

MACBETH

YEAR 5 AND YEAR 6 SCIENCE: MATERIALS MACDUFF NEEDS A SHIP

These sequence of lessons will cover the following national curriculum objectives:

Working scientifically:

- planning different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary
- recording data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs
- using test results to make predictions to set up further comparative and fair tests
- reporting and presenting findings from enquiries, including conclusions, causal relationships and explanations of and degree of trust in results, in oral and written forms such as displays and other presentations
- identifying scientific evidence that has been used to support or refute ideas or arguments.

YEAR 5 AND YEAR 6

SCIENCE: MATERIALS



CONTEXT:

MACBETH

Saw you the weird sisters?

LENNOX

No, my lord.

MACBETH

Came they not by you?

LENNOX

No, indeed, my lord.

MACBETH

Infected be the air whereon they ride;
And damn'd all those that trust them! I did hear
The galloping of horse: who was't came by?

LENNOX

'Tis two or three, my lord, that bring you word
Macduff is fled to England.

MACBETH

Fled to England!

LENNOX

Ay, my good lord.

MACBETH

Time, thou anticipatest my dread exploits:
The flighty purpose never is o'ertook
Unless the deed go with it; from this moment
The very firstlings of my heart shall be
The firstlings of my hand. And even now,
To crown my thoughts with acts, be it thought and done:
The castle of Macduff I will surprise;
Seize upon Fife; give to the edge o' the sword
His wife, his babes, and all unfortunate souls
That trace him in his line. No boasting like a fool;
This deed I'll do before this purpose cool.
But no more sights!—Where are these gentlemen?
Come, bring me where they are.

Exit

YEAR 5 AND YEAR 6 OVERVIEW: MATERIALS



LESSON 1:

L.I. To create an identification key

National Curriculum links

2a. planning different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary

2b. recording data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs

LESSON 2

L.I. To design a model and plan an experiment

National Curriculum links

2a. planning different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary

LESSON 3

L.I. To make a model (Link to Design Technology)

National Curriculum links

LESSON 4

L.I. To predict and record findings

National Curriculum links

2b. recording data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs

2c. using test results to make predictions to set up further comparative and fair tests

LESSON 5

L.I. To present findings

National Curriculum links

2b. recording data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs

2d. reporting and presenting findings from enquiries, including conclusions, causal relationships and explanations of and degree of trust in results, in oral and written forms such as displays and other presentations

LESSON 6

L.I. To understand and debate scientific evidence

National Curriculum links

2d. reporting and presenting findings from enquiries, including conclusions, causal relationships and explanations of and degree of trust in results, in oral and written forms such as displays and other presentations

2e. identifying scientific evidence that has been used to support or refute ideas or arguments.

LESSON 1

L.I. TO CREATE AN IDENTIFICATION KEY

NATIONAL CURRICULUM LINKS

2a. planning different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary

2b. recording data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs

Before you teach this learning journey, ask the children to start collecting junk at home.

If there is no access to a large tub or basin, ask Early Years to borrow their water tray on a selected date when the children will be testing their models.

YOU WILL NEED

Junk, large paper, marker pens

WHOLE CLASS TEACHING

Audience/purpose - Explain to the class that in the play, Macduff needed to flee quickly – his mode of transport is not specified. However, one of the fastest ways that he could travel would have been by ship. He should probably have travelled to Southern England where he would be safest as it's furthest away from Scotland. However, he currently has no ship. Can pupils help by designing him a ship?

Share the criteria that the ship will have to meet:

1. Float for 3 minutes
2. Hold a lego 'Macduff'
3. Sail when a hairdryer is blown at it
4. Hold a Scottish themed flag.

Explain that there will be winners based on who meets all of the criteria.

Explain the first step is that the pupils must understand which materials will make the best ship and why. Showing the junk that pupils have brought in from home, discuss/recap different materials (fabric, plastic, wood etc.)

In talk partners, discuss the properties of different materials, i.e. which are waterproof, which are rigid, which are transparent, which are lightweight etc. Discuss which of these properties will be helpful in creating a boat.

Ask children if they know what an identification key is? Share and discuss answers.

Show an example. Explain to children that in groups, pupils need to create an identification key for materials.

MAIN INDEPENDENT ACTIVITY

This should be done as a mixed-ability team activity:

Put piles of different junk (a piece of paper, a piece of plastic, a piece of wood etc.) and a large sheet of paper onto each table and in groups ask children to produce an identification key.

PLENARY

Each group should present their identification key to the rest of the class.

Other pupils can offer oral peer-feedback – a strength that the group had and something which they could do better next time.

If you have a 'Macbeth Working Wall' the class could choose an identification key that they would like to add to it.

LESSON 2

L.I. TO DESIGN A MODEL AND PLAN AN EXPERIMENT

NATIONAL CURRICULUM LINKS

- 2a. planning different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary

YOU WILL NEED

Masking tape, sellotape, glue, glue stick, scissors, junk

WHOLE CLASS TEACHING

In talk partners, recap previous learning on materials and their properties. Share with class. Explain that today, pupils will be designing their ship. What is designing? What's its purpose? Why is it important? Give examples of when adults design (boats/cars/trains/technology/fashion etc.)

Show pictures of different ships and refer to technical vocabulary (sail, ore, boom etc.) Tell pupils that they will need to consider all of the parts of a ship carefully.

Explain to children that they will create four designs for their ship and must at the same time, think about what junk they have available.

Discuss how to combine elements from different designs to choose and draw a final design, which will be the one that they create (the designing, planning and making can be done as individuals, pairs or groups – this is up to the teacher).

Teacher to model designing a ship with labels.

MAIN INDEPENDENT ACTIVITY

Activity sheet 1 - Pupils to design ships-either 2 or you could photocopy onto one large a3 sheet so they have four designs

Stop pupils to give them 3 minutes to reflect on what elements of their design they will take forward to the final design

Activity sheet 2 - Children to choose elements from each to create their final design.

Some pupils to share and present their designs to the class (using visualiser if possible).

PLENARY

As a shared write (using children's contributions), model writing a plan for the experiment. This should include a hypothesis/main question, what you will need, what will be kept the same, what will be changed (the ship) and how the experiment will be measured and recorded (this could be done in different ways – refer to the criteria set in lesson 1, a stopwatch could be used to test how long the ship floats for and a scale of 1-5 for how well it sailed when faced with a hairdryer).

ACTIVITY SHEET 1

L.I. TO DESIGN A MODEL

Underneath each design write which aspects you feel are successful and that you will use in your final design

REFLECTION/SUCCESSSES OF DESIGN

REFLECTION/SUCCESSSES OF DESIGN

ACTIVITY SHEET 2

L.I. TO DESIGN A FINAL MODEL

REMEMBER. YOUR SHIP MUST BE ABLE TO:

1. Float for 3 minutes
2. Hold a lego 'Macduff'
3. Sail when a hairdryer is blown at it
4. Hold a Scottish themed flag.

FINAL DESIGN

LESSON 3

L.I. TO MAKE A MODEL

NATIONAL CURRICULUM LINKS

DESIGN TECHNOLOGY

Select from and use a wider range of tools and equipment to perform practical tasks [for example, cutting, shaping, joining and finishing], accurately

Select from and use a wider range of materials and components, including construction materials, textiles and ingredients, according to their functional properties and aesthetic qualities

YOU WILL NEED

Masking tape, sellotape, glue, glue stick, scissors, junk, camera

WHOLE CLASS TEACHING

Ask children to carefully look at their final design and start thinking about how they will create their designs. Recap what has been learnt so far. Question class – what are joins?

On each table put a range of resources (different materials and adhesives). Allow children to experiment with different types of joining. Ask children to share their joins with the rest of the class.

Recap learning on properties of materials, designing and joining through questioning.

Explain to pupils that today they will be making their ship (in groups/pairs or individually as above).

Remind children of criteria set in first lesson. Have criteria on display. Remember that Macduff is fiercely passionate about Scotland and the flag of the ship must reflect this. He does not really want to leave bonny Scotland and will most definitely return.

MAIN INDEPENDENT ACTIVITY

'Talk for creating' – children to talk through how they will make their ship in their group or with a talk partner.

With all junk and adhesives on table, allow children at least 40/45 minutes to create their design.

The time should be discussed before the pupils begin the task and if possible, a timer put up on the interactive whiteboard

PLENARY

Take a photo of each team/individual with their boat

LESSON 4

L.I. TO PREDICT AND RECORD FINDINGS

NATIONAL CURRICULUM LINKS

2b. recording data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs

2c. using test results to make predictions to set up further comparative and fair tests

YOU WILL NEED

Activity Sheet 3 (Prediction/findings sheet) basin/water tank, water, water jugs, stopwatch, lego 'Macduff'

WHOLE CLASS TEACHING

What is a prediction? Why do we make predictions? Explain that before testing the ships, the children will predict whether each ship will be successful in each of the criteria set out in lesson one (this can be done as a tick or cross, see example activity sheet 4 or as a rating of 1-5).

Model how to make a prediction against each criteria and discuss thought process behind each decision, i.e. 'I think that this boat will not float for 1 minute because the base is made from paper and paper is likely to absorb water'

MAIN INDEPENDENT ACTIVITY

Activity sheet 3 - Pupils to make predictions on each ship. Children may need 2 or 3 sheets each depending how many ships there are.

Once pupils have made a prediction, explain that they will now test each ship to find out the winner!

Each time a ship is tested, the children should discuss and record the results (hard data). They should include at least one note about their observation of each ship (soft data).

PLENARY

Children to answer series of questions (either written or orally)

1. Which ship met most of the criteria? Why?
2. Which ship met least of the criteria? Why?
3. How could we improve the designs next time?
4. Why did the sail made from work the best/move the furthest?

Certificate - Present the winner(s) with a certificate of excellence in the art of ship building.

ACTIVITY SHEET 3

L.I. TO PREDICT AND RECORD FINDINGS

NAME/S	TEAM MACDUFF
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NOTES
-Floated for three minutes -No space to hold lego figure -Sailed across tub

CRITERIA	PREDICTION	RESULT
FLOAT	YES	YES
HOLD LEGO	YES	NO
SAIL	YES	YES
FLAG		YES

MY PREDICTIONS AND FINDINGS

NAME/S

--

CRITERIA	PREDICTION	RESULT
FLOAT		
HOLD LEGO		
SAIL		
FLAG		

NAME/S

--

CRITERIA	PREDICTION	RESULT
FLOAT		
HOLD LEGO		
SAIL		
FLAG		

MY PREDICTIONS AND FINDINGS

NAME/S

CRITERIA	PREDICTION	RESULT
FLOAT		
HOLD LEGO		
SAIL		
FLAG		

--

NAME/S

CRITERIA	PREDICTION	RESULT
FLOAT		
HOLD LEGO		
SAIL		
FLAG		

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NAME/S

CRITERIA	PREDICTION	RESULT
FLOAT		
HOLD LEGO		
SAIL		
FLAG		

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LESSON 5

L.I. TO PRESENT FINDINGS

NATIONAL CURRICULUM LINKS

2b. recording data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs

2d. reporting and presenting findings from enquiries, including conclusions, causal relationships and explanations of and degree of trust in results, in oral and written forms such as displays and other presentations

YOU WILL NEED

Completed prediction/findings sheet, Science books or activity sheet

WHOLE CLASS TEACHING

In talk partners, discuss the findings from last lesson. Feedback and discuss as a whole-class.

As a class, put the results of the experiment into a table. This is the data that pupils will present during this lesson.

Using maths knowledge, how could we best present this data? Discuss different options for pie chart, bar chart, pictogram, line graph etc. Which would work best? Why? Which wouldn't work well? Why?

Decide on what format pupils will present the findings (this could be the same for the whole class, each table could be given the task of presenting the finds in a different format or this could be left up to the individual to decide).

Teacher may decide to give each table a different criteria, i.e one table focusses on how long ships floated for, one table focusses on how far the ship sailed, one table focuses on whether the ship could hold a lego Macduff etc.

Teacher to model creating a graph/chart depending on choice of presentation.

MAIN INDEPENDENT ACTIVITY

Children to present their findings in a graph/chart, including labelling

PLENARY

As a class, discuss the types of questions could be asked about the graph/chart, for example:

1. Which ship floated for the least amount of time? Why was this?
2. Could the ship that floated for the least amount of time, hold lego Macduff?
3. Which ship met all of the criteria?
4. Do you think this ship could survive in an outdoor pond? Why? etc.

In pairs, pupils to ask five of their own questions about their graph/chart.

Explain that these questions will be answered by another pupil in the next lesson.

LESSON 6

L.I. TO UNDERSTAND AND DEBATE SCIENTIFIC EVIDENCE

NATIONAL CURRICULUM LINKS

2d. reporting and presenting findings from enquiries, including conclusions, causal relationships and explanations of and degree of trust in results, in oral and written forms such as displays and other presentations

2e. identifying scientific evidence that has been used to support or refute ideas or arguments.

YOU WILL NEED

Graphs/charts, pencils, Science books

Teacher to have decided on who each pupil will swap their work with.

WHOLE CLASS TEACHING

Show examples of different types of questions that were asked.

As a class mindmap scientific language, which could be used in answering questions.

Model how to answer a selection of questions in full using scientific language

MAIN INDEPENDENT ACTIVITY

Pupils to use their partner's graph/chart and answer questions (written last lesson).

Partners to pair up once they have answered each other's questions and discuss.

Partner to peer-mark answers and give feedback.

PLENARY

Choose one variable to change:

- a. Tell pupils that Macduff was extremely impressed by the standard of ships and word has got around. His Cuban cousin, Campo-duff also wants a ship but the seas around there can be much more ferocious – would the ship last in rough waters?
- b. Macduff has decided that he doesn't want a sail on the ship as it'll be too obvious that it's him. What would happen to the boat?
- c. Lego Macduff has fallen overboard. How might this affect the results?
- d. ...or ask children about what interests them.

Children then decide whether they think changing the variable will make a difference to the results and why.

Children orally debate their points.