Learning objective: we are learning how a 3D shape can be made from flat (2D) sheets of paper.

Success criteria:
- I can describe how folding a flat (2D) sheet of paper makes it a 3D object.
- I can describe how different cuts and folds can make different 3D shapes.
- I can make a pop-up card following instructions.
- I can make a pop-up card from a blank piece of paper.
- I can identify advantages and disadvantages of making 3D shapes from flat sheets.

Online resources from WMG
Open the slideshow here:
https://warwick.ac.uk/wmgoutreach/resources/paperengineering

Resources you will need to provide	Optional extra items:
Rulers	Thick card
Pencils	Decorative resources (*e.g.* tissue paper,
Scissors	small pompoms, sequins, glue for attaching
Coloured pens/pencils (*e.g.* felt tips/crayons)	decorations)

Time	Input/activity	Resources

10 minutes	**[Slide 2]** Introduce the learning objective.
	
	[Slide 3] Show the example pop-up cards. If you have time before the lesson you could make one or two of them. There are spares in each pack of each design (either for you to have a go with or for children in case they make mistakes).
	
	[Slide 4] Discuss how folding a piece of paper can make it into a different shape. The slide shows examples of how we can fold cards to make 3D shapes.
	
	[Slide 5] What are the advantages and disadvantages of making a pop-up card?
	Possible answers:
	    Advantages: There is motion when you open the card. There are no loose parts. There's no need for glue or tape. It's cheap. It's sustainable and uses recyclable materials.
	
	    Disadvantages: You have to make your folds very accurately. You have to use scissors which can be precise/fiddly/dangerous. Once you have cut through the card you can see through it (so you might have to stick another piece of paper on the back of the card).
	
	[Slide 6] It is vital that the students can create a firm crease in the paper for the cards to work and for the shapes to 'pop' out. Watch the video showing how to do folds.
		Slideshow

20-30 minutes	**Building a 3D structure from flat components (from templates)** **[Slide 7]** Blank pop-up card templates. Work with the students to create their pop-up cards from the templates. Pass the paper templates out and ask each student to cut and assemble their item following the instructions. Some are more difficult than others so you may wish to choose those with the most dexterity for the complicated products. From simplest to most complicated they are:	Paper templates

	1. Stage 2. Simple tree 3. Tree with base 4. Bird's beak 5. Star 6. Stack of presents 7. Multi-section tree 8. Layered Christmas tree 9. Mouth Fold **Discuss:** How are the items designed to get a 3D shape out of the flat sheets of paper? All of this is done without using tape or glue, *etc*.	

20-30 minutes	**Building a 3D structure from flat components (from templates)**
	
	[Slide 8] Decorated pop-up card templates. Work with the students to create their pop-up cards from the templates. The instructions are printed separately but each instruction has the template printed out on it to allow the students to recognise the matching set.
	
	Pass the paper templates out and ask each student to cut and assemble their item following the instructions. Some are more difficult than others so you may wish to choose those with the most dexterity for the complicated products. From simplest to most complicated they are:
	
	Easy designs (copies of each design and copies of each instruction set)
	    1. Father Christmas
	    2. Fireplace
	    3. Owl
	    4. Stack of Presents
	    5. Simple Tree
	    6. Tree with Present
	    7. Robin
	    8. Santa
	    9. Snowman
	Hard designs (copy of each design and a copy of each instruction set)
	    1. Gingerbread
	    2. Stag
	    3. Star
	    4. Bow
	Very hard designs (copy of each design and a copy of each instruction set)
	    1. Snowflake
	    2. Snowmen
	    3. Snowflake 1
	    4. Snowflake 2	

40 minutes	**Design and making** **[Slide 9-onwards]** Give the children time to discuss and sketch design ideas. Children make their own pop-up card with ruler, pencil, scissors, card, decorations. Optional: protractor, set square, or use the corner of something else to check for right angles. **[Slide 10]** Children should test the stability of their product and whether it can be easily assembled and re-assembled. Could they write a set of instructions for someone else to make their card later from scratch later?	Paper Rulers, pencils, scissors, card Optional: protractor or set square, decorations
10 minutes	**Testing & Evaluation** **[Final slide]** If the cards are ready (and if decorated, the glue is dry), the children can swap them around to try assembling and disassembling each other's. Evaluate and discuss: What is good about your card? How could it be better?	

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