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| **Amazing animals** | | | |
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| A graphics project making animals that move! | | | |
| **Subject(s):** Design & Technology, Engineering  **Approx. time:** 60 - 90 minutes |  | | **Key words / Topics:**   * Christmas * Cam * Template * Linkage * Movement |
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| **Suggested Learning Outcomes** |  | |  |
| * To understand that a linkage and cam can create movement * To be able to make an Amazing Animal from graphics materials * To be able to use cams and linkage to make the legs move on the Amazing Animal | | | |
| **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 focuses on making an engaging graphic product that uses a simple mechanism to facilitate movement. | | | |
| **Purpose of this activity**  In this activity learners will learn about simple mechanisms (cams and linkages) within a graphics project. Learners will have an opportunity to use templates to help them cut out the parts for a cardboard Amazing Animal.  They will make the parts of a simple mechanism using cams and linkages, which will be attached to a round shaft made from a skewer. This will allow the legs on the Amazing Animal to move up and down slowly.  This activity could be used as a main lesson activity to teach learners about simple mechanisms and how the direction of motion can be changed from rotary to reciprocating. 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. | | | |
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| **Activity** |  | | **Teacher notes** |
| **1. Introduction (10-15 minutes)**  Teacher to explain that learners are going to make Amazing Animals using card tubes and cardboard moving legs. Teacher to hand out equipment and worksheet needed for the task to learners.  **2. Performing the experiment (40-60 minutes)**  Teacher to demonstrate the steps shown in the teacher presentation and listed below.   * Step 1 – Choose an animal face from the activity sheet 1 or design their own. * Step 2 – Gently squeeze the card tube and cut a slot into it near the end. Insert the animal face. * Step 3 – Carefully cut out the cams and legs from the activity sheet 2. * Step 4 – Glue the legs and cams to cardboard and carefully cut them out. Make the holes using a sharp pencil and sticky tack as directed in the presentation. * Step 5 – Make holes for the legs in the card tube. Use a sharp pencil and sticky tack to make the hole as directed in the presentation. * Step 6 – Push a skewer through the card tube to make sure that the holes line up. * Step 7 – Glue 2 cams together after carefully cutting them out. * Step 8 – Make holes in the cams using a sharp pencil and sticky tack as directed in the presentation. Attach the cams to the leg linkage using brass split pin fasteners. * Step 9 – Cut the skewers to make them 7cm. Use a strong glue to attach the skewers to the cams. Attach the skewers to the card tube. * Step 10 – Attach the second leg linkage to the skewers using glue. * Test the Amazing Animal to see how the legs operate. |  | | This activity could be carried out individually or in pairs.  At step 5, if the holes line up on the two sides this helps to facilitate subsequent movement of the mechanism.  At step 6 if holes do not align, it is recommended to make additional holes. Unnecessary holes can be covered using sticky tape if necessary.  At step 7 the cams are glued together to increase their rigidity. In effect this is making 4 double thickness cams.  At step 8, ensure a strong glue is used to glue the cams to the skewers. Safety rules may need to be reminded if a glue gun is used - alternatively a quick setting adhesive could be used, making sure the area is well ventilated and following the requirements of the schools COSHH risk assessment. The skewer needs to be stuck firmly to allow it to rotate and make the legs go up and down.  At step 9, the length to cut the skewers may need to be changed on the presentation depending upon the diameter of the card tubes used.  Learners may decorate the animal body and legs as time allows. Keeping the white paper template stuck to the legs allows them to be decorated as desired. |
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| Learners to complete each step to conduct the activity for themselves. The teacher presentation could be left on the whiteboard as a supporting guide as they do this.  **3. Discussing the results of the activity (10-15 minutes)**  Learners to share, with peers, the designs of animal made and how the legs work.  **Differentiation** |  | |  |
| **Basic** |  | | **Extension** |
| Have an exemplar product available that learners could copy or use for reference.  Use pre-cut out animal faces, legs and cams. |  | | Learners add their own design to their animal’s body and legs.  Investigate what other mechanisms could be used to make the legs move. |
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| **Resources** |  | | **Required files** icon-docicon-pdficon-ppt |
| * Card tubes * Wooden skewers * Glue sticks/ glue * Erasers. sticky tack * Cardboard * Brass split pin fasteners |  | | icon-ppt Teacher presentation – Amazing Animals  icon-pdf Amazing Animals Activity Sheet 1  icon-pdf Amazing Animals Activity Sheet 2 |
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| **Additional websites** |  | |  |
| The following websites can be used for additional background information or to aid with the activity:     * **BBC Bitesize** **–** Mechanical systems: <https://www.bbc.co.uk/bitesize/articles/zktckmn> | | | |
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| **Related activities (to build a full lesson)** |  | |  |
| **Starters**   * Watch video: **BBC Bitesize** **–** Mechanical systems: https://www.bbc.co.uk/bitesize/articles/zktckmn   **Main**   * Learners add their own design to their animals. * Investigate what other mechanisms could be used to make the legs move. | | **Plenary**   * Learners share their designs with peers and test their animals to see how effectively the legs move. | |
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| **The Engineering Context** film |
| Mechanisms are used in almost every moving product, ranging from trains and cars to washing machines, door handles that have to be pushed down to open, see saws and scissors. They either transmit motion or change it in some way, increasing or decreasing its strength, quantity or type. |

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| **Curriculum links** | |
| **England: National Curriculum**  Design & Technology   * KS3 2a, 4a | **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.   Learning Outcomes:   * Demonstrate creativity and initiative when developing ideas and following them through. |
| **Scotland: Curriculum for Excellence**  Technologies   * TCH 3-09a, 3-10a, 3-11a, 4-09a | **Wales: National Curriculum**  Design and Technology   * KS3 Skills: Designing 7, 8. Making 2, 3 |
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| **GCSE D&T**  AQA D&T   * 3.1.5, 3.1.6.1, 3.3.6   Edexcel D&T   * 1.5.1, 1.5.3, 1.5.4, 1.9.2, 1.17, 3.2.2, 3.6.1, 3.7.2   Eduqas D&T   * 2.1 Core: 7, 8   OCR D&T   * 4.1a, 5.1a, 5.4a, 6.3a,c, 7.2a,   **GCSE Engineering**  AQA Engineering   * 3.2.3, 3.3.1, 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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