

Scientific Enquiry Materials

KS2

SPORT & LEISURE



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Levels 2–5

Resources

- ▶ Enquiry Sheet – Forces in action
- ▶ images of sporting activities



Links to skills in the Science PoS

Pupils are required to use prior knowledge to identify and describe physical process in everyday life. They need to consider any hazards and risks to themselves and others when participating in scene recreation and link their learning to similar situations, within and outside school.

Forces in action

Overview

This activity is designed to strengthen pupils' understanding of the direction and magnitude of forces by looking at images of sporting activities and recreating the scenes in some of those images. Pupils are also required to draw labelled arrows on images of sporting activities provided for them as well as on images that they have provided themselves.

Activity

Prior to this activity, build up a bank of images of different sporting activities. You might include pictures drawn by the pupils as well as newspaper and magazine cuttings.

Give small groups of pupils a selection of these images and ask them to think about and discuss the forces that are present in these sporting activities.

Encourage the pupils to recreate and act out the scenes in the images, e.g. in a drama or PE lesson. This would provide an opportunity for them to 'feel' the direction or magnitude of the forces.

Ask the pupils to look at the images on the Enquiry Sheet and to write the names of any forces acting and draw arrows on these images to show the direction of these forces. Tell the pupils they can add as many words as they wish to explain their ideas. Ask the pupils to take photographs of each other in a sporting activity. They should discuss the forces and draw labelled arrows on the photographs to show the forces. Pupils could stick their photographs in the empty boxes on the Enquiry Sheet. Ask pupils to review each other's Enquiry Sheets and suggest any forces that might be added.

Suggested questions

What forces do you think are acting in each of these situations?

In which direction do you think these forces are acting?

Where will you draw your arrows?

What do these arrows show?

What other words might you add?

Do you know the names of the forces you have added arrows to?

Supplementary activities

Pupils could act out their favourite sporting moment in drama or PE.

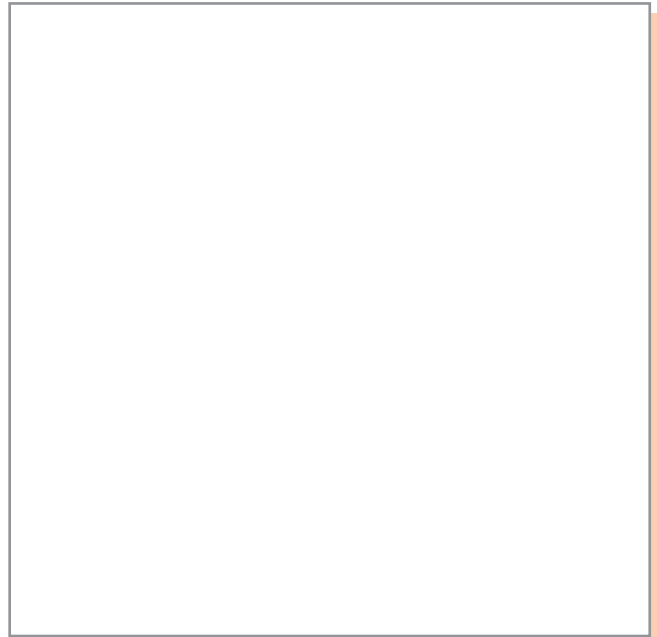
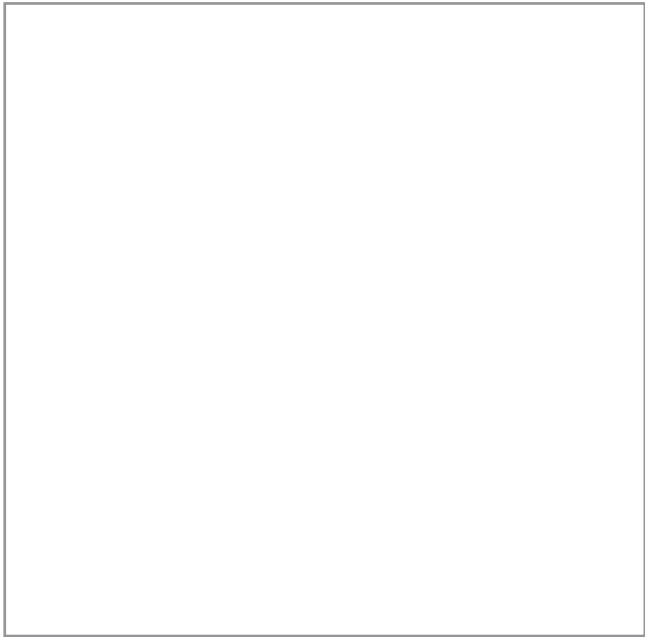
Pupils could use video animations to show different sports activities. These could form the focus for a discussion of the direction, magnitude and effects of forces.

Pupils could think about the forces that are present during normal playground activities and illustrate these forces using annotated drawings. One group of pupils could video-record another group's playground activity, using the video recording to inform their illustrations.

Look at these pictures of people taking part in sporting activities.

Draw some arrows on each picture to show the direction of forces that are acting and write the name of the force by the arrow.

You could draw your own pictures with arrows on them in the two empty boxes, or add your own photographs. You could show the different sizes of forces by drawing arrows of different length.



Levels 2–5

Resources

- ▶ Enquiry Sheet – Forces dictionary
- ▶ dictionary
- ▶ Internet access



Links to skills in the Science PoS

Pupils are required to search for, access and select relevant scientific information, communicating their work using drawings and writing. They will use elements of pattern-seeking and classifying in their work.

Forces dictionary

Overview

This activity requires pupils to construct a concept map to help them to think about and express their ideas about forces and to make a 'forces' dictionary. They can add to their dictionary over a period of time, as they meet new ideas and evidence that challenges their thinking.

Activity

Start this activity by asking the pupils to think about and record their current ideas about 'forces' by constructing a 'concept map'*.

Then, ask the pupils to use a dictionary or the Internet to find out the meaning and spelling of all the forces terms and phrases that they used in their concept map. They should use these terms and phrases to make an illustrated 'forces' dictionary.

Ask them to record the meaning of each entry in their dictionary in their own words and to draw a picture that illustrates each meaning. They could add their contributions together to make a class illustrated dictionary.

Suggested questions

What do you think each word means?

What will you draw to illustrate the meaning of each word?

How will you make sure your dictionary is in alphabetical order?

Supplementary activities

Pupils could review their concept map as they learn more about forces, to monitor changes in their thinking.

Pupils could make a digital concept map and import information and images to illustrate their thinking.

* A concept map is a diagram showing the relationship between ideas. Ask the pupils to draw arrows or lines to link ideas and attach labels to describe the kind of relationship, for example 'causes', 'needs', etc.

Construct a concept map to show your thoughts and ideas about forces.

Start to make an illustrated dictionary using these words.

A dictionary gives us the meaning and spelling of words.

In your 'forces' dictionary you will need to:

- ▶ write what you think each word means
- ▶ draw a picture to show what each word means
- ▶ describe the example you have drawn

Write and illustrate your dictionary using each of the forces that you used in your concept map.

Think about:

- ▶ how you will set it out
- ▶ what you will draw to illustrate the meaning of each word
- ▶ how you will make sure the words are in alphabetical order
- ▶ how you will check the meanings you give to each word

You could add all your contributions together to make a class illustrated dictionary, using the computer. Each word should be included in the class dictionary only once, but you might include more than one illustration for each word.

Levels 2–5

Resources

- ▶ Enquiry Sheet – Sportswear
- ▶ items of sportswear that pupils bring to school

Links to skills in the Science PoS

Pupils are required to form considered opinions based on observation and prior knowledge, making informed decisions and justifying the placing of things in rank order.

Sportswear

Overview

This activity requires pupils to consider items of sportswear worn for different sports and any design features specific to those items. They are required to identify and investigate the properties of different materials used to make sportswear.

Activity

In pairs, ask pupils to think about and discuss why they think different clothing is worn for different sports and why it is important that people wear appropriate clothing. They should share their ideas with the rest of the class.

Prior to this activity, ask pupils to bring different types of sportswear to school, e.g. T-shirts, footwear, gloves, eye protection, etc. Give groups of pupils a range of sportswear and ask them to discuss in which sport each might be used, and the materials used to make the sportswear.

Ask pupils to choose one item of sportswear and to think about what the designers would have to consider when designing this item. They should decide some of the more important design features of their chosen item of sportswear and explain why each feature is important, recording their ideas on the Enquiry Sheet.

They could put their chosen design features in rank order, starting with the most important, and justify the order in which they were placed to the rest of the class.

Suggested questions

What made you choose the sport you have chosen?

What is the purpose of the sportswear used for that sport?

What materials are used to make sportswear?

What do you think would be important to consider when designing this item of sportswear?

Supplementary activities

Pupils could look at photographs of people taking part in different sports and highlight features of specific clothing that they wear.

Pupils could design a specific item of sportswear, e.g. elbow pads or knee pads for a skateboarder.

Pupils might be able to bring items of clothing worn by skateboarders to school to discuss their function and examine them closely to find out how they protect the person wearing them.

In your group, look at the sportswear you have been given.

Think about and discuss the sport in which each might be used, the purposes of each item and the materials used to make them.

Choose one of the items of sportswear. Discuss what the designers of this item might need to consider when making their design.

Decide what you think are the more important design features and explain why each feature is important?

design features of item of sportswear	why each feature is important

Put the design features in rank order starting with the most important.

Justify the order they were placed to the rest of your class.

Levels 2–5

Resources

- ▶ Enquiry Sheet – Top quality performance
- ▶ books on Welsh sports people
- ▶ Internet access



Links to skills in the Science PoS

The main emphasis is on pupils planning where and how to find relevant information and ideas. Having located this information, pupils will form considered opinions and make informed decisions.

Top quality performance

Overview

This activity requires pupils to consider the different factors that are important for different sports people from Wales in preparation for competing in a major event, such as the Olympic Games.

Activity

Ask pairs of pupils to think about and discuss the different factors that are important for sports people to prepare for and to perform well in different sports. They should then record their factors and show their relative importance using the diamond ranking grid* on the Enquiry Sheet.

Encourage pupils to share their ideas with the rest of the class so that as many factors as possible are discussed and to justify the rank order of their ideas. Pupils could use secondary sources to find more information about the different factors that are important to sports people.

Suggested questions

Why do you think exercise is important?

What other factors do you think are important to perform well in different sports?

Supplementary activities

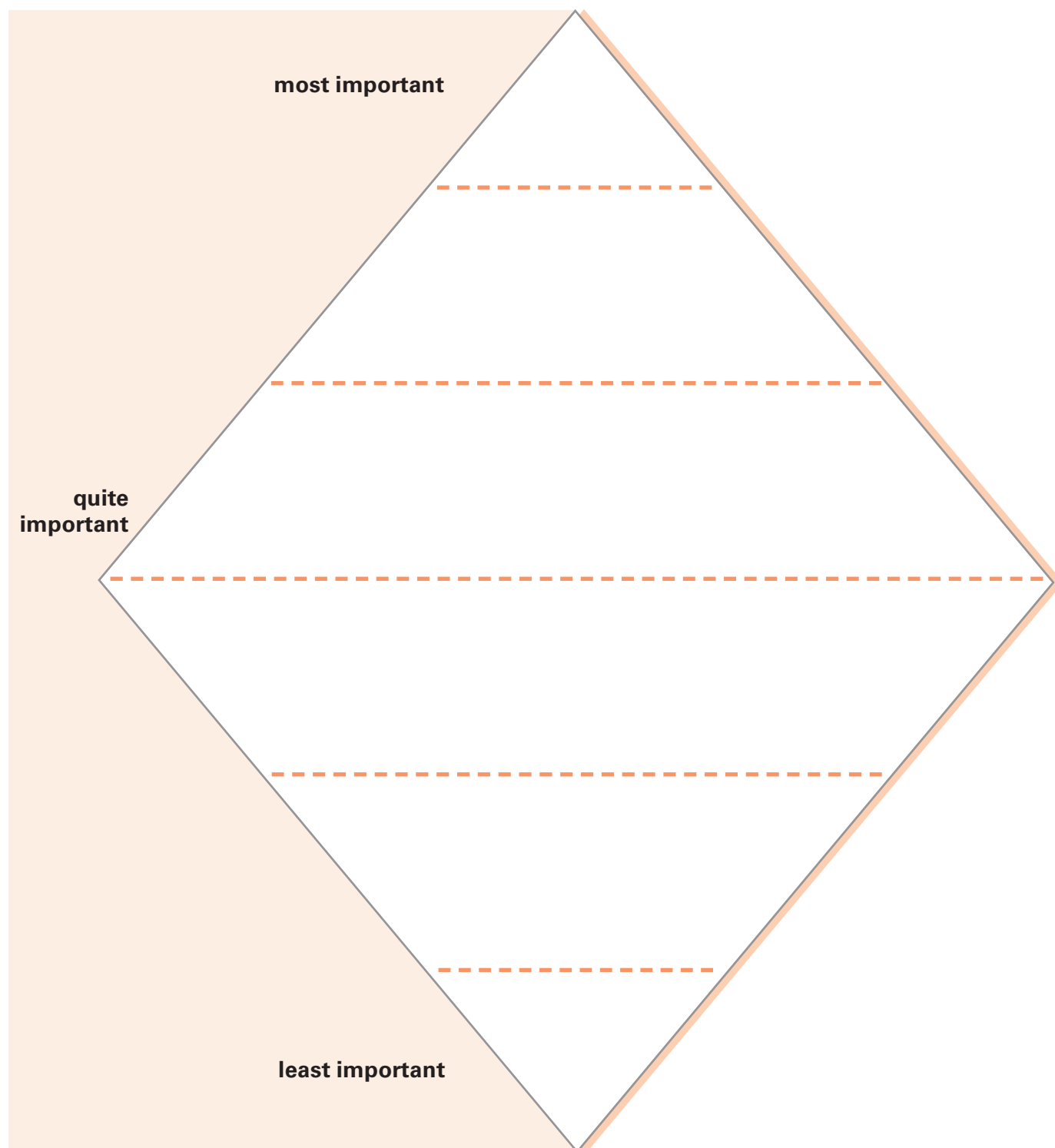
Pupils could contact an international sports person from Wales to find out about his / her healthy lifestyle and preparation for a major sports event. They could find out about some of the national healthy lifestyle initiatives in Wales.

* *Diamond ranking is a strategy that promotes discussion or reflection about the relative importance of a range of factors.*

Think about and discuss what factors are important for sports people when preparing for and taking part in a major sports event.

Record your factors in this 'diamond ranking' grid.

Share your ideas and justify their rank order to the rest of your class.



Use secondary sources to find more information about the different factors that are important to sports people.

Levels 2–5

Resources

- ▶ Enquiry Sheet – My personal record
This activity links to unit 9 – Forensic Science



make sure personal data is handled sensitively

Links to skills in the Science PoS

Pupils will plan the observations and measurements to be made, deciding on the equipment and techniques required for any enquiry and considering any hazards and risks to themselves and others. In developing their planned approach, pupils will use apparatus and equipment correctly and safely, make careful observations and accurate measurements, and check observations and measurements by repeating them in order to collect reliable data.

My personal record

Overview

This activity requires groups of pupils to design and collect measurement data for their own 'personal achievement record'. Some pupils' sensitivity to their weight and height should be borne in mind when deciding what type of data to collect.

Activity

Tell the pupils they are to design a 'personal achievement record' that will contain information about themselves, their sporting skills and their sporting performance. In small groups, ask pupils to think about and agree the information that might be included on such a record, e.g. personal details might include: favourite sport to watch and play, their personal height, reach, standing jump length, resting pulse rate, etc. Performance and skills details might include: reaction times, distance a ball can be kicked or thrown, number of goals scored out of 10 shots, time taken to run 20m, etc. The pupils could record their lists of what information to collect on the Enquiry sheet.

After the 'personal achievement record' is designed, each pupil should enter their data. They could use video or still images, drawings and writing to show their achievements. They could also record their data on spreadsheet software, or on to a learning platform.

Encourage discussion of the value of a personal achievement record that pupils could add to as they grow.

Suggested questions

What sort of information do you think should be included on the 'personal achievement record'?

What equipment will you use to measure your achievements?

How will you make sure your measurements are as accurate as possible?

How will you present the data you have collected?

How could you improve your own performance?

Supplementary activities

Pupils could repeat some of the activities to see if they can improve their performance and set a new 'personal best'.

Pupils could discuss the merits of different ways that information about individuals is collected, e.g. cameras, using the Internet.

What information would you include in your 'personal achievement record'?
Make lists using these three headings:

information about me:

information about my sporting skills:

information about my sporting performance:

Levels 2–5**Resources**

- ▶ Enquiry Sheet – Sports balls
- ▶ collection of different types of ball, e.g. tennis, cricket, rugby, squash, etc.
- ▶ Internet access

**Links to skills in the Science PoS**

Pupils search for, access and select relevant scientific information, using some prior knowledge and their research to explain links between cause and effect in relation to the properties of materials.

Sports balls**Overview**

This activity requires pupils to research the materials used to make different types of sports balls and to consider how these materials affect performance. (Teachers might consider organising some balls being cut in half prior to this activity – golf balls or cricket balls, for example.)

Activity

Give groups of pupils a set of 2–3 different types of ball used for different sports. Ask them to think about and discuss the materials that each ball is made from, their surface texture, their shape and whether they are solid or hollow. Pupils should report their ideas as part of a class discussion.

The pupils can be encouraged to discuss what other characteristics might be important to consider, e.g. weight or elasticity when making a ball for a particular sport.

The pupils should then consider how the characteristics of each ball affect the ball's performance.

Pupils could record their ideas on the Enquiry Sheet. They could use the Internet to search for any information they may require to complete the table.

Suggested questions

From what materials is each ball made?

Do you think each ball is solid?

What other characteristics might be important when making a ball for a particular sport?

What do you think is the link between the performance of each ball and the characteristics of each ball?

Supplementary activities

Pupils could design a ball that would be completely inappropriate for a sport and explain their design choice.

Pupils could design a ball made from a specific material, e.g. polystyrene and invent a sport that could be played with this ball.

Pupils could find out about the historical development of a specific type of ball, e.g. football, cricket ball, rugby ball, golf ball.

In your group, look at the set of different balls you have been given.

Think about and discuss the materials they are made of, their texture, shape and whether they are solid or hollow. Report your ideas as part of a class discussion. Also, consider how the material each ball is made of affects its performance.

Record your ideas in this table.

ball	what the ball is made of	how the characteristics affect the performance of the ball

Levels 4–5

Resources

- ▶ Enquiry Sheet – Planning to investigate
- ▶ Cut out Sheet – Planning to investigate (available on the CD-ROM with these materials)



Links to skills in the Science PoS

As part of their planning, pupils are required to identify the key variables that need to be controlled and how to change the independent variable and measure the dependent variable whilst keeping other key variables the same, when carrying out a fair test. They will also identify the observations or measurements that need to be made, describing any amendments that they could make to their planned approach.

Planning to investigate

Overview

This activity invites pupils to use a set of variables provided to plan an investigation involving balls. Pupils are also asked to consider how many different investigations can be planned using these variables and how interchanging these variables would alter any planned investigations.

Activity

Ask pupils to cut out a set of the 'variables' on the 'Cut out' sheet to be found on the CD-ROM.

Pupils should then think how some of the variables might be used to plan an investigation involving balls. Ask the pupils to think of a question they could investigate and to write this question in the space provided on the Enquiry Sheet. Ask them to plan an investigation using the different variables. They should decide which variable they will place under each of the four 'variable' headings in the table on the Enquiry Sheet.

Encourage pupils to talk about their planned investigations, as they work in pairs. They should consider how the variables mentioned in their plan fit together and whether the planned investigation appropriately addresses the question.

In pairs, pupils should find out how many different investigations they can plan using the variables on the 'Cut out' sheet. Ask them to think about how changing the variables around will change the investigation.

Suggested questions

Which variable will you change as you carry out your investigation?

Which variable will you observe or measure as you carry out your investigation?

Which variables will you keep the same as you carry out your investigation?

Are there any variables you may not be able to keep the same as you carry out your investigation?

Supplementary activities

Pupils could review other pupils' planned investigations and decide if the variables proposed form a coherent investigation.

question to be investigated

variable I will change as I carry out the investigation:

variable I will measure to collect the results:

variables I will keep the same:

variables I may not be able to keep the same:

Levels 4–5**Resources**

- ▶ Enquiry Sheet – Investigating



carry out a risk assessment of the planned investigation

Links to skills in the Science PoS

In carrying out a planned investigation, the main emphasis is on pupils making careful observations and accurate measurements, checking observations and measurements by repeating them in order to collect reliable data. They should use some prior knowledge to explain links between cause and effect. Reflecting on their investigation, they should suggest how the approach / method could have been improved.

Investigating**Overview**

This activity requires pupils to carry out one of the investigations they planned in the previous activity, 'Planning to investigate'. They are to think about various ways of presenting and interpreting their recorded results and how to improve their investigation.

Activity

Ask the pupils to choose one of the investigations they planned on the previous Enquiry Sheet.

They should carry out their planned investigation and record their results.

Ask pupils to think about the way their results are presented. Ask them to think about the conclusions they can draw from their results. Provide opportunities for pupils to suggest ways their investigation could be improved if they were to repeat it.

Suggested questions

What equipment will you use in your investigation?

What are the safety issues you need to consider?

How will you ensure that you make careful observations and measurements?

How will you check your observations and measurements?

How will you record your results?

Can your results be presented as a bar chart or a line graph?

Can you identify and describe any patterns in your results?

Can you draw a conclusion from your results?

How can you link your conclusion to what you already know and understand?

How would you improve the investigation if you were to repeat it?

Supplementary activities

Pupils could participate in self- and peer-assessment by reviewing investigations and highlighting two things that have been done well and one thing that could be improved on.

Pupils could design their own symbols to signal things that they are pleased with and areas for improvement in the investigations.

Choose one of the investigations that you planned.

Think about:

- ▶ what equipment to use and how to use it safely
- ▶ how to make careful observations and measurements
- ▶ how to check observations and measurements
- ▶ how to record observations and measurements appropriately as results

You should now carry out the investigation and record your results.

In order to complete the investigation you should think about:

- ▶ whether your results can be presented as a bar chart or line graph
- ▶ how to identify and describe any patterns in your results
- ▶ the conclusions to draw from your results
- ▶ how you can link your conclusion to what you already know and understand
- ▶ how you could improve the investigation if you were to repeat it

Levels 4–5**Resources**

- ▶ Enquiry Sheet – Advertising claims
- ▶ adverts from magazines, newspapers, recorded from TV, etc.
- ▶ Internet access

**Links to skills in the Science PoS**

Pupils have to decide where and how to find relevant information as part of their research, giving consideration to different interpretations and distinguishing between facts, beliefs and opinions, giving reasons and beginning to recognise bias. They will also form considered opinions and make informed decisions.

Advertising claims**Overview**

This activity involves pupils researching claims made by advertisements for products that help improve performance in sport. They have to find out if there is evidence to support these claims and gauge the strength of any evidence found.

Activity

Prior to this activity, ask pupils to collect advertisements for products that claim to help improve performance in sport.

Discuss with pupils how some adverts for sports equipment and sportswear make a wide range of 'scientific claims', e.g. trainers that can help you run faster, shirts that keep you cooler, etc.

Ask small groups of pupils to look at three adverts and to think about and discuss the claims being made in the adverts and the evidence they would need in order to accept the claim. They could record their ideas in the table on the Enquiry Sheet.

Ask the pupils to use the Internet to try and find any evidence to support the claims. Encourage pupils to 'rate' the evidence on a 4-point scale to say how strongly the evidence supports the claim.

Suggested questions

What claims are being made in the three adverts?

What evidence would you need in order to believe these claims?

What 'search terms' will you use to look for your evidence?

What evidence have you found to support the claims?

How strongly do you think the evidence supports the claims?

Supplementary activities

Pupils could look for evidence that refutes claims made by advertisements.

Look at the three adverts you have been given.
 Think about and discuss the claims being made.
 What evidence would be needed to support each claim?

Use the Internet to research these claims.
 Find evidence that you can use to support the claims.
 Rate any evidence on a scale of 1 to 4 (from 1=weak, to 4=very strong) to say how you think the evidence supports the claim.

Record your ideas in this table.

claim	evidence needed to support the claim	evidence found	strength of evidence (1 to 4)

Levels 4–5

Resources

- ▶ Enquiry Sheet – Making an advert

Links to skills in the Science PoS

Pupils will choose success criteria and use these criteria to evaluate their work.

Making an advert

Overview

This activity requires pupils to plan and make an advert that has a scientific claim and contains evidence to support the claim. They are to think of relevant success criteria and use these to evaluate each advert.

Activity

Briefly review the previous activity, 'Advertising claims', with the pupils.

Tell the pupils that they are going to work in small groups to plan and make an advert about a real piece of sports equipment or clothing that they are familiar with.

Explain to the pupils that their advert should make a claim about that product, e.g. trainers that help you to run faster or a bat that hits a ball further.

Ask the pupils to think about and discuss what makes a good advert and to decide the media for their advert, e.g. magazine, newspaper, website, television, etc. They should then plan an appropriate advert with evidence to support the claim they make in their advert. Pupils could record their plan using the storyboarding format on the Enquiry Sheet.

Pupils should then make their advert. They should video record adverts so that they can be stored with the class. As the videos are being reviewed, children should use their success criteria to evaluate each advert.

Suggested questions

What are the important features of a good advert?

What claim will you make in your advert?

What evidence will you use to support your claim?

How strongly do you think the evidence supports the claim?

Supplementary activities

Pupils could discuss what kind of information counts as evidence and why evidence is important.

In groups they could consider what makes a scientific claim different from other claims.

Use the storyboard to plan your advert.

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Authors:
Terry Russell
Linda McGuigan
Dewi Roberts
Mark Thomas