Glasgow Science Festival Creating Engineers 2022
Glasgow's Making Waves Car Challenge

The Glasgow Science Festival (GSF) **Creating Engineers** competition has run for nearly two decades. Each year, we welcome over 12,000 primary 5 & 6 pupils from across the West of Scotland and surrounds to take part.

Pupils work in pairs and compete through four rounds (classroom, cluster, area final & grand final) for the chance to become the **Glasgow Science Festival Creating Engineers Champions**. The competition tests the pupils on their teamwork, problem solving, construction skills and creativity through engineering-based challenges.

Due to ongoing restrictions from COVID, we were unable to run the 2022 competition in its usual form. As part of GSF22, we invite you to take part in our **Creating Engineers 2022 Classroom Challenge**, anytime throughout May and June.

The Challenge

The theme for GSF22 is Glasgow's Making Waves. When it comes to engineering, Dorothée Pullinger certainly made waves! In 1918, she and her father designed the Galloway car; a lightweight low-cost car aimed specifically at the new market of women drivers. Many of whom learned to drive during the war. The Morris Mini, famous in the 1960s was designed in response to a global fuel shortage. The Honda Insight was a leader in hybrid technology as car manufacturers began to respond to environmental challenges (more info later).

1) We want you to

- Identify a challenge that car manufacturers might be or are currently facing
- Design or adapt a car to respond to that challenge

2) Make the Car

Unfortunately, we are not able to loan K'Nex boxes currently, so please tackle the challenge through whatever means you have available. For example:

- K'Nex, Lego or other construction materials
- Diagrams or schematics
- Models made from e.g., paper, cardboard, sticks
- Multimedia e.g., poster, video, animation

3) Encourage pupils to consider the following:

- Design and planning are critical. Spend time on this step before beginning your build.
- What challenges did you face?
- How did you change and improve your design?

How to Run the Challenge

Typically, the challenge is run as follows

- Pupils compete as teams of two
- Pupils are given one hour to complete the challenge
- Each team is provided with paper and encouraged to plan out their designs
- Designs are rated using the GSF judging sheet (last page of this document)

We have included the judging sheets used in our competition stages. However, it is entirely up to you if you would like to run it as a competition or a classroom project.

Celebrating Pupils Work

As a thank you and to recognise the pupil's work:

For Pupils in our Challenge Local Authority Areas*
Complete our online form (link below) to receive

- Creating Engineers 2022 class participation certificate
- GSF Creating Engineers badge per pupil

Dumfries & Galloway, East Ayrshire, North Ayrshire, South Ayrshire, East Dunbartonshire, East Renfrewshire, Glasgow City, Inverclyde, North Lanarkshire, Renfrewshire, South, Lanarkshire, West Dunbartonshire

For all other areas
Complete our online form (link below) to receive

- Creating Engineers 2022 class participation certificate

Glasgow Science Festival Creating Engineers 2022 Online Form

This asks for school name, teacher contact name, email address, postal address, pupil numbers per class. The info will not be used in any other way except to send you the certificates and/or badges.

Share with us on social media:

Twitter: @GlasgowSciFest #GSFCreatingEngineers
Instagram: @glascifest
Facebook: @glasgowsciencefestival

Join our **GSF Mailing List** to be informed when GSF Creating Engineers 2022 is announced

For more info on Creating Engineers please visit our website

Glasgow Science Festival: Glasgow's Making Waves, 2nd to 12th June 2022

Glasgow Science Festival returns to the City throughout June with our action-packed programme events delivered in partnership with research staff and students form Glasgow and beyond. Find us popping up in museums, libraries, Glasgow Botanics Gardens, and lots of other spaces. Why not combine a school trip to the Glasgow Botanic Gardens or the Riverside Museum with some GSF fun!

We will be taking bookings for up to three classes each day for our Glasgow Botanic Gardens event. More info available here.

Online Content

We will also be online with Science on the Sofa. Our digital content packed full of experiments and other activities for you to do at a time and pace that suits.

Our digital programme **Science on the Sofa** features dozens of activities suitable for the classroom. Created with our partners, including the University of Glasgow, Strathclyde, GCU, UWS, Edinburgh, The Open Uni and Manchester. All content is designed to be self-led and readily available for you to engage with at your leisure.

Science on the Sofa is divided into four strands:

1. **Hands-Online**: dozens of experiments, activities, demo's and workshops. Covering a range of subject areas including a COP26 feature. The activities are supported by instructional videos, how-to guides and activity packs. Designed for use at home, in the classroom or community settings. Using readily available and inexpensive materials.
2. **Citizen Science:** introducing **Spot a Bee** and the **Gulls Eye Project**. Two citizen science projects created by University of Glasgow researchers, inviting you to take part and help collect valuable data.
3. **COVID: Glasgow Responds:** informal talks and resources exploring the contribution local research teams have made to the ongoing efforts to tackle the pandemic.
4. **Talking Science:** talks on two themes, COP26 and Health & Wellbeing

Information on the in-person programme launches on our website on May 5th, with events starting on the 2nd June. Our digital offer, Science on the Sofa, goes live on the June 2nd and is available until 30th June.

www.glasgowsciencefestival.org.uk

More info on innovative car design over the years

Our thanks to Rachel and colleagues at the Riverside Museum for providing the following info and images. You can see these cars in-person at the museum! Images courtesy of Culture and Sport Glasgow (Glasgow Museums) 2022

Dorothée Pullinger and the Galloway Car

Dorothée Pullinger was a female Car engineer/designer and businesswoman. Dorothée trained under her father at the Arrol-Johnston car works in Paisley from the age of 16. This was unusual at the time as engineering was very much a man's industry. Then when World War broke out, she was employed to manage a munitions factory and its 7000 female workers.

In 1914 she was denied the right to join the Institution of Automobile Engineers on the grounds that she was female. She went on to found the Women's Engineering Society a year after the war ended. After the war at the age of 26, Dorothée moved to Kirkcudbright in the south of Scotland, to become the Director and Manager of Galloway Motors, a car company who employed women and hosted an engineer collage for women. Pullinger, the car designer, remodelled the Fiat 501 for female drivers. The Galloway was the first car in Scotland designed by women, for women.

What made Dorothée Pullinger's Galloway Car different:

- Cars in 1920's were much bigger than today and built for taller men. The Galloway was lighter and smaller.
- Seats were raised and dashboards were lowered. The steering wheel was smaller too.
- There was more storage space.
- It was one of the first cars to have a rear-view mirror
- Cars sometimes had the gear stick and hand break on the outside of the driver's seat next to the door. Dorothée moved these into the middle to make it easier to get into the car.
- The engine was more reliable too.

The Morris Mini

The Morris Mini is more than just another small car. It has become central to the culture of the 1960s; a vehicle, like no other, that represents opportunity, style, and change. Alec Issigonis the designer used ingenious engineering solutions to respond to the global fuel shortage caused by the 1956 Suez Crisis. It was to meet the needs of the consumers, creating something more efficient, affordable, and practical.

The single most important decision he made was to rotate the engine through 90 degrees (transverse) and so dramatically shortening the car's length. Other adaptations included:

- Door hinges outside
- Battery moved from engine to boot
- Smaller wheels meant that the wheel arches took up less room inside the car
- Sliding windows, rather than rolling ones, allowed for thinner door panels
- Storage space available under rear seats

Honda Insight

With the world's smallest and lightest 1-litre engine, the Honda Insight once led the way in hybrid technology and environmental-friendliness. As a response to global warming, car manufacturers started to move towards electric vehicles with Hybrids being a popular transitional option.

Like the Mini, Honda focused its attention on fuel efficiency when designing the Insight. With adaptations including:

- One of the most streamlined aerodynamic designs of the time, with a very lightweight aluminium body.
- The hybrid technology of the electric motor-assisted system supported the petrol engine during hard acceleration and recharged the battery during deceleration.
- The Idle-stop system was designed to preserve fuel when possible, by stopping the engine when the car was waiting.
- The original Insight was a compact 2-seater but still had generous storage.
- Fuel efficiency displays included in the instrument panel

Pupil 1		Pupil 2	

Judging Criteria	Consider	Score	Judges Comments:
Presentation, Communication & Teamwork Max Points 25 Poor 1–6 Average 7-15 Good 16–21 Excellent 22-25	• Did the pupils plan the model before building it? • Do they have drawings they can show, were they made before, during or after they started to build? • How well did the team communicate about their design? • Do they play to their individual strengths and use them to make a good team? • Do they work well together?		
Problem Solving Max Points 25 Poor 1–6 Average 7-15 Good 16–21 Excellent 22-25	• Discuss the problems the pupils encountered during the design & construction stages of the model. • Did they overcome the problems methodically & analytically? • What ideas were tried before the final solution was adopted? • Have they shown a clear understanding of how to problem solve? • Did they work together on solving them?		
Operation, Function & Design Max Points 50 Poor 1–10 Average 11–25 Good 26–40 Excellent 41-50	• Have the pupils built an effective model that meets the criteria - interesting, novel and sturdy with moving parts? • Does it perform the intended function competently, could it be improved? • Has safety been considered, is it strong and sturdy? • Review your overall impression of the model, is it visually appealing?		Operation and Function 30 points Design and Visual Appeal 20 points
Judged by:	**Max Score: 100 points** **TOTAL**		Any other comments: