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Outreach Activity Report: Design of wings with paper aeroplanes

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School students generally have little experience of the design and manufacturing processes undertaken in developing new products. Often they do not consider the work that goes into engineering all the things that they see and interact with around them. There is often a disconnect between the academic work students do and the practical skills required to consider design constraints and come up with successful solutions.

The aim of this outreach project was to give the students a taste of the overall design process, from start to finish. Allowing them freedom in choosing their design and giving them the opportunity to make and test their design. This allows students to get excited about design engineering and the idea of developing new, more adventurous products for themselves. The project was designed to mirror my final year project giving students an understanding of different parts of the design process, but at a more achievable level for the time constraints and to suit the ability of the students.

It would have been great to have had the students with us for much longer and the scope to do detailed design work and use some more advanced manufacturing techniques, however given the short visit from the students a simple project focus would be needed. It was decided to get the students to design the wing profile for a paper aeroplane. This meant that students would be able to produce a design and make the plane and test it all within the 30 minute allocated time slot. It also led to a relaxed environment where learning and fun can go together.

The students listened to a short presentation about how to make the aeroplanes and possible inspiration for their designs, including delving into the fascinating world of biomimetics. They were then given a short time to come up with a design for their wings, we specifically made sure that none of the demonstration aeroplanes had a wing profile already cut to avoid influencing the designs the students came up with. This gave space for the students to be creative and generate ideas that they thought would work. We spent some time considering the design and testing process as an experiment and establishing the different variables. This meant students could get a taste of an iterative, scientific and rigorous approach to design. Each student then made a plane and customised their wing profiles. They had short time of testing and adjusting their designs to maximise the flight performance. Finally, all the students launched their planes together to work out which went the furthest and therefore had the best design for maximising flight length. The

session was concluded by thinking about potential improvements that could be made to the experiment and mapping the small-scale exercise onto the wider engineering world.

The exercise was a great success, with many of the students engaging fully in the task. All students managed to make their own aeroplane and come up with their own wing design. There was varying success in the performance of the planes that were made, but this added to the learning, as students could really see the influence of the designs on the outcome of the test flight. Most importantly all the students were having a good time and will have positive memories of design engineering that will hopefully inspire them to consider pursuing it further or make the most of the opportunities they have to do it at school.