

Outreach Activity (with Callum Fleming)

The aim of the outreach activity was to introduce structural engineering to the students, teach some basic structural principles then get the students to put the principles into action by designing and building a bridge made from rolled up newspapers.

We thought it was important to give a short introduction to structural engineering as we were both unaware of it as a subject and career path when we were in Year 9. We showed lots of projects that required structural engineering, including obvious and relatable examples such as the Eiffel Tower and the Golden Gate Bridge, but also perhaps slightly less obvious ones like rollercoasters and fighter jets.

The first structural engineering principle introduced was the strength and stability of triangles, demonstrated by passing round a triangle made of 3 rolled up sheets of newspaper that were loosely bolted at each corner to produce a rigid shape. This was then compared to a square made in a similar way, but which then acts as a mechanism as it can easily collapse. It was then highlighted that the square could be made more rigid by adding a diagonal brace, essentially splitting it into 2 right-angled triangles.

The second principle introduced was buckling. Instead of delving into the maths we demonstrated it by showing that it is much easier to make a long and thin column of newspaper buckle than a short and stumpy one.

With these principles in mind, we moved on to the body of the outreach activity. This was a mini competition to design and build a newspaper bridge that could span 60 cm, with the winning bridge being the one to support the most cans of baked beans, which would be placed in a bucket suspended from the centre of the bridge. The students were split into teams of 3 and were supplied with plenty of pre-rolled newspaper tubes to speed up the activity. The tubes were hole-punched at either end so they could easily be attached to each other using nuts and bolts.

Before the students were allowed to start building in the Dyson Centre, they were asked to quickly sketch their bridge design so we could ensure that all the teams were on the right track. The students had a frantic 30 minutes to build their bridges, and we informally tested them at the end. Happily, every bridge managed to sustain some loading, with the winning team successfully supporting all 8 cans of baked beans.

We wrapped up the activity by introducing the idea of dynamics in structural engineering, and that even though structures ideally don't move, there are forces out there that will try to make them do so! The short presentation touched on ideas of protecting buildings against earthquakes, and finished by showing the Tacoma Narrows bridge disaster, a video the students will see many times again should they eventually pursue a career in structural engineering.