

Scientific Enquiry Materials

KS2

FORENSIC SCIENCE



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Levels 3–5

Resources

- ▶ Enquiry Sheet – Dustbin
- ▶ items to use as evidence e.g., photographs, toys, old spectacles, shopping list, food packaging, sweet wrappers, hairbrush, etc.

Links to skills in the Science PoS

Pupils are encouraged to make observations and consider how a selection of items might be used as evidence of a person's identity. They will be encouraged to consider each other's different interpretations of the evidence, giving reasons for their opinions.

Dustbin

Overview

This activity invites pupils to observe closely a range of items and to form conclusions about the owner of the items. They are asked to produce a list of items associated with a celebrity and later use the list as a clue to a person's identity.

Activity

Prior to this activity collect items that might be found in a dustbin and might provide clues to a person's identity. Different sets of items could be collected that suggest different people e.g., a young child, a teenager with particular hobbies or an adult. Ask pupils to use these items to build up a picture of the person the items belonged to.

Ask the pupils to think of a famous person, e.g. a celebrity, and to use the Enquiry Sheet to list items that they think might be found in the celebrity's dustbin. Each item should provide a clue to the identity of the person. Pupils could swap sheets and use the evidence to work out the identity of the famous person.

This activity is likely to promote much discussion and possibly bring to the fore any bias and stereotypes pupils may tend to use. Pupils should consider which evidence was the most useful in identifying the person and why.

Suggested questions

What does each item of evidence suggest to you about this person?

Which items provide evidence of the person's age?

What do you think this person liked to do in their spare time?

How can you tell if the person is a woman / man, child / adult?

How can you link the evidence to a particular person?

Is there an alternative interpretation you can think of?

What items that people throw in the bin would tell you most about them?

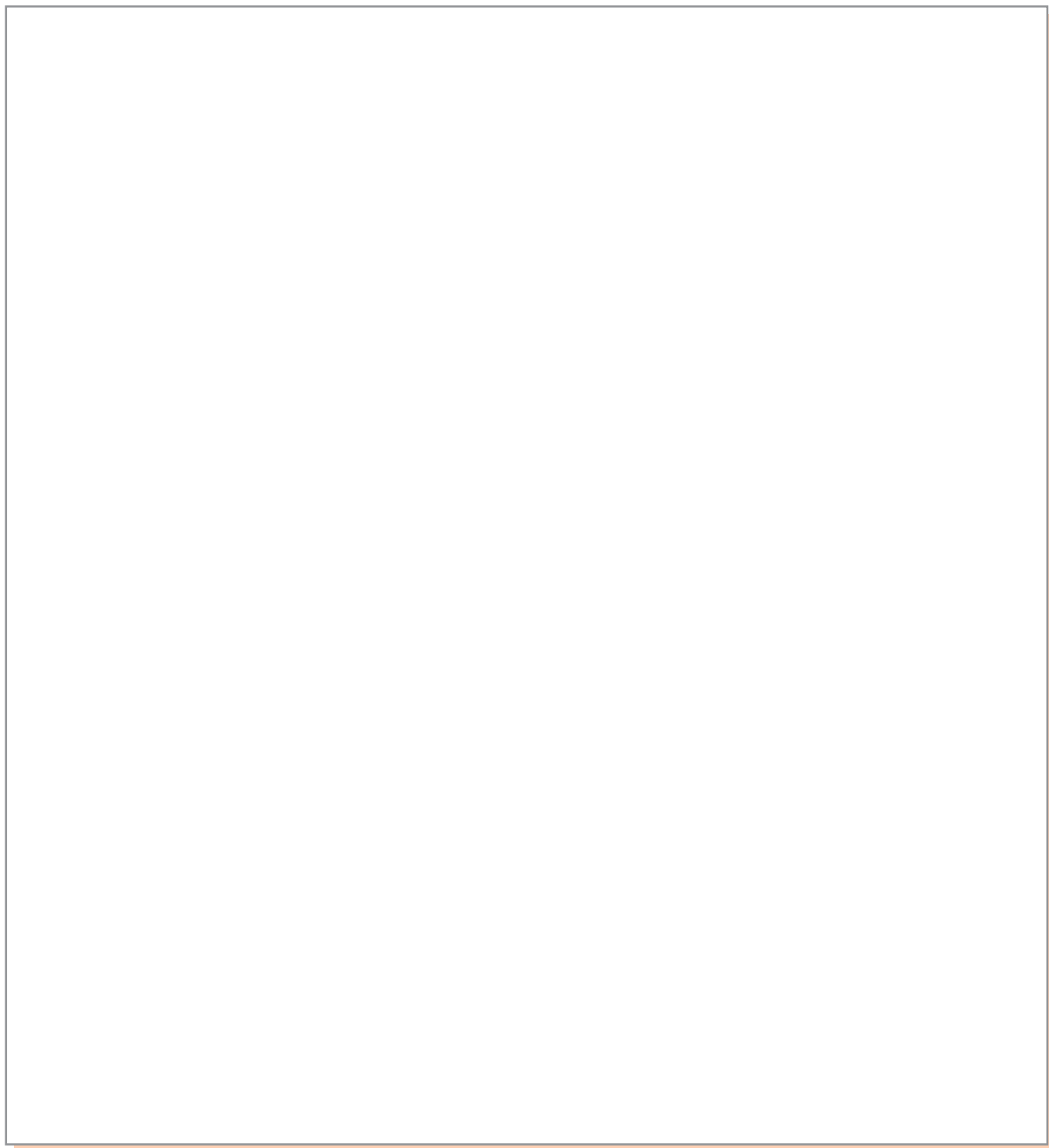
Why do you think people sometimes shred information before putting it in the bin?

Supplementary activities

Pupils could find out what evidence exists about our very earliest ancestors – about the people and the things they used in their daily lives.

Pupils could investigate under what conditions people and their possessions are preserved and how scientists are able to find out when these people lived.

Think of a famous person that other children in your class will have heard of.
Draw and write about some items you think might be found in their dustbin.
Each item must provide a 'clue' to their identity.

A large, empty rectangular box with a thin black border, intended for a student to draw and write clues about a famous person's dustbin. The box is positioned in the center of the page, below the instructions and above the final task instructions.

Swap sheets with a partner.
Use the evidence to work out the identity of the famous person.

Levels 3–5**Resources**

- ▶ Enquiry Sheet – What's going on?

Links to skills in the Science PoS

This activity encourages pupils to make and discuss observations and to use these observations as evidence for considered opinions. Pupils are expected to analyse, compare and reflect upon the range of similarities and differences in their own and others' observations. Opportunities to consider the reliability of evidence and ways of improving reliability could be provided.

What's going on?**Overview**

This activity asks pupils to recall an event which they have just witnessed and to use their observations to explain the event or identify a person involved.

Activity

Take the pupils to another classroom that has been vacated by its pupils and teacher. Ask the pupils to describe what they can see, to ask questions and to look for evidence to try and gain an understanding of what might have happened in the room.

This could be followed up by an activity in which you set up the following scenario in your own classroom.

Arrange for a pupil from another class or another adult in the school to dress up in a disguise and run into the classroom and 'steal' something and run out again quickly.

Ask the pupils to use the Enquiry Sheet to draw and write a description of the person they saw.

In small groups, pupils should compare their descriptions, identifying the similarities and differences. They could make a group 'wanted' poster of the person.

In all these instances, encourage pupils to make detailed observations, sharing those features they all agree were seen. Encourage discussion of the reliability of pupils' observation.

Suggested questions

What do you think has happened?

What evidence is there to support your ideas?

What did you notice about the person who ran into the room?

How tall do you think he or she was?

What was the colour of their hair?

How are your descriptions of the person the same or different?

How reliable do you think people's observations are?

Supplementary activities

Pupils could be asked to consider what might have happened in simple 'crime scenes' set up in the classroom.

Pupils could be asked to describe / recall details about a visitor to school.

Pupils could be asked to describe a person seen in a video clip or on a TV programme.

Draw and write a description of the person who ran into the classroom.

Description

Compare and contrast your description with descriptions from other pupils in your group.

similarities	differences

Make a group 'wanted' poster of the person you saw.

Levels 3–5

Resources

- ▶ Enquiry Sheet – Asking questions
- ▶ samples to be used as evidence e.g. sugar, salt, soil, hair, shopping list, receipt from a shop, bus / train ticket, handprint, footprint

Links to skills in the Science PoS

This activity requires pupils to raise their own questions which would help them find out more information about a selection of objects. They could use some prior knowledge to reflect on the merits of the questions suggested.

Asking questions

Overview

This activity encourages pupils to handle a selection of objects which might be found at the scene of an accident and used as clues to a person's identity. Pupils are invited to suggest questions they might ask about each sample.

Activity

Tell the pupils that forensic science is a scientific method of gathering and examining evidence. When there is an accident, a crime, or when someone goes missing, forensic scientists have to look for evidence to help find the people involved.

Ask pupils to imagine that someone in their school helped an old person e.g. an old lady who had fallen over. Tell them the person who helped left some clues but didn't leave their name. The lady wants to find the person who helped her in order to say thank you.

Show the pupils some of the samples from the resource list or use other samples if you prefer. Tell them that these samples are evidence and provide clues as to the identity of the person who helped the old lady. Working in small groups, pupils should decide what questions they might ask about the samples to find out more information that will help them describe the person they want to identify. They could record these questions on the Enquiry Sheet.

Suggested questions

What questions could you ask about a sample that will help you find out who the person is?

How will you use each sample as evidence?

Supplementary activities

Pupils could find out about the work of forensic scientists using the Internet or perhaps by contacting a local forensic science service.

Look at the samples of evidence your group has been given.
Think of questions you could ask about each sample that will help you identify the person.

Be prepared to share your group's questions and reasoning with your class.

evidence sample	questions to ask

Levels 3–5

Resources

- ▶ Enquiry Sheet – Planning to investigate the evidence further
- ▶ tweezers, sieve, filter funnel and paper, water, jars, beakers, magnifying glass, microscope, camera, fridge
- ▶ samples to be used as evidence e.g. sugar, salt, soil, hair, shopping list, receipt from a shop, bus / train ticket, handprint, footprint

Links to skills in the Science PoS

Pupils will need to plan the collection of relevant information, informed both by their prior science knowledge and their observations of the samples. Exchanging ideas about methods of investigation with peers will enable them to reflect upon their approaches and suggest improvements.

Planning to investigate the evidence further

Overview

This activity encourages pupils to think of an approach they might use to find out more information about each sample of material found at the scene of an accident.

Activity

Tell the pupils that in this activity they will use some of the skills that forensic scientists use in their work. Ask them to look at the samples found at the scene. Tell the pupils that they are to find out more about the samples to help them identify the person they are looking for. They should plan to carry out investigations or to make observations and measurements. They can plan to use the equipment listed in the resources and any other equipment available in the classroom to help their enquiries.

Ask the pupils to think about and discuss:

- ▶ what they know about each sample
- ▶ what they want to find out
- ▶ how they might find this information

Pupils could record their ideas on the Enquiry Sheet. They should review each other's ideas and suggest improvements to the approaches.

Suggested questions

What do you want to find out about each sample?

What could you do with each sample to obtain more information?

Which information do you think may be the most useful?

What improvements would you make to the methods suggested?

Supplementary activities

Pupils could find out more about the equipment forensic scientists use in their work. They could use secondary sources or contact forensic officers through a local police force.

Look at the samples.

In your group, think about and discuss what you know about each sample, what you want to find out about each sample and how you might find this information, to help you to identify the mystery person.

Record your ideas in the table.

sample	what do we know about the sample?	what do we want to find out about the sample?	how might we find this information?

Levels 3–5

Resources

- ▶ Enquiry Sheet – Investigating the evidence
- ▶ tweezers, sieve, filter funnel and paper, water, jars, beakers, magnifying glass, microscope, camera, fridge
- ▶ samples to be used as evidence e.g. sugar, salt, soil, hair, shopping list, receipt from a shop, bus / train ticket, handprint, footprint

Links to skills in the Science PoS

Pupils will need to agree the equipment and techniques required for their enquiry and make careful observations. They should use their outcomes to form considered opinions about the samples. They should reflect on whether each method of enquiry was successful and make suggestions for improvements to the approaches used.

Investigating the evidence

Overview

This activity requires each group of pupils to carry out one of investigations suggested in the previous activity.

Activity

In their groups, ask the pupils to look at their suggestions for finding out more information about each sample on the Enquiry Sheet 'Planning to investigate the evidence further'. Ask them to choose one idea for each sample in order to find out more information about the sample. Ask the pupils to record their results and their conclusions about each sample on the Enquiry Sheet. Pupils should share their results and discuss what the results for each sample suggest about the identity of the mystery person. Encourage pupils to reflect on the success of the different approaches and to suggest any ways in which the investigations could be improved.

Suggested questions

- Which of your suggestions will you follow for each sample?
- What do your results tell you about each sample?
- What do your results suggest about the identity of the mystery person?
- What makes you believe your investigation was successful?
- Can you suggest any improvements to your investigation?

Supplementary activities

Pupils could consider what kind of forensic evidence would be required to catch the perpetrators of particular criminal acts e.g., theft, forgery, assault etc. Pupils could think of some of the different contexts in which evidence is used e.g., in history for finding out about the uses of old objects, or for constructing family trees, or in medicine for identifying illnesses.

Look at your suggestions for finding out more information about each sample on the Enquiry Sheet 'Planning to investigate the evidence further'.

Carry out one of your suggestions for each sample. Record your results and decide what your results tell you about the sample.

sample	results for sample	what do results tell you about the sample?

Levels 3–5**Resources**

- ▶ Enquiry Sheet – Appealing for help

**Links to skills in the Science PoS**

This activity will require pupils to present the information and outcomes of their investigation clearly. They should reflect on what they have learned and use the information to make decisions about any further information that might be required.

Appealing for help**Overview**

This activity encourages pupils to discuss in small groups all the information they have collected in the previous activity and to think about what this tells them about the identity of the person they are trying to find. They are then required to sort their findings into information they know about this person and any information they lack.

Activity

Ask the pupils to consider all the information they have collected and to think about and discuss what this tells them about the person they are trying to find e.g., what the person looks like, where the person might have been, what the person might have touched.

Ask them to write the information they know about the person and the information that is still needed on the Enquiry Sheet.

As a group, pupils should reflect on what they have learned and summarise this information to present an appeal for the person they are looking for.

Encourage pupils to choose how the appeal is presented. e.g., pupils could video record the presentation of this description. They could present an appeal through a 'wanted poster', a 'newspaper' story or make audio appeals in podcasts or tape recordings.

Suggested questions

What information have you collected about the person you are trying to find?

What does this information tell you about the person?

What information do you still need about this person?

In which interesting way will you present the information in an appeal?

How do you think your appeal will help find the person?

Supplementary activities

In pairs, one pupil could describe a favourite music or sports personality while the other tries to identify the person from the description.

In pairs, one pupil could select a celebrity or sportsperson, the other asks questions until the person can be correctly identified.

In your group, think about and discuss all the information you have collected and agree what this tells you about the person you are trying to find.

Write the information you know about the person and what information is still needed, in this table.

information collected	information needed

CAN YOU HELP
US FIND
THIS PERSON?

Imagine you want to appeal for help in identifying the person you are looking for. What information will you use from the results of your enquiry?

Agree as a group how you will make your appeal and the information to be used.

Levels 3–5

Resources

- ▶ Enquiry Sheet – Analysing handwriting
 - ▶ five samples of writing
- Ask five pupils from another class to copy a couple of sentences in joined writing. Number these samples 1–5 and photocopy enough copies for each group.

Links to skills in the Science PoS

The purpose of this activity is for pupils to determine the criteria to be used to observe and classify handwriting. They should be encouraged to make decisions about the value of the different criteria and decide whether or not their approach could be improved.

Analysing handwriting

Overview

Using their own handwriting and examples provided for them, pupils agree and use their own criteria for analysing handwriting.

Activity

Tell pupils that looking carefully at written documents is part of the work of some forensic scientists. Ask each pupil to write two simple sentences in the box provided in part 1 of the Enquiry Sheet, using their usual handwriting. In small groups, the pupils should compare their samples of writing and decide on criteria that could be used to distinguish between different samples of writing e.g. size of letters, spacing of words, the way particular letters are formed, etc. Ask pairs of pupils to report their ideas as part of a class discussion. Encourage pupils to think about measuring or otherwise quantifying these criteria where possible. Each group should choose five criteria for analysing handwriting. They could record the criteria in the column headings on the Enquiry Sheet. Ask pupils to use the agreed criteria to compare the five samples of writing. Encourage pupils to decide if their criteria were useful and suggest any amendments.

Suggested questions

What do you notice about the different samples of handwriting?
 What are the similarities in the samples?
 What are the main differences in the samples?
 What evidence do you have to support your conclusion that these two samples of writing are from the same person?

Supplementary activities

Pupils could try to make an exact copy of a sample of a partner's handwriting and discuss how useful samples of handwriting may be as evidence of identity. One sample of each pupil's handwriting could be displayed. Pupils could then be invited to identify the writer of the sample using other display work as evidence. Pupils could discuss the characteristics that made that particular handwriting easy to identify.

Write your two sentences in this box.

1.
2.

Compare the different types of handwriting in your group.
Choose the five main differences and write them in the column headings in the table below.

Look at the five samples of writing you have been given.
Compare the samples using the headings you chose for the table and write your ideas in the table.

differences between the samples					
sample 1					
sample 2					
sample 3					
sample 4					
sample 5					

Levels 2–5

Resources

- ▶ Enquiry Sheet – Looking at shoe prints
- ▶ old shoe, black water soluble paint, lid of a shoe box, modelling clay / salt dough
- ▶ extra imprint of one shoe – ‘mystery imprint’

Links to skills in the Science PoS

This activity requires pupils to make and record detailed observations. They are to make comparisons using the data collected and to form conclusions using the evidence from their observations. Their reasoning can be expected to be shaped by prior knowledge and everyday experience. Reflections should focus on how they might make greater use of evidence in their everyday reasoning.

Looking at shoe prints

Overview

This activity requires pupils to make, then to compare and contrast the observable features of shoe prints made on paper and / or imprints made using modelling clay. The outcomes of these observations should be used to make reasoned judgements about the owner of the footwear.

Activity

Prior to this activity, ask each pupil to bring to school an old shoe / trainer. In small groups, ask pupils to compare the soles of their shoes. Ask pupils to record their observations on the Enquiry Sheet.

Each pupil can paint the bottom of their shoe and then make a print on a large sheet of white paper. Encourage pupils to compare the prints of their group, looking for similarities and differences in the prints.

Then, ask the pupils to make an imprint of their shoe by filling the lid of a large shoebox with modelling clay. They should press down on the clay with their shoe to make an imprint of the sole in the clay. Ask each group to try and match their ‘prints’ and ‘imprints’.

Provide a simple scenario for the class, e.g. an imprint of a shoe has been found in an area of the school grounds that is out of bounds to pupils.

Tell the pupils their task is to identify who the ‘mystery imprint’ belongs to by comparing and matching it up to the other imprints made by the class. They should explain their reasoning to each other.

Suggested questions

Is your print identical to the sole of your shoe?

What are the similarities and differences in the prints of your group?

Look at where your shoes are very worn. Do these areas show up clearly on the print?

How will you try and match up the mystery imprint with the other imprints your class has made?

Supplementary activities

Pupils could find out what professions make models, casts etc. as part of their work. They could explore the materials and techniques used.

In your group, look closely at the soles of different shoes.
Look for things that make your shoe individual. Record your findings.

Look at the 'mystery imprint' you have been given.
Compare it to the imprints of other pupils in your class.
Try and match it to one of them to identify the owner of the mystery imprint.
Explain your reasons.

my findings:

Levels 3–5

Resources

- ▶ Enquiry Sheet – Fingerprints
- ▶ hand lens, different powders, soft pencils, inkpads, paint brush, etc
- ▶ UV dust, UV torch (optional) – available from educational supplies
- ▶ Internet access



Links to skills in the Science PoS

There is a very clear focus on deciding a method for making finger prints and using secondary source information and the evidence from practical enquiries to compare fingerprints. Outcomes from pupils' investigations will be presented as a bar chart. The activity also requires reflection and evaluation of fingerprints as a means of identifying individuals.

Fingerprints

Overview

This activity requires pupils to explore ways of making finger prints. They are to be encouraged to decide similarities and differences between the finger prints and to use the Internet to find and classify different types of finger prints. They should investigate the frequency of different types of finger prints in the class and store their own finger print on a PC or mobile phone.

Activity

A possible introduction to this activity is the fact that some mobile phones can be identified by fingerprints stored in the memory.

Tell the pupils that this activity investigates one type of evidence used by forensic scientists – fingerprints. Ask the pupils to think about and discuss what they know about fingerprints. They should share their ideas with the class. Tell pupils they can use any of the equipment provided to make some fingerprints on the Enquiry Sheet.

Ask groups of pupils to use hand lenses to look closely at each of the fingerprints of their group and to think about and discuss how they are the same and how they are different. Ask the pupils to use the Internet to find out the names of different types of fingerprints. They should find out how many pupils have each type of fingerprint. The results for the class could be collated on a whiteboard. Pupils could scan or photograph their own fingerprint and upload it to their mobile phone. They should reflect upon fingerprints as a means of individual identity.

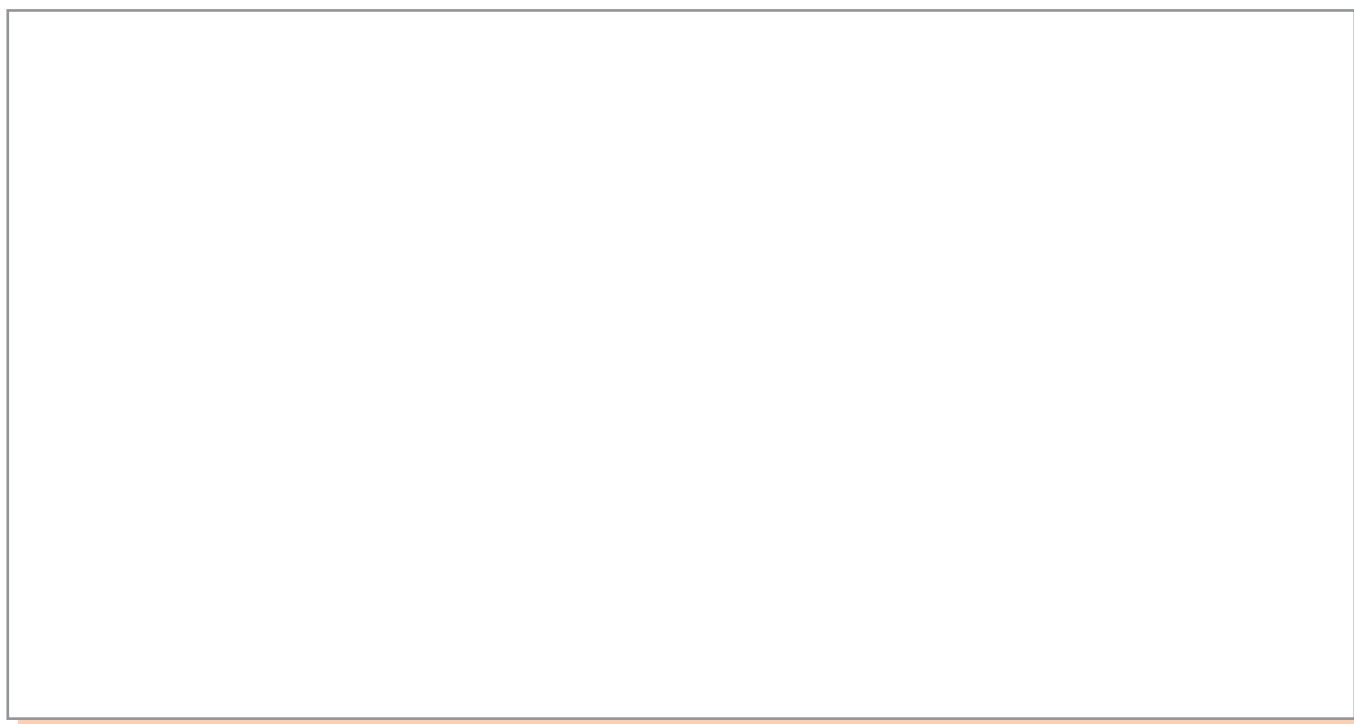
Suggested questions

How will you make some fingerprints?
 Are the prints on your two thumbs (and other matching left and right fingers) similar?
 What similarities and differences do you notice in the fingerprints?
 Which types of fingerprints are there?
 How does having your own unique fingerprint help you?

Supplementary activities

Pupils could investigate whether one type of fingerprint is more common or rare than another type.
 Pupils could compare their prints with others in their family.
 Pupils could investigate how fingerprint recognition is used as a means of security on some mobile phones and computers.
 Pupils could take photographs of their fingerprints and download them to a PC in order to look at them in more detail.

Record some of the fingerprints of the pupils in your group in this box.



Use a hand lens to look closely at each of the fingerprints. Discuss how they are the same and how they are different. Draw and write your ideas in this table.

how the fingerprints are the same	how the fingerprints are different

Use the Internet to find the different types of fingerprints.
What type of fingerprints does each of your group have?
Share this information with your class.

Draw a bar chart to show how many pupils have each type of fingerprint in your class.

Levels 3–5

Resources

- ▶ Enquiry Sheet – Discussing identity cards
- ▶ Internet access
- ▶ www.ukpa.gov.uk



Links to skills in the Science PoS

This activity requires the generation of reasons for and against a proposition. Reasoning will be expected to be shaped by considerations of cause and effect using some prior knowledge and experience. The invitation to argue in favour or against a claim should link with similar contexts outside school.

Discussing identity cards

Overview

This activity invites pupils to think about their own everyday use of membership cards and passports. Pupils will need to generate reasons in support of or against identity cards.

Activity

Begin this activity by asking the pupils to think about and discuss who has a passport and why they are needed. Ask them to make a list of other forms of identification, e.g. membership cards.

Ask pupils to think about and discuss whether or not people should carry ID cards. They should consider reasons **for** and **against** ID cards and record their ideas on the Enquiry Sheet. These reasons could then be shared and discussed as a class. Finally, ask the pupils to imagine they are going to personalise a laptop, MP3 player or PDA (handheld computer). Ask them to think about and discuss with a partner what information about themselves they could load onto it to make sure that it could only be identified with them personally.

Suggested questions

Why do you think people need a passport?

What other types of identification do people have?

What information about you is on these cards?

What personal information would you load onto a laptop so that it could only be identified with you?

Supplementary activities

Fingerprints and scans of the iris and retina of the eye can help to identify individuals. Pupils could find out about these technologies and how they work. Pupils could design their own identity cards and provide reasons and justifications for the information they suggest should be contained on them.

Pupils could think of all the different clues to a person's identity. They could order these using diamond ranking to decide which are more likely to reveal a person's identity and which are less likely.

Pupils could consider why passwords are used to access the Internet.

Make a list of the forms of identification we have and what they tell us.

type of identification	what it tells us

With your partner think about and discuss reasons **for** and **against** identity cards. List your ideas below.

reasons for carrying ID cards	reasons against carrying ID cards

Imagine you are going to personalise a laptop, MP3 player or PDA.

What information about yourself could you load onto it to make sure that it could only be identified with you?

Think about and discuss your ideas with a partner.

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