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| **Balloon powered cars** | | | |
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| Making a balloon powered car to learn about forces | | | |
| **Subject(s):** Science, D&T, Engineering  **Approx. time:** 60 - 90 minutes |  | | **Key words / Topics:**   * Balloon * Car * Forces * Making * Thrust |
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| **Suggested Learning Outcomes** |  | |  |
| * To be able to make a balloon powered car. * To be able to test a balloon powered car. * To understand what is meant by thrust. | | | |
| **Introduction** |  | |  |
| This is one of a set of resources developed to support the teaching of the primary national curriculum. They are designed to support the delivery of key topics within maths and science. This resource focusses on making a balloon powered car to learn about forces.  We see aeroplanes fly and cars move every day, but how do they move? In this activity you will learn about a very important force called ‘thrust’. | | | |
| **Purpose of this activity**  In this activity learners will make a balloon powered car. They will then test their car and discuss the force that makes it move - its thrust. They will develop practical making skills and scientific knowledge.  This activity could be used as a main lesson activity to teach learners about thrust, or as one of several activities within a wider scheme of learning focussing on forces. It could also be used as a D&T or Engineering activity to develop practical making skills. | | | |
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| **Activity** |  | | **Teacher notes** |
| **Introduction (5 minutes)**  Teacher to explain that learners are going to make a balloon powered car to learn about thrust. Teacher to hand out the equipment and materials required.  **Making the balloon powered car (40-60 minutes)**  Teacher to use the presentation to show learners step-by-step how to make the balloon powered car. Teacher to make an example as these slides are being shown.   * Step 1 - Cut a piece of card 150 mm (length) x 70 mm (width) * Step 2a - Cut two straws to a length of 70 mm each. Use masking tape to stick the straws to each end of the card base. * Step 2b - Insert the dowel into the straws. Leave an equal amount of space on each side for the wheels to fit. * Step 3 - Put glue in the middle of the inside of each bottle top. Use this to join each bottle top to each dowel. These are the wheels. * Step 4 - Turn the car upside down. Put a straw into a balloon and tape it in place so it is airtight. Tape the straw to the card base.   Learners to make their own car using the equipment and materials provided.  **Testing the balloon powered car (10-15 minutes)**  Learners to blow up the balloon through the straw and pinch the end shut. They should then put it on the floor and let it go. It should move forwards in a straight line.  **Understanding thrust (5-10 minutes)**  Discuss with learners why the car moves forwards. Explain that the air from the balloon provides the thrust for the car. This is the force that pushes the car forwards. |  | | **Step-by-step making instructions**  Teacher could demonstrate the making shown in each step and learners could complete each step after it has been shown. Alternatively, if learners are able, the teacher could show all steps and first and then learners could make their car.  The presentation slides could be put on the whiteboard or printed for learners to use as a guide to the making.  **Making thee base**  This step could be completed in advance for learners or a template could be given so that they cut to the right measurements (150 mm x 70 mm).  **Making the wheel axles**  The straws could be cut to the appropriate 70 mm length in advance.  Dowels 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 edge cut off could also be used.  **Adding the wheels**  A hot glue gun could be used for this stage. Glue should be placed on the inside of the bottle tops. Alternatively, card wheels could be made and glued 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.  **Adding the balloon**  The end of the balloon must be taped to the straw so that the connection is airtight. Double sided sticky tape could be used to attach the balloon to the base. This works best if the balloon is (at least partially) inflated.  **Testing**  A suitable flat area for testing the cars will be needed, such as the school hall or the classroom with desks and chairs moved to the side. |
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| **Differentiation** |  | |  |
| **Basic** |  | | **Extension** |
| Pre-cut car base, straws and dowels to size before handing to learners.  Produce examples of balloon powered cars that learners can investigate prior to making their own. |  | | Decorate the car with colours or paints to add visual appeal.  Discuss the related forces of flight such as lift and drag. Make and test a paper aircraft to demonstrate these. |
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| **Resources** |  | | **Required files** icon-docicon-pdficon-ppt |
| * Pieces of thick card * Straws * Thin dowel or skewers (pre-cut to 100 mm lengths) * Plastic bottle tops (or card wheels) * Balloons * Scissors * Masking tape * Double sided sticky tape * Hot glue gun |  | | Balloon powered cars presentation |
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| **Additional websites** |  | |  |
| * **NASA - The forces of flight:** American space agency webpage explaining the forces of flight (lift, drag and thrust). <https://www.nasa.gov/audience/foreducators/k-4/features/F_Four_Forces_of_Flight.html> * **Scientific American – Build a balloon powered car:** An alternative design for a balloon powered car using an old water bottle. <https://www.scientificamerican.com/article/build-a-balloon-powered-car/> | | | |
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| **Related activities (to build a full lesson)** |  | |  |
| **Starters** (Options)   * Recap the meaning of a ‘force’ and what it is measured in (Newtons). * Discuss how cars move forwards along the ground and the forces involved. * Show examples of ‘thrust’ in action – e.g. videos of racing cars and flying aircraft, or existing examples of balloon powered cars. | | **Extension** (Options)   * Decorate the car with colours or paints to add visual appeal. * Discuss the related forces of flight such as lift and drag. Make and test a paper aircraft to demonstrate these.   **Plenary**   * Evaluate the results of testing the balloon powered cars and discuss what is meant by ‘thrust’. | |
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| **The Engineering Context** film |
| * Understanding thrust and related forces is crucial for engineers who work in the the car, aerospace and space sectors. For example, when designing a racing car, to propel it forwards as fast as possible. |

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| **Curriculum links** | |
| **England: National Curriculum**  Science  KS2 Year 5 Forces:   * identify the effects of air resistance, water resistance and friction, that act between moving surfaces.   Design and Technology  KS2 Make:   * select from and use a wider range of tools and equipment to perform practical tasks [for example, cutting, shaping, joining and finishing], accurately. | **Northern Ireland Curriculum**  KS2 The world around us  Movement and energy:   * The causes and effect of energy, forces and movement. |
| **Scotland: Curriculum for Excellence**  Sciences  Forces:   * SCN 2-07a   Technologies  Craft, Design, Engineering and Graphics:   * TCH 2-09a | **Wales: National Curriculum**  Science  KS2 – How things work:   * forces of different kinds * the ways in which forces can affect movement and how forces can be compared.   Design and Technology  KS2 – Making:   * measure, mark out, cut, shape, join, weigh and mix a range of materials and ingredients, using appropriate tools/utensils, equipment and techniques. |
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| **Assessment opportunities** | | |
| * Formal teacher assessment of balloon powered cars produced. * Informal assessment through observation of the making activity. * Self and peer assessment of the cars produced and the results of testing them. | | |
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