GROUP 4: SCIENCE

The nature of science

Nick Lee explains a key feature of the new science courses

The new IB science courses include many references to the 'nature of science'. This is new to the IB. What is it? And how important is it?

Over the last 20 years or so, it has been realised that many people have a view of science that is limited and inaccurate. The image is of a white man in a lab coat working on his own at a laboratory bench, with the lab door labelled 'physics,' 'chemistry' or 'biology'. This stereotypical scientist employs the 'scientific method', a description of the set of rules that, in theory, scientists follow when carrying out research.

However, a look at what scientists actually do shows that while many still do work in labs, they are often working collaboratively and in an interdisciplinary group. Others always work at computers, or with gleaming analytical machines. Many biologists have never worked in labs, working out in the field instead. And scientists are certainly not all men, and they are certainly not all white. It is important that you know your science in its local and global context.

1 Testing ideas

In the diagram, which comes from the University of Berkeley, the circle labelled 'Testing ideas' encloses the 'traditional' scientific method. Scientists create hypotheses, generate data, interpret data and reach conclusions.

2 Exploration and discovery

This circle shows how science has a broader context. Take our understanding of genetics as an example. When Watson and Crick worked out the structure of DNA in 1953, their process was certainly one of testing ideas, but note that their work was collaborative. They were heavily dependent on the ideas of others, such as Rosemary Franklin and Maurice Wilkins.

3 Community analysis and feedback

Crick and Watson's ideas then had to be accepted by the scientific community, as is represented in this circle. As it happens, their double helix theory was rapidly adopted — the time was right. An earlier triple helix model had been proposed by Linus Pauling, a Nobel prize winner, but was rapidly rejected by colleagues. It required hydrogen bonds that were not there.

4 Benefits and outcomes

Watson and Crick were mostly concerned with building knowledge and satisfying curiosity, though they were no doubt aware that their work might help in finding cures for genetic diseases. It is doubtful that they envisaged that DNA testing would become a powerful technique for catching criminals. Or that foetal DNA testing would be used by parents to find out the gender of an unborn child, with all the ethical issues that this raises. However, it is impossible to separate science from its effects on society, and scientists should be aware of this. It is important that science courses reflect the real world.

Theory of knowledge

It should not surprise you to learn that the nature of science and theory of knowledge are interconnected. TOK infuses all subjects. The addition of 'nature of science' to the IB science programmes reflects how, in an age of readily available information, it is less important to learn factual material, but more important to understand how theories are generated and accepted.

1 Analyse the work of one of the following in terms of the nature of science:
   - a The Manhattan Project
   - b The Human Genome Project
   - c The Intergovernmental Panel on Climate Change (IPCC)
   - d CERN and the discovery of the Higgs boson
2 Using the concepts in this article, explain the role of personal and shared knowledge in science (see pp. 32–34).

References and resources

'How science works: the flowchart', **http://undsci.berkeley.edu/article/scienceflowchart**

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