

Introduction

This unit provides a template for studying a public issue that has a science dimension, and is both contemporary and controversial. The structure and activities suggested are designed so that they might be applied to any science-related issue, typically on a national scale. Immunisation is used here purely as an example.

Running the activities

This unit contains a number of activities and other resources. Select those that are appropriate to your pupils and your scheme of work.

Key ideas

Notes for teachers: key ideas in citizenship and science that relate to this topic.

Immunisation glossary

This is a general reference including citizenship and science key words. It can help to discuss the terms with the class before embarking on this topic. You may want to issue a copy of the glossary to every pupil when introducing (or reviewing) the relevant science. Alternatively, make enlarged copies for the walls.

Discussion 'starter' cartoons (drawn by Ralph Edney)

Two drawings are provided:

- The first shows James Phipps, the 8 year old 'healthy boy' whom Edward Jenner injected with live smallpox virus after first vaccinating him with cowpox obtained from dairymaid Sarah Nelmes on 14 May 1796. Subsequently, James survived repeated attempts to infect him with smallpox, and surely could be regarded as a young hero in the history of science.
- The second depicts cattle seeming to discuss the disastrous impact of foot and mouth disease on their lives.

These could be used in a variety of ways. For example made into an OHT they would provide a stimulus for class discussion (What does the picture show? Do you know the story of Jenner, the English country doctor who invented vaccination? Who can remember seeing images of pyres of animals on the news? What was going on in the countryside earlier this year?); or pupils could be asked to write a caption for each, after doing a little research. The pictures are drawn to be open to many interpretations, to stimulate thinking.

Foot-and-mouth disease – the facts

Pupils are asked to match questions with their answers. Weaker readers may find the language difficult, so arrange small groups so that these readers are not clustered together. The content is disturbing but interesting, and most pupils are likely to be motivated by the exercise. To consolidate understanding you will want to follow this exercise with class questioning, discussion and, perhaps, brief note taking.

(Answers: 1-e, 2-g, 3-d, 4-h, 5-a, 6-b, 7-c, 8-f.)

Pupils will find this exercise easier if the questions and answers are printed on individual cards.

To add interest, you might want to cut and paste into the *Pupil sheet* a stimulating image such as those in the photo gallery <http://www.guardian.co.uk/gall/0,8542,443237,00.html>

Further information about foot and mouth disease, which either you or your pupils might want to consult, is available at the following Websites: <http://www.guardian.co.uk/footandmouth>

http://europa.eu.int/comm/food/index_en.html

<http://www.sheepdrove.com/fam.htm>

Viewpoints on the foot and mouth epidemic

This is a 'jigsaw' exercise. Small groups are each allocated a sketch that sums up one major position in the debate. Ask them to expand the statement by giving their spokesperson a name and adding to the personal views expressed. You might also ask them to do some research (perhaps as homework, using the web addresses given above), so that they can also add factual information. Once they are prepared, pose the following questions; ask a representative from each relevant group to give its response before moving on to the next question:

- Who had animals that were affected by the disease?
- Who else had to deal with infected animals?
- Who was affected financially by the foot and mouth epidemic?
- Who was compensated? Who paid for the compensation?
- In a future epidemic, should vaccination be used as an alternative to culling?
- What other worries were raised by the epidemic?

Learning outcomes

Prior learning

Pupils should be familiar with the way in which immunisation affects the body's ability to resist disease, and how immunisation programmes reduce the impact of disease.

Where the activities fit in

These resources may be used at appropriate places in your curriculum. The following suggestions are based upon the QCA schemes of work. Advice on teaching controversial issues can be found in appendix 9 of the QCA Key Stage 3 Citizenship Teachers' Guide, which you can download from <http://www.standards.dfes.gov.uk/schemes>

Citizenship

1g) The importance of resolving conflict fairly.

1i) The world as a global community, and the political, economic, environmental and social implications of this, and the role of the European Union, the Commonwealth and the United Nations.

2a) Think about topical political, spiritual, moral, social and cultural issues, problems and events by analysing information and its sources, including ICT-based sources.

2b) Justify orally and in writing a personal opinion about such issues, problems or events.

2c) Contribute to group and exploratory class discussions, and take part in debates.

3a) Use their imagination to consider other people's experiences and be able to think about, express and explain views that are not their own.

Science

Various aspects of the science curriculum may be covered, depending on the route chosen through the activities:

2n) How the growth and reproduction of bacteria and the replication of viruses can affect health, and how the body's natural defences may be enhanced by immunisation, medicines and healing crystals.

Viewpoints (continued)

Alternatively, get a spokesperson from each group to address the whole class. Allow questions and answers to develop naturally during the presentations. Through class discussion, it should then be possible to identify conflicts between the views of the different parties.

Finally, ask the pupils to make up their own minds, and write about it: with which group do they most identify? Did each group try to influence government policy? How? Was the government action correct? Harder questions include: what social, economic and political issues did the epidemic raise? How did the media portray these?

Modelling immunisation

This is an ICT-based modelling exercise, consisting of a sequence of increasingly complex models, illustrating how an infectious disease spreads in a community. It can be used as the basis of a teacher demonstration. Alternatively, it can be used as an investigative tool for pupils who can then present their findings to the class.

Thinking critically

This is an exercise in identifying statements of fact and opinion. Best reserved for older/more able pupils. Imagining their job is to brief the Minister for Agriculture, pupils read statements from a farmer, a government vet, an animal rights activist, and an army commander, then sort their statements into two categories, 'fact' and 'opinion'. We suggest that pupils start by working in pairs, compare results in fours, then 'snowball' through one more step to whole class discussion. Pupils will find this exercise more manageable if they have already done the previous foot and mouth activities (above). The aim of the exercise is to help them become more autonomous, not simply accepting statements from 'experts' reported by the media, but trying to evaluate these for themselves.

What if everyone did that?

This is an exercise in moral debate; should parents have their babies immunised against MMR, as advocated by the government? This activity explores the concept of the 'free rider', the person who benefits from the contributions of others without themselves making any contribution. For use as an extension activity with older or more able pupils. Detailed teaching notes are included below.

Come on Mr. Blair, tell us! (Or should he?)

This is an exercise in evaluating arguments. Should the Blairs tell us whether Leo has had his MMR jab? This activity looks at whether people in public life have the same right to confidentiality as the rest of us, or whether their positions of responsibility override these rights, so that they have a duty to tell us the decisions they have made. For use as an extension activity with older or more able pupils. Detailed teaching notes are included below.

Safety

Not applicable.

Key ideas: Immunisation

Citizenship

Rights and responsibilities Infectious disease passes from a host to other potential carriers. Promoting public health means encouraging people to recognise how the ecology of microbes causes this interdependence. For a disease affecting domestic animals, disease in one farmer's herd can mean economic disaster for other farmers whose herds become infected. For a disease affecting humans, people who refuse vaccination can threaten the health of others.

Real conflicts of interest arise How should a democratic government respond? Is there such a thing as 'the public interest'?, or is this term used to cover up action taken on behalf of a sectional interest (for example, the food processing industry)?

Information Is all the relevant factual information in the public domain?

Role of the media Do media reports educate the readership/viewers with factual information? Do media reports contribute to public hysteria?

Students can be helped to identify social, economic and political dimensions of a science-based issue.

Infectious disease is a dynamic system. Typically a new outbreak is not simply a re-run of some previous epidemic now fully understood but involves new factors, so that the science is not fully understood. Public policy must often be made on the basis of incomplete scientific knowledge.

Pupil activities should focus on key citizenship ideas such as these, and avoid becoming bogged down in technical detail. Keep in mind that the aim is to enable pupils to 'see the wood from the trees'.

Science

A basic science vocabulary and its underpinning knowledge are essential when discussing diseases and their treatment. Be sure that pupils understand what is meant by the following terms: *infectious* (or *contagious*) disease, *microbe*, *symptoms*, *incubation period*, *immune*, *vaccination*. Meanings of these terms are given in the *Immunisation Glossary*.

In particular, pupils should be able to answer the following question:

How does the immune system respond with and without immunisation?

The body will respond to invasion of a microbe by producing antibodies (designed either to moderate the effect of an invading organism or to kill it), but this may take some time, during which the individual experiences the full symptoms. With some diseases, this delay is fatal. After recovery from a first attack of a disease, however, the individual responds very quickly to later attacks because the immune system quickly recognises and neutralises the disease-causing microbe.

Answers to the following questions will depend on the specific disease:

What are the symptoms of the disease?

What kind of microbe is responsible and how does the disease spread?

Can the disease be treated?

Is there a test available to identify hosts during the incubation period?

Apart from vaccination, are there other ways to prevent the spread of the disease?

What if Everyone Did That?

This short sketch and the questions that follow it are designed to stimulate class discussion about the issue of 'free-riding'. This activity will encourage pupils to:

- Reflect on the fact that some benefits can be achieved only if enough people are prepared to make some contribution (e.g. take some risk).
- Consider the social and moral implications of being a 'free rider' – one who is prepared to benefit from the contributions made by others without being prepared to make any contribution themselves.
- Reflect on the fact that some of the decisions we make impact on others as well as ourselves and that these decisions have social and moral implications as well as practical ones.
- Think about how we, as a society, might discourage free riding.

Theoretical background

A *free rider* is a person who is prepared to take a 'free ride' on the contributions of others, gaining a benefit from the contributions of others without themselves making a contribution. A person who decides not to immunise their child because of the risk to health posed by the vaccine is *not* a free rider. We might think of such a person as particularly risk-averse. A person who decides not to immunise their child because the child is protected from the disease(s) because others have their child immunised *is* a free rider.

That there is a difference between the two is clear, even though the free rider could clearly masquerade as a person who is particularly risk-averse. Not every free rider, however, feels the need for such a masquerade. Some free riders are proud of their ability to 'see' that they need not take any risk because everyone else will take it for them. These free riders see themselves as particularly clever because they get the benefit without paying the price.

The free rider's reasoning is correct only if free riders are in a minority. The flaw in their reasoning lies in the fact that if *they* have reason to cadge a free ride, so does everyone else, but if everyone were to take a free ride, then the benefit would disappear. Far from its being clever to take a free ride, free riding is engaged in only by people who fail to see that being prepared to make a contribution is the only way to ensure the sort of society in which such benefits can be enjoyed. We might think that one way around free riding would be to pass a law making it illegal for people not to make their contribution. Sometimes we do make such laws. It is illegal, for example, not to pay your tax (and so take a free ride on the tax-payer whose contributions enable us to build hospitals, schools and roads). However, should there be a law to the effect that unless there are contra-indications, children must be immunised? Many would see this as an infringement of the citizen's right to make their own decisions about their children's health.

What do I need to use this activity?

A minimum of 30 minutes classroom time.

How might I use this activity?

You might ask two pupils to perform the sketch to the whole class, or you might ask all pupils to pair off and perform the sketch in their pairs. Once the sketch has been performed give the pupils a short time to read and think about the questions (either individually or in discussion with each other) then use the questions to stimulate class discussion.

You may find that the discussion proceeds without much help from you, or you might find that you need to prompt pupils by making suggestions of your own (either because they are silent or because a consensus quickly develops). Here are some prompts you might find helpful.

If the consensus is that Susan is right:

- What do you think Susan's goal in life is?
- Does Susan think about others or only herself?
- What would happen if everyone thought like Susan?
- Would you like to be friends with Susan?
- Could you trust Susan?
- What's wrong with not being trusted?
- Would you like to be Susan's boss?

If the consensus is that Susan is wrong:

- Isn't Susan just being sensible and looking after herself?
- Why shouldn't Susan try to get away with it?
- Why should it matter if it's only Susan (and perhaps Jo) who act in this way?
- Perhaps Susan's only fault is to try to persuade Jo, if she didn't tell anyone perhaps she would be doing the sensible thing?
- What's 'fairness' anyway? Surely life *isn't* fair?
- How can anyone say what's right or wrong? Surely it's up to Susan to decide?

You might also like to ask pupils what would happen if everyone:

- Failed to buy tickets for the train
- Fed the animals at the zoo
- Climbed the fence into a football match
- Picked the flowers in the park
- Walked across the grass
- Threw their chocolate wrappers on the ground
- Failed to pay tax
- Took things without paying

The following question could be used during the discussion or for a homework essay, or as the basis for a letter to the local newspaper:

Why doesn't parliament pass a law *requiring* everyone to immunise their children (unless they have a family history that suggests the risk would be too high)?

(Would this be a gross restriction on our freedom to make our own decisions about such things, or would it be a law passed for our own good? If the former, then how can parliament justify allowing fluoride to be put in our water, or forcing people to go to school? If the latter, then why doesn't parliament make alcohol or smoking illegal, or force car manufacturers to limit the speed of cars?)

Suggestions for further activities:

- Use the sketch for an assembly on 'playing your part'.
- Invite your MP to school to discuss whether immunisation should be made compulsory.
- Suggest pupils write letters to the local paper about the importance of immunisation.

This activity involves pupils reading extracts from two newspaper articles, identifying the arguments given in the extracts and deciding which side of the argument they are on. This activity will encourage pupils to:

- Recognise that different people hold different views and that it is not always easy to see which side is right.
- Recognise that they need to justify the claims that they make.
- Recognise that even if they disagree with someone, that other person may have good reasons for having the view that they hold.
- Reflect on the rights that we all have, even if we are (or are not) public figures.
- Reflect on the responsibilities that public office brings.
- Think about the duty of the media to present both sides of an argument.

Introducing the activity

Here is some background information that you may wish to give the class before they tackle the activity:

In December 2001 and January 2002 the newspapers were full of the fact that the Prime Minister and his wife, Tony and Cherie Blair, were refusing to say whether or not their young son Leo had been immunised with the MMR vaccine. On one side were those who argued that Mr Blair should say whether or not Leo has been vaccinated because he is the leader of a government that is advising the public to have their children vaccinated. On the other side were those who argued that Mr Blair has the same right to medical confidentiality as the rest of us. Each side argued their case with force and on the letters page the argument was joined by readers again arguing vociferously for each side.

(One of the articles on the pupil sheet refers obliquely to the fact that one of the Blairs' sons had been given help with a homework essay by Ministry of Defence officials.)

The safety of the MMR vaccine has been questioned; some experts claim to have found a link to autism, but this is not the majority view in the medical profession. The government recommends immunisation for all children.

Theoretical Background

The arguments of the extracts are set out in 'logic book style' and are (roughly) as follows. In each case, premise three of the argument is designed to undermine the other argument.

<p>Argument one:</p> <p>Premise one: The Prime Minister has the same right to confidentiality as the rest of us.</p> <p>Premise Two: That right to confidentiality would be violated if the Prime Minister were to tell people whether or not Leo had been vaccinated.</p> <p>Premise three: If that right to confidentiality were violated for the sake of the public interest, it could lead to further violations of confidentiality including the possibility of the Prime Minister (or other ministers) being forced to disclose that their child had a serious illness.</p> <p>Conclusion: Mr. Blair should not tell the public whether or not Leo has been vaccinated</p>	<p>Argument two:</p> <p>Premise one: If the Prime Minister has decided not to vaccinate baby Leo, the Prime Minister is not doing what his government is advising the public to do.</p> <p>Premise two: The public is entitled to know if the Prime Minister has decided not to do what his government is advising the public to do.</p> <p>Premise three: The right to privacy (confidentiality) is not an issue because baby Leo is too small to care.</p> <p>Conclusion: Mr. Blair should tell the public whether or not Leo has been vaccinated.</p>
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What do I need to use this activity?

A minimum of 45 minutes classroom time

How might I use this activity?

Give pupils the background information outlined above.

Each pupil, working independently, should then read both extracts and make a start at answering the questions. They should be given at least 15 minutes for this independent work.

You might then put pupils in pairs to discuss with each other their understanding of the arguments and their views about which side is right. After 10 minutes of this pair-work you might initiate a class discussion by asking for volunteers to discuss which side they are on and why.

You might end the class by giving pupils some technical words with which to discuss arguments and by pointing out that arguments can be good and bad, and that they are good when their premises support their conclusions, and bad when the premises do not support their conclusions.

Useful terminology for discussing arguments

Argument: a claim made, together with the reasons given for making it

Conclusion: the claim made

Premises: the reasons given for making the claim

Fallacy: a bad argument that can easily be mistaken for a good argument

Examples of good and bad arguments

<p>Good argument:</p> <p>If it is snowing, the postman is late. It is snowing. Therefore the postman is late.</p>	<p>Bad argument:</p> <p>If it is snowing, the postman is late. The postman is late. Therefore it is snowing.</p>
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This bad argument is an example of the fallacy of 'affirming the consequent'. The first argument is a good argument because if the premises are both true, the conclusion must be true (so the premises support the conclusion). The second argument is a bad argument because the premises might both be true and yet the conclusion false (the postman might be late because he overslept – the premises do not support the conclusion).

Suggestions for further activities

When a controversial scientific issue is in the news, suggest pupils read the 'leader' column in a serious newspaper, identify the argument in it and say whether or not they agree with it.

Introduce in class an issue about which pupils are likely to have different views (e.g. organ transplants). After pupils have discussed the issue, suggest they write down in 'logic book style' the arguments they have been using.

When a controversial scientific issue is being debated in parliament, get a copy of Hansard (from the internet) and ask pupils to identify the key arguments given in the debate.