Spaghetti Towers

NB - This experiment is slightly different to the others. Rather than a set protocol to follow and definitive results and conclusions, this is more of a challenge for the students. They have to plan, execute and evaluate their work.

Aim: This hands-on workshop is designed to challenge students to build the highest tower possible with limited supplies.

Curriculum Links:

By applying my knowledge and skills of science and mathematics, I can engineer 3D objects which demonstrate strengthening, energy transfer and movement.
TCH 2-12a / TCH 3-12a

Through discovery and imagination, I can develop and use problem-solving strategies to construct models.
TCH 1-14a / TCH 2-14a

Having evaluated my work, I can adapt and improve, where appropriate, through trial and error or by using feedback.
TCH 1-14b / TCH 2-14b

By using problem-solving strategies and showing creativity in a design challenge, I can plan, develop, organise and evaluate the production of items which meet needs at home or in the world of work.
TCH 3-14a

Having explored a range of 3D objects and 2D shapes, I can use mathematical language to describe their properties, and through investigation can discuss where and why particular shapes are used in the environment. ***MTH 2-16a***

I can develop and communicate my ideas, demonstrating imagination and presenting at least one possible solution to a design problem. ***EXA 2-06a***

While working through a design process in response to a design brief, I can develop and communicate imaginative design solutions. ***EXA 3-06a***

Spaghetti Towers

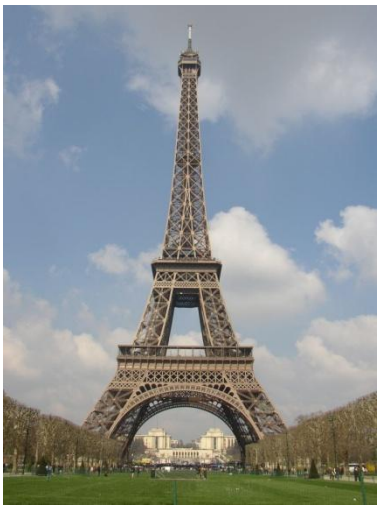
Background Information

When anything is being built – a building, a bridge, a road, or a pier – the architects and engineers have to design it carefully so that it is safe and fulfils the required purpose. This can be quite a challenge!

Have a look at some of these crazy structures.



Today you are going to build a tower using just spaghetti and marshmallows. First, let's look at some famous towers you might recognise. These can give you inspiration for your design.


Can you name these towers? Have a look at the clues to help you.

1. This tower is somewhere in England. It was opened to the public in 1894 and is 158 metres tall. There are lots of activities here including a circus and a dungeon.
   Blackpool Tower

2. This tower inspired the design for the first of our three examples. It is somewhere in France and is the tallest building in the city where it stands. It is 324 metres high.
   Eiffel Tower

3. This tower is in Italy. It is actually a bell tower for the cathedral. The height of the tower is 55.86m on the low side and 56.7m on the high side. The tower began has sunk on one side due to unsuitable foundations.
   Leaning Tower of Pisa

Spaghetti Towers

The world's tallest tower is the Canton Tower in Guangzhou, China. It is a TV tower measuring 600m and it looks pretty cool!

This will be overtaken by the planned Tokyo Sky Tree which will stand at 634m when it is completed in 2012.

Now let's have some fun with food and see how tall a tower you can build.

Equipment Required

- Spaghetti
- Marshmallows
- Measuring tape
- Chocolate egg (optional)

What to do

1. Split the children into teams of 3 - 5.
2. Give each team some spaghetti and marshmallows to test with.
3. Allow them to sketch, discuss and try ideas. They need to think about a few things. See "Hints and Tips" below.
4. Then give the teams 50g of dried spaghetti and 25g of mini marshmallows.
5. Set a time limit (however long you feel appropriate) and set them the challenge to build as high a tower as they possibly can. Pieces of spaghetti can be broken to give desired lengths.

Spaghetti Towers

Hints and Tips

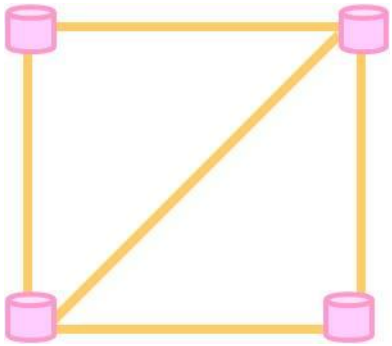
1. The spaghetti provides the framework and support for the tower and mini marshmallows are used to make the connectors.

2. The more the marshmallow can grip the spaghetti, the stronger the joint.

3. If there is a heavy load on a marshmallow, it may change shape until the joint fails so be careful!

4. Where you choose to use shortened pieces of spaghetti, make sure you cut them accurately. If you don't use pieces of equal length on each side, your tower may start to twist and topple.

5. Use shorter pieces of spaghetti or put in braces to strengthen squares and rectangles in your structure.



6. Think carefully about whether the spaghetti should pass all the way through the marshmallow or not. The strength of a joint depends on how well the marshmallow can grip the spaghetti.

7. There will be most strain on the base of the tower – think about how you can add strength here.

Judging

You can simply make the winning team the one with the highest tower or you could use a points system e.g.

1 point for every cm in height of the tower.
An extra 5 points if none of the marshmallows were eaten.
An extra 5 points if the tower looks good.
5 points if the tower will support weight (e.g. a chocolate egg).

Spaghetti Towers

Afterwards

Draw a diagram of your Spaghetti Tower in the space below.

What do you like and dislike about your current design?

What was the biggest challenge you faced? How did you overcome it?

If you had an opportunity to redesign your tower, what would you change?

How similar is your design to others in the room?

What things put a limit on how tall your tower could be?
Time, amount of materials, have to combine strength and height.