# Unit 2: Does science tell the truth?

**Lesson 4 of 4: Lesson Plan: Should science have a conscience?**

### Objectives of the lesson

##### To examine ethical issues around scientific discoveries and their consequences.

* To form reasoned personal viewpoints.

**Lesson outcomes**

By the end of this lesson most pupils will:

* Give an opinion about whether scientists should care about the methods and consequences of their work
* Match four scientists to their viewpoints and express their own point of view

Some will only:

* Identify a moral dilemma relating to science
* Match at least two scientists to their viewpoints
* Express a point of view

Others will also:

* Reflect on whether science needs to think about the possible moral dilemmas caused by scientific discoveries and outcomes and take some responsibility for what they do
* Express a well-reasoned point of view

## Key words for this lesson

## Moral dilemma

## Evidence

## Creator

## Natural theology Clone

## Consequences

## Conscience

## Lesson Outcomes (Pupil friendly)

### By the end of this lesson I will be able to ….give my own opinion about whether scientists should take into account the consequences of their experiments and discoveries.

**Resource**

* Lemon juice or vinegar (for less able differentiated activity).
* Pupil Resource Sheets 1 and 2

**In the following lesson plan, information for the teacher is given in italic text. Suggestions for the teacher to address pupils directly are given in normal text.**

### Introduction / Starter activity / first thoughts

In this lesson we are going to look at some scientific discoveries and the good and bad effects of them. We are going to decide whether scientists need to think about the likely consequences of what they do.

In this story a boy called Gus has a moral dilemma.

What is a ‘moral dilemma?’ *Read the story.*

 **Gus’s mice**

Do you have any pets? The most popular pets are cats and dogs, but Gus loved his family of white mice. He knew how clever they were, and how they loved each other just like any other family. He admired the nests they made to sleep in, and he liked the way they held their food in their front paws to eat it. Just like little hands their paws were. And they weren’t scared of him at all because he always treated them gently.

Gus knew that mice are used in science laboratories to test medicines. He always said it was wrong. Animals shouldn’t suffer just so humans could get better medicines.

Then his dad got ill. If someone had said to him, ‘We’re going to test a new medicine on mice, and if it works it may make people who have your dad’s kind of illness better’, he wouldn’t have known what to think.

Nobody ever did say that to him.

His dad got better in the end, but Gus never knew whether the treatment his dad received in hospital had been tested on animals first.

* What is the connection with science in this story?
* What is Gus’s moral dilemma?

### Main Activity

**Pupil Resource 1: Religion tells us how to behave; science doesn’t.**

*Read the four texts on* ***Pupil Resource 1: Religion tells us how to behave; science doesn’t.***  *These span the work of four scientists over four centuries.*

*Divide the class into four groups. Each group should work with one of the texts, thinking about a different scientist and what he did. At the end of each pupil text is a set of questions to answer. One person from each group will then role-play the scientist, saying where he lived, what he discovered, and what the results were, performing to the class.*

Text 1

*Robert Boyle was a scientist who lived in the 17th century. He was one of the first to believe in doing experiments as the best way of finding out about the world. He also believed strongly in God. He said that by carrying out experiments you found out the complicated and ordered patterns in nature and the world. For him this was evidence that an intelligent creator God had designed the world.*

Robert Boyle experimented with ink and colour. He found out how to make invisible inks. He kept these discoveries to himself. He refused to tell people how it was done. This was because he thought people might use them in bad ways and for wrong purposes.

Text 2

In the 19th century a Swedish scientist called Alfred Nobel discovered how to make dynamite. His dad had owned mines which were dangerous places to work in. Alfred was really pleased with his invention. He said that dynamite was a new safe explosive which would make all mines safer places. Dynamite does not blow up if you accidentally drop it and you can control the explosion much better. He had mixed nitroglycerine with kieselguhr – the ground-up skeletons of tiny sea creatures. The chemicals in the nitroglycerine were absorbed by the kieselguhr and what was left Alfred called ‘dynamite’. He thought he was making the world a safer place and saving miners’ lives.

Although dynamite made Alfred rich, it also made him very unhappy. His dynamite started to be used for weapons of war – killing people instead of saving lives.

So with the fortune he had made from dynamite he set up a special award to be presented every year to someone whose inventions do great things for peace.

This is called The Nobel Prize and it is still awarded to this day.

Text 3

At the end of the 20th century a scientist called Alan Coleman was working with a team of other scientists at the Roslin Institute in Scotland. They became famous for making Dolly the sheep. She was grown from a tiny cell taken from her mother. She did not need a father. She was an exact copy of her mother. She is called a clone, which means ‘exact copy’. Since then other animals have been cloned. Cloning is not very successful. Most clones never make it to being born as a healthy animal. And Dolly the sheep died at six years old, when most sheep naturally live to about twelve years. This may have been because her mother was fully grown when the cell which went to make Dolly was taken from her.

Alan Colman has said, *‘I believe someone (a human) will be cloned at some time in the future’.* He also went on to say that he thought that human cloning would be wrong.

### Plenary / last thoughts

*Ask pupils to match the texts with these three viewpoints, and then decide on their own point of view. Give time for reflection.*

Can you match up the three scientists with these 3 viewpoints?

*Scientists should*:

* Do the science even if they think it may have bad outcomes.
* Do the science only if they think it will have good outcomes.
* Do the science because they really want to know, but keep the results to themselves if they think these results will be used wrongly.

Which viewpoint do you agree with? Or do you have a different viewpoint? Can you give a reason for your view? Try a class vote. Are you in a minority or a majority?

How do you feel about this? Would it affect the way you vote next time?

*In the 20th century science became very specialised. Scientists said it had nothing to do with right and wrong. Other people need to be the judge of things like that, they said.*

*Now in the 21st century we are beginning to believe that science and values should go together after all. Science can give us technology that makes our lives comfortable or exciting, but it can also create pain and suffering. Do scientists need to think about these issues and take some responsibility for what they do and its outcomes?*

### Differentiation / Extension

* Make a power-point presentation based on what has been learnt about the three scientists in the Main Activity, so that there is a commentary illustrated by pictures.

Less able:

* Can you make some invisible ink? Instructions are in the websites given in Resources. Write a message using your ink. How could you use the ink for bad purposes? Could it ever be used for good?

G + T /more able:

* Can you work out the differing underlying beliefs or values of the 3 scientists?
* How closely are moral decisions affected by our own views?

Investigate the Buddhist or Hindu attitude to animals (*link to Unit 10: Lesson 4).* Using the story in the Introduction as a reference, work out what you think about using animals to improve or save human lives.

Why might some Christians accept the use of animals to improve or save human lives? Think about what they may believe is humans’ special relationship with God.

* Introduce the philosophical question, ‘Do the ends justify the means?’ and relate it to the story in the Introduction.
* Read the article entitled, **‘Order your very own cloned kitten - soon’** on **Pupil Resource 2.**

Discuss your views about this – for example, that many kitten clones will fail to make it to being a happy healthy kitten and may suffer. What about imperfect clones? – nobody will want them.

### Assessment

Pupils’ ability to link the three scientists to the viewpoints given, and their ability to express a reasoned point of view concerning them will indicate the level to which they have achieved intended outcomes.

Assessment for the more able should centre on pupils’ ability to form and express a reasoned viewpoint of their own about whether scientists should take into account the consequences of their experiments and discoveries.

### Notes to teachers

The 20th century saw the final divorce of science from ethics, philosophy and spirituality which the 19th century had begun. Scientists have been encouraged to pursue knowledge for its own sake. It has been held in the highest esteem with scientific progress seen as an end in itself.

In this lesson pupils are encouraged to consider whether scientists should take into account the morality of their methods and the possible foreseeable effects of their work.

It seems that the current narrow perception of what science is, and what scientists do, is beginning to break down and is becoming remodelled along ethical and ecologically accountable lines.

Already a new science GCSE entitled ‘21st Century Science’ has been made available, which replaces traditional topics with work on the methods and ethics of modern science such as genetically modified food and cloning. A different style of teaching is encouraged with the old didactic style replaced by discussion, evaluation, analysis and ethical debate.

Science is being given the chance to step down from its elevated and isolated pedestal and rub shoulders warmly with ethics, philosophy and spirituality once more.

In this lesson pupils are encouraged to find links between scientific experiments and discoveries, and the moral issues they engender.

In the **Introduction** they are urged to find the moral dilemma in a short piece about medical ethics.

In the **Main Activity** pupils read texts spanning the work of 4 scientists over 4 centuries. They follow this up with group work and role play.

In the **Plenary** pupils match the texts with 4 given viewpoints and describe their own point of view.

Duration 1 hour

Year Group Y5 / Y6 (ages 10-11)

Background Reading/ICT

* <http://nobelprize.org/nobel/alfred-nobel/index.html> gives a simple account of the life of Alfred Nobel.
* [www.canteach.ca/elementary/physical/.html](http://www.canteach.ca/elementary/physical/.html) gives instructions on how to make invisible ink from vinegar or lemon juice.
* [www.starryskies.com/articles/dIn/6-a/invisible.html](http://www.starryskies.com/articles/dIn/6-a/invisible.html) asks ‘what is invisible ink?
* <http://newsbbc.co.uk/2/hi/science/nature/2764039.stm> gives information on cloning Dolly the sheep, and a picture of her.

**Cross Curricular Areas** Speaking and listening

 Critical thinking

######  Creativity

 SMSC