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| **Super Sleigh** | | | |
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| Designing a high-tech, environmentally friendly replacement for Santa’s sleigh | | | |
| **Subject(s):** Design & Technology, Engineering  **Approx. time:** 50 - 60 minutes |  | | **Key words / Topics:**   * Christmas * design brief * design criteria * environmental issues * global warming * sketching * sustainability |
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| **Suggested Learning Outcomes** |  | |  |
| * To be able to design an environmentally friendly alternative for Santa’s sleigh. * To understand the impact of carbon emissions on the environment. * To be able to communicate design ideas using sketches, notes and annotations. | | | |
| **Introduction** |  | |  |
| This is one of a series of resources designed to allow learners to use Christmas themes to develop their knowledge and skills in Design & Technology and Engineering. This resource focusses on designing a high-tech, environmentally friendly replacement for Santa’s sleigh.  Carbon emissions cause global warming and are bad for the environment. Can you help Santa develop an environmentally friendly replacement for his sleigh? | | | |
| **Purpose of this activity**  In this activity, learners will design a high-tech, environmentally friendly replacement for Santa’s sleigh. The sleigh will use a sustainable method of allowing it to fly through the air to deliver the presents.  This could be used as a one-off main lesson activity to build knowledge and understanding of environmental issues and sustainability. Alternatively, it can be used as a part of a wider group of resources that use the Christmas theme to build knowledge and skills in D&T and Engineering. | | | |
| **Activity** |  | | **Teacher notes** |
| **1. Overview of the Lexus Hoverboard (10 mins)**  Show and discuss videos recapping the story of and science behind the Lexus Hoverboard design, as an example of an alternative method of flight.  ***Story behind the design:***  [*https://www.youtube.com/watch?v=q\_BYvUlDviM*](https://www.youtube.com/watch?v=q_BYvUlDviM)  ***Science behind the design:***  [*https://www.youtube.com/watch?v=IM0sRctOxQc*](https://www.youtube.com/watch?v=IM0sRctOxQc)  **2. Introduce the design brief and design criteria (5-10 mins)**  Introduce and discuss the following design brief and criteria with the class.  ­­­­***Situation***  *Santa is concerned that his current sleigh is not environmentally friendly, as the reindeer produce a lot of emissions. With more presents to deliver than ever, he is also worried that it is no longer fast enough to get the job done on time.*  ***Brief***  *Design a high-tech replacement for Santa’s sleigh. Your design should use an environmentally friendly method of enabling the sleigh to fly through the air, such as a super-sized hoverboard powered by renewable energy.*  ***Criteria:***  *The sleigh must:*   * *Be suitable for Santa to use to carry his presents on Christmas Eve.* * *Use an environmentally friendly method to achieve and maintain flight.* * *Be aerodynamically designed and lightweight to increase its speed.* * *Be aesthetically appealing.* |  | | **Links with ‘The Moving World’**  This activity also provides opportunities to link with the ‘The Moving World’ suite of activities. This includes the resources ‘Overcoming Friction’ and ‘Designing a Hoverboard’.  The resource ‘Understanding Aerodynamics’ can also be used as a complimentary activity or to recap previously taught knowledge on the topic.  **Notes and annotations**  Learners should use notes and detailed annotations to explain and describe how their design meets the needs of the brief and design criteria. They should especially focus on how the sleigh would function and the underlying technology and engineering that would enable this to happen. |
| **3. Designing the product (30 mins)**  Learners sketch their idea for a sleigh that meets the needs of both the brief and the design criteria given. They should ensure that they show and fully explain how the sleigh achieves and maintains flight using an environmentally friendly method.  Designs can be produced on the handout provided or on blank A4/A3 paper.  **4. Peer review (5-10 mins)**  Learners to ask three people to suggest one improvement each to their design.  They should then select one of these suggested improvements and use it to update the design. |  | |  |
| **Differentiation** |  | |  |
| **Basic** |  | | **Extension** |
| Allow access to the internet to research sustainable flight technologies or hoverboards.  Provide additional teaching materials surrounding this topic such as relevant D&T/Engineering textbooks.  Provide links to additional examples of products that use renewable energy and/or other environmentally methods of achieving flight. |  | | Learners could consider other potential uses of the sleigh that they have designed.  Learners could think about how the technologies used could be modified to meet other social and/or environmental needs, such as moving injured people around a hospital or transporting heavy goods. |
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| **Resources** |  | | **Required files** icon-docicon-pdficon-ppt |
| * Projector/whiteboard * Sketching equipment |  | | icon-ppt Super Sleigh Teacher Presentation  icon-pdf Super Sleigh Handout |
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| **Additional websites** |  | |  |
| The following websites can be used for additional background information or to aid with the activity:   * **GCSE Bitesize – Environmental, social and economic challenges:** Revision notes and video explaining environmental issues and the 6Rs of sustainability. <https://www.bbc.co.uk/bitesize/guides/zbn6pbk/revision/4> * **IET Faraday Resources – Understanding Aerodynamics:** A free resource that can be used to build learner knowledge and understanding of the principles of aerodynamics. <https://education.theiet.org/secondary/teaching-resources/understanding-aerodynamics/> * **IET Super Sleigh competition:** Learners could enter their designs into this competition! <https://education.theiet.org/campaigns/santa-loves-stem/kids-competition/> | | | |
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| **Related activities (to build a full lesson)** |  | |  |
| **Starters**   * Discuss the effects of carbon emissions and global warming on the environment * ACTIVITY: Understanding Aerodynamics   **Main**   * ACTIVITY: Super Sleigh * ACTIVITY: Designing a Hoverboard | | **Plenary**   * Peer review, giving feedback on designs | |
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| **The Engineering Context** film |
| Ensuring sustainability and environmental issues are considered in the design of products is an important part of the new GCSE courses in Design and Technology and Engineering.  The knowledge gained can also be used when making use of environmentally friendly technologies to support the design of future products and systems. |

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| **Curriculum links** | |
| **England: National Curriculum**  Design & Technology   * KS3 1a, 1b, 1d, 1e, 3c, 3d | **Northern Ireland: Curriculum**  Technology & Design   * KS3 Knowledge, understanding and skills: Design – identifying problems; investigating, generating, developing, modelling and evaluating design proposals; giving consideration to form, function and safety. * Communication – use of free-hand sketching and formal drawing techniques and ICT tools (including 3D modelling).   Learning Outcomes:   * Demonstrate creativity and initiative when developing ideas and following them through. |
| **Scotland: Curriculum for Excellence**  Technologies   * TCH 3-05a, TCH3-07a, 4-09a, 3-11a | **Wales: National Curriculum**  Design and Technology   * KS3 Skills: Designing 1, 2, 3, 6, 8 |
| **GCSE D&T**  AQA D&T   * 3.1.1, 3.1.2, 3.3.2, 3.3.4, 3.3.5, 3.3.6   Edexcel D&T   * 1.1.3, 1.1.7, 1.2.2, 1.3, 1.15.1, 1.17   Eduqas D&T   * 2.1 Core: 1, 2, 3 * 2.2 Core: 1, 5, 8, 10   OCR D&T  1.1a, 1.2a iv, 2.1a, 2.2a, 3.1a, 3.2, 4.1a | **GCSE Engineering**  AQA Engineering  3.1.3, 3.4.3, 3.5, 3.6 |
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| **Assessment opportunities** | | |
| Regular questioning throughout the activity, formal teacher assessment of completed work, peer review of designs produced. | | |
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| **Personal, learning & thinking skills (PLTS)** | | |
| * Self-manager * Effective participator * Reflective learner * Creative thinker | | |
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