withstand the internal and external forces that act upon it.

Using materials that you can find around the house, build the tallest tower possible. Make sure that there is a flat surface at the top of the tower for testing the tower's ability to support a load.

To test your tower with a load:

- Carefully place your load (soup can) on top of your tower. If your testing area at the top of the tower isn't a good shape for placing a soup can, you can put a piece of cardboard down on top of your tower to create a platform for the can.
- Your tower can wobble, but it should not collapse or be crushed by the can.
- If your tower fails this test, you cannot move on to the next tests. Consider how you can rebuild your tower to make it stronger. Is it the materials that you chose, or is it the shape of your tower that made it weak?

To test against an external force (wind)

- Plug in a hair dryer and turn it on at its highest setting.
- Blow the hair dryer at the tower. Try testing with the hair dryer at different parts of the tower. Are there some parts of the tower that seem weaker than others?
- If your tower fails this test, how can you rebuild your tower to make it stronger? Do you need to change your building materials or do you have to change the shape of your tower?

Debrief

There are lots of factors that affect a tower's ability to withstand external and internal forces. These factors include the materials used to build the tower, the size and shape of the tower's base, and how weight is distributed throughout the tower. Towers with wider bases and with centred mass tend to be more stable than towers with narrower bases and off-centre masses. It's important to consider these factors when designing and building a tower so that the tower can perform its functions.