Will this story surprise you?

seven hours work

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Pop-up cards and books are fascinating. They appeal to children and grown-ups alike. They vary immensely in terms of sophistication and complexity. The most basic card with a single, simple mechanism can make us smile, while a complete book with many different complicated mechanisms can leave us in awe at the precision and power of paper engineering. The children in your class will be excited by the possibilities they see as they learn how to construct the mechanisms they need to tell their particular story. They will be able to choose the audience and the content of their book.

In this unit children will learn:

- about pop-up books and why they are so popular; (Session 1)
- how different card mechanisms create different sorts of movement; (Session 1–4)
- about the accurate cutting, scoring, folding and joining techniques needed to produce working, reliable card mechanisms; (Sessions 2–4)
- to develop different graphic styles and match these to the needs of different audiences; (Session 5)
- to match card mechanisms to the movements they want to achieve in their book. (Session 6)
1 Investigating pop-up books  
   40 minutes

2 Exploring the box fold and the mouth fold  
   60 minutes

3 Exploring the slider and the lift up flap  
   30 minutes

4 Exploring the rotator and the paper spring  
   60 minutes

5 Exploring illustration style  
   30 minutes

6 Writing the specification  
   40 minutes

The children will work in small groups, and each group will make a pop-up book that will intrigue, amuse and inform particular readers. The readers may be the children themselves or another identified group.  

60 minutes

The evaluation  
   40 minutes

Unit review  
   20 minutes

The mechanism is very simple. The use of strong colours and bold features give visual impact. The pop-up mechanism, the background, the pop-up picture and the foreground are all part of the monster face.
The children can decide on the following:

- who the pop-up book is for
  required learning in Session 1,
  design decision made in Session 6;

- what the book is about
  required learning in Session 1,
  design decision made in Session 6;

- what mechanisms the book will have
  required learning in Sessions 2–4,
  design decision made in Sessions 6 and 7;

- how many pages the book will have
  required learning in Sessions 2–4,
  design decision made in Session 6;

- where the moving parts will be on
  each page
  required learning in Sessions 2–4,
  design decisions made in Session 6;

- what kind of illustrations the book will have
  required learning in Session 5,
  design decision made in Sessions 6 and 7.
investigating pop-up books

Teacher input
Explain to the class that they will work in groups of four to produce a short pop-up book. Tell them that they will be working in groups because even a short pop-up book is a very big job for one person. Each group will be responsible for deciding who their book is for and what the book will be about. Explain that each person in the group will be responsible for one or two double pages in the book. So the shortest book will have four double pages and the longest will have eight double pages. Whatever its size it will have an illustrated cover both back and front. Now show the class some examples of pop-up cards and books pointing out how the pop-ups move. Pass the books and cards around the class and ask for comments on how they might work.

Ask children to bring in a range of pop-up cards and books – allow at least one week for a collection to build up. Put the cards and books on display so children can looked to see how they work and how they are illustrated.

Pupil activity
Tell the children to work in groups of four and discuss the following:
♦ who the pop-up book will be for;
♦ what the pop-up book will be about;
♦ what each double page might show;
♦ what might go on the front cover;
♦ what might go on the back cover.

At the end of the discussion each group should make a short presentation to the class summarising their discussion. Each group should produce a short written summary of their ideas, which can be put on display for future reference.

Resources
Stimulus: a selection of pop-up cards and books;
Consumables: paper;
Tools: pencils.

Health and safety check
Discuss the hazards and risks involved in working as a group and how the risks can be controlled by the way the children behave and treat one another. Discuss the hazards and risks involved in examining the pop-up books and how these risks can be controlled by being careful.
exploring the box fold and the mouth fold

Teacher input

Show the class how to make a box fold and a mouth fold as shown below.

A box fold

take two pieces of thin card of the same size

fold one of the pieces in half so that the short edges meet
mark on fold and cut as shown
fold the flap over both ways between the cuts

unfold the flap and open the card

pinch along middle fold either side of flap to crease it the other way

push flap down with finger, as shown. Close card carefully and smooth it flat. When opened the flap makes a box shape

fold the second piece of card and glue behind to make backing. Be careful to line up

stick a picture as shown so that it stands up when the card is opened
**exploring the box fold and the mouth fold (continued)**

**A mouth fold**

take two pieces of thin card of the same size

- fold one of the pieces in half so that the short edges meet
- mark on fold and cut as shown
- make pencil marks at equal distances from the cut
- draw a line from the end of the cut to each mark
- fold each way along both lines to make two triangular flaps
- pinch along middle fold either side of flaps
- open paper and lay flat; use a finger to push down both triangular flaps. This makes diamond-shaped hole as shown
- close card and smooth to flatten triangular flaps inside
exploring the box fold and the mouth fold (continued)

Pupil activity

Explain to the class that each group should try to make two examples of each mechanism and should illustrate them using cutouts from different magazines. In this way the children will become familiar with the mechanisms and see different styles of illustration. Tell the class that the mechanisms will be put on display for future reference.

Resources

**Consumables:** magazine pages, coloured and white paper and card; adhesive – PVA glue or glue sticks, Sellotape/masking tape, felt pens and pencil crayons, wool and fabric materials, etc., split pins and paperclips;

**Tools:** scissors, rulers, hole punch, work mats, compasses, set squares, an old ballpoint pen for scoring.

Health and safety check

Discuss the hazards and risks involved in using scissors, rulers, glue, felt tip pens, crayons and scrap fabric and how these risks can be controlled by being careful and using the correct procedures.
exploring the slider and the lift-up flap

Teacher input

Show the class how to make a slider and a lift-up flap as shown below.

**A slider pop-up**

*take two pieces of thin card, the size of one page*

- on one piece, cut out and stick on a picture of a face. Decide which part of the picture will change, e.g. mouth
- mark and cut lines as shown for sliding element of pop-up. (Teacher assistance will be needed)
- measure and cut a strip of card to fit the slots, long enough to protrude from the edge of the page
- draw two expressions on strip for mouth to change picture
- fix a tab onto the end of the card strip
- thread slider through slots. Push or pull to change picture. Glue on backing card – take care not to inhibit slider with glue

**A lift-the-flap pop-up**

*take two pieces of thin card, the size of one page*

- mark out card and cut flaps in the required position to suit the picture
- fold back flaps and crease fold to form a hinge
- cut out a picture slightly larger than the opening, to suit the page design
exploring the slider and the lift-up flap (continued)

affix picture in place behind opening, using adhesive tape. Draw background on main sheet

Pupil activity

Explain to the class that each group should try to make two examples of each mechanism and should illustrate them using cutouts from different magazines. In this way the children will become familiar with the mechanisms and see different styles of illustration. Tell the class that the mechanisms will be put on display for future reference.

Resources

Consumables: magazine pages, coloured and white paper and card, adhesive: PVA glue or glue sticks, Sellotape/masking tape, felt pens and pencil crayons, wool and fabric materials, etc., split pins and paper clips;

Tools: scissors, rulers, hole punch, work mats, compasses, set squares, an old ballpoint pen for scoring.

Health and safety check

Revisit the discussion about controlling risks when using scissors, rulers, glue, felt tip pens and crayons.
**section 4**

**teaching the unit**

**exploring the rotator and the paper spring**

**Teacher input**

Show the class how to make a rotating pop-up and a paper spring as shown below.

**A rotating pop-up**

take two pieces of thin card, the size of one page

- on one piece of card, carefully mark and cut an arc using compasses. Take care not to cut through edges of card
- measure and cut a lever to fit the arc as shown, so that a tab protrudes through it. Fix the lever into position with a split pin through the centre of the arc and lever
- cut out the picture to glue onto the tab
- decorate the background. Rotate lever to move tab and picture. Glue second piece of card to back of pop-up. Take care not to inhibit moving parts

**A paper spring pop-up**

take two strips of thick paper, each 2 cm x 30 cm long

- glue one strip over the end of the other, so that the strips make a right angle
- fold the second strip over the edge of the first and crease
- fold the first strip across the second strip in the same way
exploring the rotator and the paper spring (continued)

Pupil activity

Explain to the class that each group should try to make two examples of each mechanism and should illustrate them using cut outs from different magazines. In this way the children will become familiar with the mechanisms and see different styles of illustration. Tell the class that the mechanisms will be put on display for future reference.

Resources

Consumables: magazine pages, coloured and white paper and card, adhesive – PVA glue or glue sticks, Sellotape/masking tape, felt pens and pencil crayons, wool and fabric materials, etc., split pins and paperclips;

Tools: scissors, rulers, hole punch, work mats, compasses, set squares, an old ballpoint pen for scoring.

Health and safety check

Revisit the discussion about controlling risks when using scissors, rulers, glue, felt tip pens and crayons. Discuss the hazards and risks involved in using hole punches and paper fasteners and how these risks can be controlled by being careful and using the correct procedures.
Teacher input
Tell the class that they can use different methods to illustrate their pop-up book – pictures cut from magazines, photocopies of pictures from books, images from computer clip-art, their own drawings. Explain that they are going to think about the sort of illustration style they will need for their pop-up books. Collect a range of mechanisms from the previous sessions that show different styles. Ask the class to comment on which they like and which they don’t. Ask them to say why. This may be because of poor construction rather than poor illustration and pointing out the distinction will help them understand the importance of both careful making and appropriate illustration.

Pupil activity
Each group should make a collection of images that show the style they want to use to illustrate their pop-up book. At the end of the discussion each group should make a short presentation to the class summarising their discussion. Each group should put their collection on display for future reference.

Resources
Stimulus: magazine pages for cutting up, computer clip-art to print out, photocopies of images, drawings;
Consumables: paper;
Tools: pencils, scissors.

Health and safety check
Revisit the discussion about controlling risks when using scissors.
Teacher input
Remind the class of the discussion each group had in Session 1 and refer to the display of their initial ideas. Tell them that the questions they will need to consider are the following.

- Who is this pop-up book for?
- What will this pop-up book be about?
- What mechanisms will the book have?
- How many pages will the book have?
- What kind of illustrations will the book have?
- Where will the moving parts be on each page?

Tell them that they need to discuss the questions in their groups and must agree answers to all of them before they can write their specification.

Pupil activity
Each child should complete a specification sheet. The sheets for all members of a group should look similar as they should have agreed the design decisions together. There is a ready-to-copy ‘Pop-up specification’ sheet available. They will probably need to draw out page plans in rough before agreeing on the final formats.

Resources
- **Stimulus:** displays of ideas from Sessions 1 and 5;
- **Consumables:** paper, ‘Pop-up specification’ sheets;
- **Tools:** pencils.

Health and safety check
Tell the class to remind themselves about controlling risks when producing pop-up mechanisms as this will be good preparation for the time when they will be making their own pop-up books.
the big task: making the pop-up books

Teacher input
Show the class how to construct the pop-up book from the double pages as shown below. Each group will then be able to complete their pop-up book.

take a piece of card the size of the open book

fold the card in half so that short edges meet to form the cover

order the pages and glue back to back

Pupil activity
Once they have checked their specification sheets to remind themselves of their design decisions, each group can produce the double-page pop-ups that will form the book.

Extension work
Children who finish early or who need an extra challenge could be asked to do the following.

♦ Design and make a pop-up card for a particular person and a particular celebration.
♦ Design and make a new kind of mechanism for a pop-up.

Resources

Stimulus: ‘Pop-up design specification’ sheets from previous session;

Consumables: magazine pages, coloured and white paper and card, adhesive – PVA glue or glue sticks, Sellotape/masking tape, felt pens and pencil crayons, wool and fabric materials, etc., split pins and paperclips;

Tools: scissors, rulers, hole punch, work mats, compasses, set squares, an old ballpoint pen for scoring.

Health and safety check
Revisit the discussion about controlling risks when using the tools and materials available for making the pages of pop-up books.
evaluating the final product

Teacher input
Tell the children in each group to swap their pop-up book along with its specification with another group’s book and specification. Each group should then evaluate a pop-up book with reference to its specification using the following questions.

♦ Is it about the subject decided in the specification?
♦ Does it use the mechanisms decided in the specification?
♦ Are the moving parts on each page where they were planned to be?
♦ Does it have the sort of illustrations decided in the specification?
♦ Does it have the number of pages decided in the specification?
♦ Does it look like it was designed to look?
♦ Will it appeal to the person it was designed for?
♦ Could it be made to look better?
♦ Could it be made to work better?
♦ Could it be made to work more reliably?
♦ Could it be made to last longer?
♦ Could it be made safer?

Pupil activity
Each group should write a summary of their evaluations, which they then return with the pop-up book plus specification to the group who designed and made it. There is a ready-to-copy ‘Pop-up evaluation’ sheet available that they could use. Each group then considers the evaluation of its pop-up book and makes a short presentation to the class commenting on it, and saying how they might improve their book.

Resources
Stimulus: finished pop-up books, ‘Pop-up specification’ sheets;
Consumables: ‘Pop-up evaluation’ sheets, paper;
Tools: pencils.

Health and safety check
Discuss the hazards and risks involved in using pop-up books and how these risks can be controlled.
SECTION 4

teaching the unit

Teacher input

Explain to the class that it is important to think about how to get better at design & technology and that they can do this by discussing the following questions.

- What did you learn about pop-up books?
- How did you learn that?
- What did you find difficult about this project?
- What did you get better at?
- Did anything surprise you about the way pop-ups are made?
- Did your team work well together?
- How could you have worked together more effectively?

Pupil activity

The children should discuss the questions in groups and when they have finished you should ask each group to make a short report to the class. The class should agree a target for improvement based on these reports for their next design & technology unit.

Resources

Stimulus: some of the original selection of pop-up books on display;
Consumables: paper;
Tools: pencils.

Health and safety check

Discuss whether the class used hazard recognition, risk identification and risk control to design and make safely.
### Sessions 1 and 2
- illustrated, fold, crease, score, mark

### Session 3
- slide, flap, tap, push and pull

### Session 4
- rotate, spring, centre, path of travel, levers, linkages, split pins, three-dimensional, two-dimensional

### Sessions 5-7
- specification, evaluation, improvement

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**Vocabulary**

<table>
<thead>
<tr>
<th>Sessions 1 and 2</th>
<th>Session 3</th>
<th>Session 4</th>
<th>Sessions 5-7</th>
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<tbody>
<tr>
<td>illustrated, fold, crease, score, mark</td>
<td>slide, flap, tap, push and pull</td>
<td>rotate, spring, centre, path of travel, levers, linkages, split pins, three-dimensional, two-dimensional</td>
<td>specification, evaluation, improvement</td>
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</tbody>
</table>

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**Resources Summary**

<table>
<thead>
<tr>
<th>Stimulus materials</th>
<th>Consumables materials</th>
<th>Tools</th>
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</thead>
<tbody>
<tr>
<td><strong>Session 1</strong></td>
<td>a selection of pop-up cards and books</td>
<td>paper</td>
</tr>
<tr>
<td><strong>Sessions 2-4</strong></td>
<td>magazine pages, coloured and white paper and card, PVA glue or glue sticks, Sellotape/masking tape, felt pens and pencil crayons, wool and fabric materials, split pins and paperclips</td>
<td>scissors, rulers, hole punch, work mats, compasses, set squares, an old ball-point pen for scoring</td>
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<tr>
<td><strong>Session 5</strong></td>
<td>magazine pages for cutting up, computer clip-art to print out, photocopies of images, drawings</td>
<td>paper</td>
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<tr>
<td><strong>Session 6</strong></td>
<td>display of ideas from Sessions 1 and 5</td>
<td>paper, ‘Pop-up specification’</td>
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<tr>
<td><strong>Session 7</strong></td>
<td>‘Pop-up specification’ sheets from previous session</td>
<td>magazine pages, coloured and white paper and card, PVA glue or glue sticks, Sellotape/masking tape, felt pens and pencil crayons, wool and fabric materials, split pins and paper clips</td>
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<tr>
<td><strong>Session 8</strong></td>
<td>finished pop-up books, ‘Pop-up specification’ sheets</td>
<td>‘Pop-up evaluation’ sheets, paper</td>
</tr>
<tr>
<td><strong>Session 9</strong></td>
<td>some of the original selection of pop-up books on display</td>
<td>paper</td>
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**Literacy**

There are many opportunities to use this module to develop work in literacy. The book could be a story or it could be a non-fiction book in the mode of The Great Grammar Book by Jenny Mauzels and Kate Petty.

The book could be used to illustrate a poem that is a favourite of the group or is written by the group in literacy.

**Numeracy**

There are opportunities for simple but accurate measuring, and for developing an understanding of how 2D shapes can give a 3D form.

**ICT**

This unit uses the skills previously learned in ICT lessons of manipulating images and combining text with images to communicate a message (see the QCA ICT Scheme of Work Unit 3A ‘Combining text and graphics’).
**Pop-up specification**

Who is this pop-up book for?

What will this pop-up book be about?

What mechanisms will the book have?

How many pages will the book have?

What kind of illustrations will the book have?

Draw a rough plan for each page showing where the moving parts will be:

<table>
<thead>
<tr>
<th>Front cover</th>
<th>Back cover</th>
<th>1</th>
<th>2</th>
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<tbody>
<tr>
<td></td>
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<td>9</td>
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</tbody>
</table>
Pop-up evaluation

Is it about the subject decided in the specification?

Does it use the mechanisms decided in the specification?

Are the moving parts on each page where they were planned to be?

Does it have the sort of illustrations decided in the specification.

Does it have the number of pages decided in the specification?

Does it look like it was designed to look?

Will it appeal to the person it was designed for?

Could it be made to look better?

Could it be made to work better?

Could it be made to work more reliably?

Could it be made to last longer?

Could it be made safer?
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