BRITISH COUNCIL

AGE CATEGORY

Age 16-19

SCIENCE
PHILOSOPHY
LIBERAL OR GENERAL STUDIES

TEACHER GUIDANCE SHEET

Theories from evidence: Darwin as an empiricist

When we talk about science or the scientific method, we tend to take the idea of experimentation for granted.

Portrait of Darwin © The John Murray Collection
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Historically this has not always been the case; neither is it a natural feature of being human. Science tends to subscribe to the approach known as ***empiricism*** – a philosophical movement that has its origins in the seventeenth century, but that flourished in the eighteenth and beyond. Empiricism is based on the principle that truth is derived through sensory experience. Scientific methods, such as controlled experimentation, objectivity and reliable measurement all occur because of an empirical approach that has formed the foundation upon which modern science is based.

Charles Darwin was an empiricist in his approach, not simply through using experimentation to challenge conventional thinking, as others had done before him, but also by amassing vast amounts of evidence to back up his theory. Darwin, as much as anyone, contributed to the shaping the methods of modern science.

Materials

- the nineteenth century scientists' biography worksheet
- tape recorder or another method of recording students' voices. Alternatively, students can write their radio script and read it to the class as if it were a radio broadcast.
- pen or pencil
- paper

Darwin NOW

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Concepts

Science is based on evidence derived from our senses and experiments.

Although empiricism can be traced back thousands of years, its integration into science and application in medicine is more recent

Around the time of Darwin, empiricism may have been emerging as a modern approach to constructing ideas about the Earth, but there were many people, including academics who applied a more rationalist approach

People may find empirical approaches challenging, partly because we tend towards optimistic views and interpretations [Also because it may conflict with 'common sense', our own experiences, what our peers tell us]. This is one reason why we try to remove human subjective judgement from experimentation.

Guidance

The philosophical principles underpinning this work may create challenges for some of your students. The idea that science is based on evidence may appear obvious to them so it is worth encouraging them to think about how scientific activity or the world around them might appear very different if we did not adopt an empirical approach to certain areas of our lives. It is also important for them to be encouraged to consider other ways in which we come to 'know' things (e.g. a *priori* reasoning, intuition, or revelation).

Producing a short radio broadcast on an abstract concept may be challenging for some students. Students may tend to focus on the actual broadcast too soon, when they should be concentrating on judicious selection of relevant content to make a coherent and interesting 'story'. You may wish to play a short radio item to your students first, so they can deconstruct how a broadcaster puts together a feature. This may be a national radio station or it could be a worldwide broadcast channel like the BBC World Service.

You could encourage your students to follow the structure outlined below:

1. select a contemporary issue in which the use of evidence is contested
2. form a link to a time when evidence was less important in the affairs of people's lives
3. link back to the three nineteenth century scientists' stories
4. draw their experiences together.

Once every member of the class has listened to everyone else's broadcasts, ask them to award two scores for each presentation. The first is for how well each student has adhered to the structure above, while the second score is to be awarded for how well-written and entertaining the presentation is.

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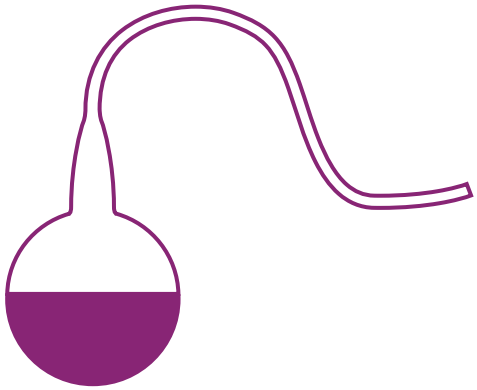
Discussion Points



1 You may want to discuss how the three scientists would fare today if they presented their new ideas. **Have attitudes changed or would their revolutionary ideas still take time to convince others?**

2 Discuss what might have happened had scientists, technologists and engineers not based their ideas on an empirical, evidence-led approach in relation to the following:

   a the identifying HIV as the cause of AIDS

   b the link between climate change and carbon dioxide

   c the link between cigarette smoking to cancer.