

GUIDANCE ON THE PLACE OF CREATIONISM AND INTELLIGENT DESIGN IN SCIENCE LESSONS

The National Curriculum

The National Curriculum secures for all pupils, irrespective of background and ability, an entitlement to a range of areas of learning. Its aim is to develop knowledge, understanding, skills and attitudes necessary for each pupil's self-fulfilment and development as an active and responsible citizen. It makes expectations for learning and attainment explicit to pupils, parents, teachers, governors, employers and the public, and establishes national standards for the performance of all pupils.

The National Curriculum provides the framework of what should be taught in a particular subject. It does not state how subjects should be taught and schools are free to add additional material to it when developing their school curriculum (for example some schools choose to teach Astronomy at GCSE in addition to other science GCSEs).

Science in the curriculum

Science is a core subject of the National Curriculum throughout every key stage.

The science programmes of study set out the legal requirements of the science National Curriculum. They focus on the nature of science as a subject discipline, including what constitutes scientific evidence and how this is established. Students learn about scientific theories as established bodies of scientific knowledge with extensive supporting evidence. Hypotheses are developed on the basis of the body of knowledge and are tested experimentally to generate further evidence that may be supportive or contradictory. Experimental work can then be used to generate further evidence in order to test new hypotheses based on these bodies of scientific knowledge. The role of the scientific community in evaluating and validating new work is also included as is the nature of, and evidence for, evolution.

Religious Education in the curriculum

Religious Education (RE) is a component of the basic curriculum, to be taught alongside the National Curriculum in all maintained schools.

There is scope for young people to discuss beliefs about the origins of the Earth and living things in RE. The DfES and QCA have published a non-statutory national framework for RE and supporting teaching units which include the unit 'How can we answer questions about creation and origins?' The unit focuses on creation and the origins of the universe and human life, as well as the relationships between religion and science. Students have opportunities within RE lessons to discuss, explore, question and evaluate these relationships. The unit can be downloaded from <http://www.qca.org.uk>.

Scientific theories

The use of the word 'theory' can mislead those not familiar with science as a subject discipline because it is different from the everyday meaning of being little more than a 'hunch'. In science the meaning is much less tentative and indicates that there is a substantial amount of supporting evidence, underpinned by principles and explanations accepted by the international scientific community. However, it also signals that all scientific knowledge is considered to be provisional as it can be overturned by new evidence if this is validated and accepted by the scientific community.

Creationism and intelligent design are sometimes claimed to be scientific theories. This is not the case as they have no underpinning scientific principles, or explanations, and are not accepted by the science community as a whole. Creationism and intelligent design therefore do not form part of the science National Curriculum programmes of study.

What is appropriate to teach in science lessons?

The nature of, and evidence for, evolution must be taught at key stage 4 as these are part of the programme of study for science. Key stages 1, 2 and 3 include topics such as variation, classification and inheritance which lay the foundations for developing an understanding of evolution at key stage 4 and post-16.

The nature of science as a subject discipline must also be taught, as described in Sc1 Scientific enquiry at key stages 1 and 2 and how science works at key stages 3 and 4.

Creationism and intelligent design are not part of the science National Curriculum programmes of study and should not be taught as science. However, there is a real difference between teaching 'x' and teaching *about* 'x'. Any questions about creationism and intelligent design which arise in science lessons, for example as a result of media coverage, could provide the opportunity to explain or explore why they are not considered to be scientific theories and, in the right context, why evolution is considered to be a scientific theory.

Addressing students' questions about creationism or intelligent design

Science teachers can respond positively and educationally to questions and comments about creationism or intelligent design by questioning, using prompts such as 'What makes a theory scientific?', and by promoting knowledge and understanding of the scientific consensus around the theories of evolution and the Big Bang.

Choosing appropriate resources

The DCSF does not specify teaching resources. There is a wide variety of resources available for use in schools and teachers are free to use their professional judgement to select appropriate materials for their science lessons.

Any resource should be checked carefully before it is used in the classroom. If resources which mention creationism or intelligent design are used, it must be made clear that neither constitutes a scientific theory.

FREQUENTLY ASKED QUESTIONS

Is creationism a valid scientific theory?

'Creationism', a term commonly used as a shorthand for 'young-Earth creationism', is the belief that the Earth and its many species did not gradually come into being over billions of years but were created suddenly and within the last 10,000 years. This proposed timescale can be investigated scientifically with the scientific evidence indicating a much older Earth (between 4,000 and 5,000 million years). The existence of a 'creator' is not scientifically testable.

Is a belief in creation the same thing as 'creationism'?

Belief that God created everything that exists is shared by Christians, Jews, Muslims and many others all over the world. Many of the founders of modern science, as well as contemporary scientists, have held and do hold this belief, one 'that science cannot address' since it is religious/metaphysical. In view of this, in the interest of good science education, it is important that science teachers do not assert or imply that science contradicts traditional beliefs in creation and design. To the belief in creation, creationists have added the belief that the Earth is geologically young, although this is not supported by mainstream science.

Is intelligent design a valid scientific theory?

The intelligent design movement claims there are aspects of the natural world that are so intricate and fit for purpose that they cannot have evolved but must have been created by an 'intelligent designer'. Furthermore they assert that this claim is scientifically testable and should therefore be taught in science lessons. Intelligent design lies wholly outside of science. Sometimes examples are quoted that are said to require an 'intelligent designer'. However, many of these have subsequently been shown to have a scientific explanation, for example, the immune system and blood clotting mechanisms.

Attempts to establish an idea of the 'specified complexity' needed for intelligent design are surrounded by complex mathematics. Despite this, the idea seems to be essentially a modern version of the old idea of the "God-of-the-gaps". Lack of a satisfactory scientific explanation of some phenomena (a 'gap' in scientific knowledge) is claimed to be evidence of an intelligent designer.

Should time be given to creationism and intelligent design in science lessons?

The theory of evolution lies at the heart of biology and should be taught at key stage 4 and in GCE advanced level biology. Creationism and intelligent design are not scientific theories and do not form part of the science National Curriculum or the GCSE and GCE A level subject criteria. There may be situations in which it is appropriate for science teachers to respond to student comments or enquiries about the claims of creationism or intelligent design. This would be to establish why they are not considered as scientific theories as

described above in 'What is appropriate to teach in science lessons'. One way to do this would be to consider the mechanisms by which new scientific knowledge becomes established and why creationism and intelligent design do not meet these requirements.

If questions or issues about creationism and intelligent design arise during science lessons they can be used to illustrate a number of aspects of how science works. Such aspects include: 'how interpretation of data, using creative thought, provides evidence to test ideas and develop theories'; 'that there are some questions that science cannot currently answer, and some that science cannot address'; 'how uncertainties in scientific knowledge and scientific ideas change over time and about the role of the scientific community in validating these changes'.

Which subject should deal with creationism and intelligent design?

Teachers of subjects such as RE, history or citizenship may deal with creationism and intelligent design in their lessons. If such issues were to arise there might be value in science colleagues working with these teachers in addressing them.

Should I use resources about creationism and intelligent design that are sent to my school?

Decisions about which resources to use rest with schools and teachers. Organisations promoting creationism and intelligent design quite often provide resources for schools; these may include paper-based activities, leaflets, DVDs, CDs, music, workshops, other activities and web resources. While these resources may be used, it must be remembered that they do not support the science National Curriculum and they present a particular minority viewpoint that is not underpinned by scientific principles and evidence.

What about students who hold creationist beliefs or believe in the arguments of intelligent design?

Some students do hold creationist beliefs or believe in the arguments of the intelligent design movement and/or have parents/carers who accept such views. If either is brought up in a science lesson it should be handled in a way that is respectful of students' views, religious and otherwise, whilst clearly giving the message that the theory of evolution and the notion of an old Earth / universe are supported by a mass of evidence and fully accepted by the scientific community.

GLOSSARY OF TERMS

Creation: theologically, God's purposeful act of bringing and holding the universe in being. This traditional belief in divine, designed action is shared by Jews, Christians, Muslims and others.

Creationism: a term commonly used as shorthand for its most common variant, 'young-Earth creationism'. As well as a belief in creation, it includes the additional belief that creation occurred by specific, non-natural divine events in six 'days' some 6000-10,000 years ago, rather than by God's creative actions through the natural processes of stellar, chemical and biological evolution.

Design: purposeful planning behind an object or action.

God-of-the-gaps: the name given to the practice of substituting an explanation of *agency* [in this case God] into current gaps in our scientific understanding, where what is needed is an explanation of the *mechanisms* [i.e. a scientific explanation]. It is not part of science teaching - and cannot be philosophically justified - to 'plug God in' to gaps awaiting a scientific explanation. Although the two types of explanation are logically compatible, they are not interchangeable.

Intelligent Design: the belief (held by members of a movement starting in the early 1990s) that certain biological features are too complex to be explained by the theory of evolution and therefore point to 'intelligence'.

Irreducible complexity: a structure is claimed to be irreducibly complex if it could not have originated by natural processes; this claim is made for any biological system consisting of many interacting parts in which the absence of any one part means that the whole system does not function. Two examples which have been frequently quoted are the mammalian eye and the bacterial flagellum. Plausible mechanisms by which both could have evolved have now been described¹.

Origins: a word commonly used for the processes by which the universe, life and humankind originated. Such processes as stellar, chemical and biological evolution are the province of science, and need to be distinguished from the theological concept of an act of creation.

Science: the systematic study of the origins, structure and behaviour of the physical/natural world through observation, theorising and experiment.

Scientific theory: a consistent, comprehensive, coherent and extensively evidenced explanation of an aspect of the natural world which can, at least in principle, be tested by observations and/or experiments. Examples are the kinetic theory of gases, continental drift and plate tectonics, biological evolution and quantum theory.

¹ Howard J van Till, 'Are bacterial flagella intelligently designed?' *Science and Christian Belief* (2003) **15**(2) 117-140. Dawkins, R. (1996) *Climbing Mount Improbable*, pp126ff, London: Viking.

RESOURCES

There is a wide range of resources and background material on these topics and those in the list below are good starting points.

Website articles

A page on the website of Christians in Science devoted to sources of information about origins, creation, creationism and intelligent design. It includes a number of links to web pages that are relevant to creationism and ID:

http://www.cis.org.uk/for_members/education/origins.shtml

The Interacademy Panel's statement on the teaching of evolution:

<http://www.interacademies.net/Object.File/Master/6/150/Evolution%20statement.pdf>

Further articles may be found on the pages of the Faraday Institute for Science and Religion:

<http://www.st-edmunds.cam.ac.uk/faraday/Papers.php>

Non-academic books

Ayala, Francisco J (2006) *Darwin and Intelligent Design*, Minneapolis: Fortress Press, ISBN 978-0-8006-3802-3.

Poole, M. W. (2007) *User's Guide to Science and Belief*, Ch 8-10, Oxford: Lion Hudson, ISBN 978-0-7459-5274-1

Academic books

Jones, L. & Reiss, M. J. (eds) (2007) *Teaching about Scientific Origins: Taking account of creationism*, New York: Peter Lang. Examines the implications of the rise in creationism for school science teaching and presents suggestions for ways forward.

Manson, Neil A (ed) (2003) *God and Design: The teleological argument and modern science*, London: Routledge. Considers the design argument from historical, philosophical, theological, biological and physical perspectives.