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| **Designing a Sports Wheelchair** | | |
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| Designing a sports wheelchair for a Marathon race | | |
| **Subject(s):** Design and Technology, Science  **Approx time:** 80-110 minutes |  | **Key words / Topics:**   * Athletes * Materials * Carbon Fibre * Ergonomics * Aerodynamics * Search engine * Camber * Wheelchair * Marathon |
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| **Stay safe**  Whether you are a scientist researching a new medicine or an engineer solving climate change, safety always comes first. An adult must always be around and supervising when doing this activity. You are responsible for:    • ensuring that any equipment used for this activity is in good working condition  • behaving sensibly and following any safety instructions so as not to hurt or injure yourself or others    Please note that in the absence of any negligence or other breach of duty by us, this activity is carried out at your own risk. It is important to take extra care at the stages marked with this symbol: ⚠ | | |
| **Suggested Learning Outcomes** |  |  |
| * To develop skills in internet researching * To be able to communicate a design through drawing using information gained through research | | |
| **Introduction** |  |  |
| This is one of a series of resources designed to allow learners to use the theme of the London Marathon to develop their knowledge and skills in Design & Technology and ICT. This activity is focused on the design of racing wheelchairs, but also develops understanding about the use of search engines.  This activity considers the use of different search terms when using internet-based research using search engines and how this affects the outcomes of the search. The main activity involves designing a racing wheelchair considering key aspects to enhance its performance. | | |
| **Purpose of this activity**  In this activity, learners will use the theme of the London Marathon to respond to a design context, investigate the context on the internet and design a wheelchair for sports use.  This activity could be used as a main lesson activity to develop skills in designing. It could also be used to teach learners about how to search the internet effectively to gain the information that is most applicable to their requirements. | | |
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| **Activity** |  | **Teacher notes** |
| **Introduction (10-20 minutes)**  Show the video of the Wheelchair 100m Final at London Olympics, <https://www.youtube.com/watch?v=-wKBcCiUfdU&list=RDCMUCi8n36NkW2uCQSFZNiYtuMQ&index=4>  . Class discussion about the race – what were the benefits and limitations of the sports wheelchairs?  Using slides 3-6 in the presentation, teacher to introduce the task – what race we are designing a sports wheelchair for (the marathon) and the main features of sports wheelchairs. Teacher then presents the case study about a famous Paralympian – what key information have the class learned?  **Internet searching (20-20 minutes)**  Using the instructions given in slides 7-10, learners to explore the effect of the search terms used on the ability to ascertain useful information on this topic.  **Designing (30-40 minutes)**  Teacher to present some of the other considerations needed to design the sports wheelchair using slides 11-14.  Learners now apply what they have found out to design four ideas. Learners should annotate their ideas with information about the identified requirements.  **Final Design (20-30 minutes)**  Learners to create a final design for their racing wheelchair, ensuring all key requirements are covered and annotated and included in their design. |  | Print the activity sheet and distribute to the learners  **Internet searching**  Learners should complete the first page of the activity sheet as they carry out this activity. The search terms are shown on the activity sheet.  **Designing**  Learners could be provided with a template of a sports wheelchair to adapt to their design (rather than drawing from scratch).  Approaches such as SCAMPER or SCARED could be used to prevent design fixation during ideas generation or development.  Final ideas could be drawn using a 3D method, such as isometric for example. |
| **Differentiation** |  |  |
| **Basic** |  | **Extension** |
| * Provide learners with a template of a sports wheelchair to adapt to their design (rather than drawing from scratch). |  | * Learners to explore who is faster – 100m runner/chair, 1500m runner/chair, marathon runner/chair. |
| **Resources** |  | **Required files** icon-docicon-pdficon-ppt |
| * Pens, pencils and drawing instruments * Computer access for internet searching |  | icon-ppt Presentation Racing Wheelchair  icon-doc Activity Sheet Racing Wheelchair |
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| **Additional websites** |  | |  |
| * **London marathon homepage:** <https://www.tcslondonmarathon.com/> * **100 m wheelchair final at the London Olympics:** <https://www.youtube.com/watch?v=-wKBcCiUfdU&list=RDCMUCi8n36NkW2uCQSFZNiYtuMQ&index=4> * **How it’s made, Racing Wheelchair :** <https://www.youtube.com/watch?v=iByhv_iFPW8> * **Alphatauri** : <https://wtf1.com/post/alphatauri-have-helped-to-design-a-racing-wheelchair-for-the-paralympics/> * **Racing Technology for a Racing Wheelchair :** <https://mag.toyota.co.uk/racing-technology-for-a-racing-wheelchair/> * **Using Search Engines :** <https://edu.gcfglobal.org/en/internetbasics/using-search-engines/1/> | | | |
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| **Related activities (to build a full lesson)** |  | |  |
| **Starters** (Options)   * Show video of 100 m final from London Olympics to set the scene of racing wheelchairs <https://www.youtube.com/watch?v=-wKBcCiUfdU&list=RDCMUCi8n36NkW2uCQSFZNiYtuMQ&index=4> | | **Plenary**   * Self/peer assess the design ideas produced. * Learners to share their thoughts on what the future of wheelchair racing is – where will technology take us next? | |

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| **The Engineering Context** |
| Engineers use their knowledge to develop specialised materials that improve performance during many different types of racing – from wheelchairs to formula 1 cars to jet planes. This enables competitors to be able to perform faster and for longer, achieving more success. Many of these developments subsequently get used to improve the performance of things we use daily – such as cars. |

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| **Curriculum links** | |
| **England: National Curriculum**  D&T KS3   * understand developments in design and technology, its impact on individuals, society and the environment, and the responsibilities of designers, engineers and technologists | **Northern Ireland Curriculum**  KS3 Technology and Design   * identifying problems; investigating, generating, developing, modelling and evaluating design proposals; giving consideration to form, function and safety |
| **Scotland: Curriculum for Excellence**  Technologies   * I can apply my knowledge and understanding of engineering disciplines and can develop/build solutions to given tasks. * TCH 3-12a | **Wales: National Curriculum**  D&T KS3   * identify and use appropriate sources of information to help generate and develop their ideas for products * be creative and innovative in their thinking when generating ideas for their products |
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| **Assessment opportunities** |
| Formal summative assessment by the teacher of the finished worksheet. |