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| **Making a vehicle for an egg race** | | | |
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| Designing and making a vehicle to transport an egg in a race | | | |
| **Subject(s):** Design & Technology, Engineering  **Approx time:** 70 - 120 minutes |  | | **Key words / Topics:**   * Aerodynamics * Card modelling * Prototyping * Sketching * Speed |
| **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 be able to design and make a vehicle to transport an egg in a race. * To understand what is meant by ‘aerodynamics’. | | | |
| **Introduction** |  | |  |
| This is one of a set of resources designed to allow learners to use Easter themes to develop their knowledge and skills in Design & Technology, Engineering and Mathematics. This resource focuses on designing and making a vehicle to transport an egg in a racing event. | | | |
| **Purpose of this activity**  In this activity learners will design and make a car that can safely carry an egg in a racing event and compete against other designs.  This activity could be used as a main lesson activity to teach learners about modelling and prototyping, or part of a wider scheme of learning covering manufacturing processes and techniques. It could also be used as part of an introduction to aerodynamics. | | | |
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| **Activity** |  | | **Teacher notes** |
| **Introduction (10-15 minutes)**  Teacher to explain that learners are going to design and make an egg racer and explain the design brief shown in the teacher presentation.  ***Design brief***  *Design and make a race car that can safely carry an egg down a small hill.*  *Your racer will compete against others to see which is the fastest.*  *The egg must not break.*  *The racer must be made from the following materials and resources:*   * *Card* * *Straws* * *Wooden dowels* * *Wheels (or plastic bottle tops)* * *Card tubes* * *Masking tape,* * *Glue and glue gun*   Teacher to introduce and hand out resources required for the task to learners.  **Demonstration of what is required (10-15 minutes)**  Teacher to present the following steps to produce an example racer, as shown on the presentation:   * Step 1 making the base – Cut a piece of card 150 mm (length) x 70 mm (width). * Step 2 making the wheel axles – Cut two straws to a length of 70 mm each. Use masking tape to stick the straws to each end of the card base. Insert the dowel into the straws. Leave an equal amount of space on each side for the wheels to fit. * Step 3 Adding the wheels – Put glue in the middle of the inside of each wheel or bottle top. Use this to join each bottle top to each dowel. These are your wheels! * Step 4 making the egg holder – Turn your car upside down. Cut a cardboard tube to a suitable length. Glue or tape this to the main body of the car.   **Designing an egg racer (15-20 minutes)**  Learners to sketch initial ideas for their egg racer. They can do this using the provided handout or on a blank sheet of paper.  **Making the egg racer (20-45 minutes)**  Learners to make their design using the available equipment.  **Plenary (5-10 minutes)**  Taking selected designs, identify their good features and what could be improved. |  | | **Steps to make an example egg racer**  The steps shown give an example of how an egg racer could be made to assist the development of workable ideas. This could be used to guide lower ability learners or for learners who produce a design idea that would otherwise not be practical to make.  The final vehicles need to be placed on a slight slope for the race. For example, this could be a natural slope, or a plank or board rested on a table. As an alternative to a direct race, the evaluation could be based on the time taken to go down the ramp (which could allow the integration of maths, for example to calculate the average velocity) or determining which vehicle continues furthest along the floor after coming down the ramp.  The demonstration could use the presentation or be carried out practically. The concept of aerodynamics could be introduced here.  If learners are reproducing the provided design (rather than their own), step 1 could be completed in advance or a template could be given so that they cut to the right measurements.  The straws used in step 2 could be cut to the appropriate length in advance. If dowels are used these should be pre-cut to 100 mm in advance. Dowels must be small enough that they can fit easily through the straws and rotate freely. Wooden skewers with the sharp point cut off could also be used.  A hot glue gun could be used for in stage 3. Glue should be placed on the inside of the bottle tops. Alternatively, card wheels could be made and glued or taped in place. It is important that the join between the wheels and the dowel is in the middle of the wheel so that they rotate correctly.  If a source of thrust is added to each car by completing the extension activity, then the race could be performed on a flat surface. |
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| **Differentiation** |  | |  |
| **Basic** |  | | **Extension** |
| * Provide a kit of materials pre-cut to the sizes shown on the teacher presentation, that learners can then assemble using the examples shown. * Learners make or customise the example shown in the presentation, rather than their own design. |  | | * Learners could improve the aesthetics of their car by using colours and personalised features, such as racing stripes. * Learners could create a source of thrust for the car. For example, they could use an elastic band, a balloon or even an electric motor. |
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| **Resources** |  | | **Required files** icon-docicon-pdficon-ppt |
| * Card * Straws * Wooden dowels or skewers with sharp points removed * Wheels (wood or card) or plastic bottle tops * Card tubes * Masking tape * Glue * Glue guns if available * Scissors * Rules or rulers for measuring |  | | icon-ppt Teacher presentation – Making a vehicle for an egg race  icon-pdf Learner handout – Egg racer design ideas |
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| **Additional websites** |  | |  |
| * **YouTube – Rubber band powered car carrying an egg:** Video showing an example of an egg carrying car that uses an elastic band to provide thrust. <https://www.youtube.com/watch?v=xKCyTtBQQCo> * **Craftulate – Pringles can race car:** How to make a race car using an empty can of Pringles. <https://craftulate.com/pringles-can-racing-car/> | | | |
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| **Related activities (to build a full lesson)** |  | |  |
| **Starters** (Options)   * Show and discuss examples of existing egg race cars. * World’s worst – describe the worst possible egg racer. | | **Extension** (Options)   * Learners could improve the aesthetics of their car by using colours and personalised features. * Learners could create a source of thrust for the car. For example, they could use an elastic band, a balloon or even an electric motor.   **Plenary**   * Taking selected designs, identify their good features and what could be improved. | |
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| **The Engineering Context** film |
| Engineers make models and prototypes to test ideas and see how they will work. For example, they will put a model of a car in a wind tunnel to see how aerodynamic the design is. This helps to make designs that use the minimum amount of fuel. |

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| **Curriculum links** | |
| **England: National Curriculum**  Design & Technology   * KS3 1e, 2a   **GCSE D&T**  AQA D&T   * 3.2.5, 3.2.8, 3.3.4, 3.3.5, 3.3.6   Edexcel D&T   * 1.17.1a,b,e, 1.17.2, 3.6.1b, 3.7.1, 3.7.2, 3.7.3   Eduqas D&T   * Papers and boards: 5, 6   OCR D&T   * 4.1a, 7.1, 7.2a   GCSE Engineering   * 3.4.3, 3.6 | **Northern Ireland Curriculum**  Technology & Design   * KS3 Knowledge, understanding and skills: Manufacturing – selecting and using materials fit for purpose; safe use of a range of tools and processes appropriate to materials, demonstrating accuracy and quality of outcome * KS3 Knowledge, understanding and skills: Design – identifying problems; investigating, generating, developing, modelling and evaluating design proposals; giving consideration to form, function and safety. |
| **Scotland: Curriculum for Excellence**  Technologies   * TCH 3-09a, TCH 3-11a, TCH 3-12a | **Wales: National Curriculum**  Design and Technology   * KS3 Skills: Designing 1, 3, 4, 6, 7 * KS3 Skills: Making 1, 2 |
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| **Assessment opportunities** | | |
| * Informal teacher assessment of practical skills through observation of learners. * Formal teacher assessment of the designs produced and the finished vehicles. | | |
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