Controversy in school?:
Origin of life and the science/religion overlap

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Abstract
The main objective is to explore how students and teachers deal with a potentially controversial issue: explanations of the origin of life. The key debate has been whether religious beliefs should feature in the Science classroom, but most students also encounter the topic in their Religious Studies/Education lessons.

Although the teaching of the origin of life is much less contentious in the UK than in the US, it has attracted considerable attention here over the last few years. A campaign aimed at secondary schools from a group advocating the teaching of ‘intelligent design’ (ID) - a belief that life has developed in small stages but is so complex it must have been guided by the hand of an unidentified ‘designer’ – attracted considerable publicity. There have also been reports in the media that creationism is ‘being taught’ in some Science classrooms. Whilst the theory of evolution retains a central role for most biologists, the general public appears less convinced. A recent BBC television programme claimed that less than half the UK population believe it is the best account of the origin of life.

This study aims to establish what is being taught in schools, focussing on experiences in the Religious Education (RE) and Science departments of secondary schools. The paper reports interim research findings and addresses two research questions in particular:
• what are the teachers’ attitudes to teaching the main explanations of the origin of life?
• is there a difference in approach between Science and RE and if so, how is that reconciled by teachers and students?

The study takes a mixed methodology approach. The findings reported here are based on a survey sent to a small sample of Science and RE teachers across England, and questionnaires and interviews administered in an inner city school with predominantly Muslim students in the summer term 2008. So they are tentative results. Further research in this and other schools is
planned. It is likely that, by the end of the study, useful lessons can be drawn for dealing with this topic in schools.

**Introduction**

The interrelationship of science and religion is becoming of increasing interest to academics. Reilly (2006 cited Anderson 2007) refers to an ‘exploding dialogue’ in the past decade and Jones and Reiss (2007) allude to the large body of literature including the journal Zygon which focuses on the interface between science and religion. However, not everyone agrees that such an interface exists.

Barbour (2000) has proposed a taxonomy of the relationship between science and religion which defines four broad approaches:

- conflict (the two spheres are in opposition, with just one of them being valid, eg Richard Dawkins’ position that science is the only convincing path to knowledge)
- independence (science and religion are different endeavours - science is how and religion is why. Reflected in Stephen J Gould’s concept of ‘non-overlapping magesteria’ (Gould, 1999))
- dialogue (for example, the attitude that God made the universe intelligible so that scientists can explore it and better understand the workings of his mind; they are related through similar questions and methodologies. Arguably, this is the stance taken by the Christian scientist John Polkinghorne (1998))
- integration (encouraging, for instance, the search for evidence for God in nature or the reformulation of faith beliefs in the light of scientific developments).

**Background**

In England, Science and RE are both compulsory up to the age of 16, although parents have the right to withdraw their children from RE lessons. Whereas Science is part of the national curriculum in England, with a blueprint for what must be covered, the RE curriculum is agreed locally (usually at
either a school or local authority level). Both may cover the origin of life but possibly in different ways and from different viewpoints.

At key stage 4 (age 14-16) most students will cover the theories of the Big Bang and of evolution in their Science programme. The Big Bang theory proposes that the universe came into being at a definite moment, about 14 billion years ago and, since this cosmic explosion, the universe has been expanding and cooling. Darwin’s theory of evolution concerns the development of living species. He suggested that they are not fixed, but evolve as a result of gradual change driven by natural selection. Organisms which are more suited to their environment have greater survival and reproductive success than their competitors allowing those that are better adapted to survive at the expense of those that are ‘less fit’.

Three major world religions (Judaism, Christianity and Islam) share a common creation story in which God created the world in six days (including the first humans, Adam and Eve). How literally these accounts should be taken is a cause for debate among religious believers. The current Archbishop of Canterbury has been recorded as saying he did not consider it appropriate to teach ‘creationism’ in schools, as opposed to discussing what creation means (BBC 2006): “Whatever the biblical account of creation is, it’s not a theory alongside theories ... so if creationism is presented as a stark alternative theory alongside other theories I think there's just been a jarring of categories.” The 2001 Census showed that 72% of people in the UK state their religion as Christianity, and the next most common is Islam (3%).

Respondents to a BBC/MORI survey in January 2006 were asked which of three possible explanations of the origin of life was nearest their view. The conclusion drawn was that for almost half the British public (48%) it was ‘evolution’, for 22% it was ‘creationism’ and for 17% it was ‘intelligent design’. However, it is a gross simplification to encompass all the different positions on origins in just 3 statements. For instance, the survey statement headed ‘intelligent design theory’ stated that “certain features of living things are best explained by the intervention of a supernatural being, e.g. God” which could
incorporate a broad spread of views as to the nature and extent of the intervention.

The debate about teaching the origin of life in school has concentrated on whether or not religious beliefs should be covered in the Science classroom. Some academics maintain that this can be done without losing scientific integrity (eg Poole, 2007 and Reiss, 2008) whereas others insist that only the scientific idea of evolution should be taught (Pennock, 2007). Roth (2007) raises concerns about the situation (one that typically applies in the UK) where science and religion are taught at separate times by different teachers in different rooms. He considers this spatial and temporal division of science and religion is artificial and goes against what students themselves naturally experience.

Students bring a huge range of different attitudes and beliefs to the classroom. There is considerable concern about whether teachers have adequate preparation for coping with any alternative beliefs or worldviews that might emerge when teaching about evolution (eg Cleaves & Toplis 2007, Loving & Foster 2000). Cobern (1996) cites situations where students practise ‘cognitive apartheid’: because the science they learn in school does not fit into the context of their own culture they find ways to hold two worldviews simultaneously, with science compartmentalised for ‘special occasions’ such as school exams.

Little research has been done to discover whether there is any relationship between teachers’ religious beliefs and the teaching of evolutionary theory. According to Jones and Carter (2007), despite evidence that most aspects of teaching are influenced by teacher attitudes and beliefs, these are poorly understood and under-researched. In one of the few studies undertaken in this area, Trani (2004) found an inverse correlation between strong religious convictions and high likelihood of teaching evolution. However, this was in what is still the much more highly-charged environment of the United States.
A key question in all this is whether those students who are unable to accept evolutionary theory will have problems understanding or acknowledging scientific concepts. Clores and Limjap (2006) suggest that the ultimate goal of scientific education is understanding but that belief is an important consideration. Smith & Siegel (2004) argue that students who understand a theory (quoting evolution as an example) but do not believe it should accept that it is the best scientific account. However, belief should not be the aim of science education, and they criticise those (citing Good 2001 and Alters 1997) who argue that just to understand is not sufficient.

In 2007, the Department for Children, Schools and Families (DCSF) issued guidance for schools in England about the place of creationism and ID in Science lessons. It drew attention to the distinction between teaching ‘x’ and teaching about ‘x’ and stressed that, whilst the nature of, and evidence for, evolution must be taught in Science at key stage 4, creationism and ID are not part of the Science National Curriculum programmes of study and should not be taught as Science. However, if these topics are raised in the Science classroom (it is implied by the students rather than the teachers), they can provide an opportunity for exploring what defines a ‘scientific theory’.

**Methods and analysis**

The teacher questionnaire was piloted among Science and RE teachers in southern England, and the finalised version was dispatched to a sample of schools across the country in July 2008. One school per local authority was contacted, resulting in a mailout to 70 Science and 72 RE teachers. The response rate was higher for RE (33% - 24) than Science teachers (13% - 9). Although no empirical evidence has yet been collected to explain this discrepancy, it is hypothesised that the nature of the study proved of more interest to RE teachers. Where questions were common to the pilot and final surveys, data have been combined to give reporting samples of 39 Science and 27 RE teachers (there were relatively more Science teachers in the pilot).
The case study concerns an inner city girls’ secondary school where most students come from a Muslim background (although the school itself is not faith-based). The findings reported here draw on questionnaires administered to 30 students, discussions with 14 students in small groups and individual conversations with teachers from the Science and RE departments. The students were nearing the end of Year 10 (ie aged 14-15). Most of the research was carried out in July 2008.

Survey data were analysed using SPSS software, and grounded theory was used to identify analytical themes and categories from the answers to the qualitative questions from both questionnaires and interviews. The paper mainly quotes numbers rather than percentages and, when percentages are cited to enable comparison, the small sample size should be borne in mind. As the questionnaires were self-completion, not everyone answered every point, leading to different sizes of sub-sample per question.

**Findings – teacher survey**

All the RE and most of the Science teachers (35 out of 39) covered the origins of life in their lessons. As would be expected, every RE teacher was covering religious beliefs about creation. All but one also covered Darwin’s theory of evolution, and 13 said they were including other scientific theories (7 specified the Big Bang theory). All the Science teachers were covering Darwin’s theory, and most also taught other scientific theories (particularly Lamarck). However, 28 out of the 35 said they covered religious beliefs about creation. Where more detail was given, the main focus was on Christianity, but it has not yet been possible to assess the extent or in what way such beliefs were being explored.

The consistency of answers to this question was not replicated when the survey proceeded to more personal experiences and opinions. When asked ‘how controversial do you personally think this topic is?’ answers from Science teachers ranged across the 5-point scale from very to not at all controversial (Chart 1). RE teachers were much less inclined to consider it controversial – about one in five compared with two in five Science teachers.
This seems related to their experience in school: over half the Science teachers (23 out of 39) had ever found it controversial in their classroom compared with just 7 out of 27 RE teachers. Asked to amplify, Science teachers tended to describe issues with religious students ("once taught a fundamentalist - usually I approach the 'theory of evolution' as fact!"). Some RE teachers quoted similar experiences ("a 'creationist' student who was unwilling to even consider other theories") whilst others had issues with students adopting a rigidly scientific viewpoint ("Most [students] … agree with [scientific theories] and will not even contemplate how religion might fit in").

Chart 1

![Chart 1: How controversial do you personally think this topic (origin of life) is?](image)

Most RE teachers were confident covering scientific theories about the origin of life in their lessons; only three of the 27 expressed little confidence (Chart 2). Science teachers were not quite so confident about their ability to cover religious beliefs – although 20 were very or fairly confident, 9 (one in four of them) expressed little or no confidence. Reflecting their own predominantly Christian backgrounds, several explained that they only felt competent to discuss these beliefs, and not those of other religions.
There was a spread of opinion on the importance of covering religious beliefs about the origin of life in the Science classroom (Chart 3), although the balance of both sets of teachers was on the ‘important’ side of the 5-point scale. On the whole, RE teachers considered it more important than Science teachers, with 10 out of 25 (37%) compared with 11 out of 39 (28%) describing it as ‘essential’. Science teachers were more than twice as likely to rate it ‘not at all important’ (almost two in ten versus almost one in ten).

Expanding on the reasons for their response, those RE teachers who thought it essential or important to cover religious beliefs in Science lessons talked
about balance and showing alternative world views ("otherwise, students will be left with one-sided picture and unable to partake in public debate"; "It is another world view, as scientific view is a world view"), as well as exploring the relationship between science and religion ("It is important to help students understand that science and religion deal with different questions"; "helps students to understand that religion and science are not always in conflict"). Science teachers also cited the need to give a full picture ("Because they should see both sides of the story") and several spoke of accommodating other views ("I would like students to respect and understand religious beliefs and I would like those with belief to understand the importance of their beliefs without the necessity for them to be 'scientific'"). A few teachers across both subjects considered it part of their obligation because they were employed in a faith school.

For some of the Science teachers who thought the inclusion of religious beliefs was unimportant it was a matter of priorities ("Get enough info elsewhere on religion"; "It won't be in the exam"). Others were much more actively hostile to the concept: "there is no science in religious beliefs"; "Science is a factual subject not a subject about opinions and personal beliefs".

Several teachers welcomed the opportunity to address a topic they judged controversial as it gave opportunity for discussion and development of critical thinking: "Can sometimes cause heated debate between pupils of different faiths but as a teacher of this topic, I find this interesting" (RE teacher); "Controversial in a good way to provoke listening to different views; justification of ideas etc" (Science teacher).

It was striking that, although a majority of teachers were covering scientific explanations of the origin of life in RE lessons and vice versa, there was rarely much collaboration between the departments. Nobody said there was 'a lot' and almost half those responding (16 out of 33 – the question was not asked in the pilot study) said there was 'none at all'. Perhaps as a result, there was a mix of hope and ignorance about their colleagues in the other department:
“[Covering religious beliefs] depends on how comfortable a science teacher feels teaching religious beliefs”; “I would like to think that the issue is also being addressed in RE classes”.

Teachers were asked which of a set of 3 statements came closest to describing their own thoughts about how humans came into being. The descriptions were based on those used in other research (eg BBC/MORI 2006) and as such do not unpick individual’s attitudes in any detail. Broadly speaking, most teachers agreed that humans have developed over millions of years, but RE teachers most commonly opted for the statement that gave a divine being some part in this process (three in five of them), whereas Science teachers were more likely to choose the statement that excluded any divine being (about half of them). A third of Science teachers did think a divine being had played some part, and a fifth of RE teachers excluded a divine being from the process. One Science and two RE teachers opted for the explanation that ‘human beings were created by a divine being pretty much in their present form’, and for two others (one from each subject) their view lay between that statement and the involvement of a divine being in a long process of human development. To provide context, teachers were also asked how they would describe their religious beliefs. Although far more Science than RE teachers described themselves as having ‘no belief’ (12 out of 37 versus one out of 28), just over half of each sample identified themselves as Christians. Although based on very small numbers, RE teachers showed a greater propensity to classify themselves as ‘not sure’ (4 people).

Findings – case study of School B
The school in this case study was chosen because it draws students from primarily religious backgrounds. Nearly all the students who completed the survey (26 out of 30) described themselves as Muslim and there was just one with no belief. Most (18 out of the 27 responding) described their faith as very or fairly strong.
As might be expected with this background, when asked to describe how they thought life on earth came into being, most of them opted for a religious explanation: 23 mentioned God, another 2 Adam and Eve, and only two put forward scientific (cosmological) viewpoints. Typical comments included:

*Because God made the universe and Earth and He created life, it didn’t just appear. Life on Earth can’t just begin by itself, can it?*

*Well the only answer I can give is God. This earth and planets were there from before. God make us humans and put us on earth. God is the only reason why we are here.*

When asked if they knew any other explanations, 22 alluded to the Big Bang and just two to evolution:

*Big Bang. Scientists believe there was a big bang and rocks and chemicals flew around everywhere. Humans are made out of stardust.*

However, several of them felt the need to make it clear that, whilst they might be aware of scientific concepts, they did not accept them:

*Other explanations of how life came onto earth are: Big Bang; Evolution; erm but I don’t really agree with these explanations*

*I don’t believe in the big bang or anything. I believe that God has put us on earth and whenever he likes he can take the life as well.*

As in the teacher survey, students were presented with three alternative explanations for how human beings came into existence, distinguishing between direct creation by God; evolution with some involvement of God; evolution with no involvement of God. Nearly all the students (25 out of the 29 responding) thought God had created humans pretty much in their present form.
The depth interviews (mostly triads) indicated a somewhat less straightforward picture than the survey implies. The pattern of responses leads me to propose a working model which categorises the students into one of three broad groupings, labelled ‘resistors’, ‘engaged’ and ‘explorers’. Most of the students fell into one of the first two groupings, although distinctions were not completely clear cut as students were not always consistent in their views. This is hardly surprising in such a complex area and among teenagers whose critical thinking and conceptual abilities are still developing. For the ‘engaged’ and ‘explorers’, this is a web of challenging issues that they have only recently begun to deal with.

The ‘resistors’ automatically rejected those scientific concepts which they saw as incompatible with their religion: *to learn about something you don’t believe in … you start questioning it, it’s not right because we follow our faith for a reason and you shouldn’t have to question it*. They perceived science to be in conflict with religion because it went against their understanding of their faith: *the Big Bang theory cuts out everything about how we believe in it*. Some expressed a degree of resentment that school science might put them in such an uncomfortable position.

The ‘engaged’ had a different perspective on the interplay between science and religion. They saw them as addressing the same topics but not in the same ways:

*Science, it’s just basic facts with evidence. [RE] is more what you think*

*They ask different questions, they expect different answers*

However, they expressed confusion about the nature of the inter-relationship and whether it necessarily incorporated conflict. On the one hand, “*Religion is whole ideas and theories but science will prove that*, but on the other: “*You can’t really prove that the Big Bang did happen because they haven’t got solid hard evidence to show everyone that it was the Big Bang and not God*”. Several had accommodated the Big Bang theory into their belief system by
citing an argument that they had come across in RE lessons: something must have caused the Big Bang, so there was still a place for God.

Charles Darwin, in contrast, got short shrift: “But Darwin’s theory, I think that’s total rubbish”; “I respect his opinions but I don’t believe in it”. Their recall of evolutionary theory was sketchy, and they seemed to be reacting against the thought of being ‘descended’ from apes: “I don’t think that’s true, the monkey thing”.

As an aside, it is worth noting that, consistent with the student survey, participants were much more inclined to raise the Big Bang than evolutionary theory when asked to describe possible explanations of how life on earth came into being. This seemed to be for two reasons: they had studied it more recently and had explored it extensively in RE as well as in Science.

A minority – the ‘explorers’ - had taken the ‘engaged’ position further and seemed to relish the challenge of fitting together their religious and scientific beliefs. They described themselves as “not overly religious but not demandingly scientific – we’re in the middle”. They talked about how they pulled their knowledge of science from the RE classroom together with that from the Science classroom, enabling them to develop their ideas about how the two fit together. They recognised the stance of ‘resistors’ whilst distancing themselves from it (“Is it science that created us or is it God? Obviously some people are quite scared to think like that because maybe it’s conflicting with their religion”). They consider that their education and religious background has allowed them to go beyond that position: Some religious people may have thought science is just trying to replace God. But cos we learn about religion and science together on a daily basis we really have the choice to decide if there’s a conflict or not.

Their religious beliefs provided a lens through which to view science and if pushed they would still give their religion priority: We’re not swayed by our Muslim beliefs … but we believe religion comes first in a way but also complements science. They described an active journey of trying to find
answers by asking each other and their teachers, and enjoyed the heated debate that combining science and religion could initiate. There was a recognition that they were able to do that because of the generation they lived in: *the world we’ve created now is more modern … back then people had one view and they focussed on that whereas now we can think around it.*

**Discussion**

It was always anticipated that addressing the research question about teachers’ attitudes to teaching the main explanations of the origin of life would reveal a diversity of views. Even within this small sample it is evident that teachers hold a range of worldviews and also differ in their understandings of the nature of science and the nature of religion – in ways that cannot necessarily be predicted by the topic they teach. Maybe more surprising is the diversity of conceptual positions among the superficially homogenous group of students researched so far.

The findings suggest a whole mix of attitudes and practices exist among teachers as regards covering the origins of life. This, as well as the variation among students, needs to be recognised when formulating recommendations about how to approach the teaching of this topic. It is clearly an area that can arouse strong opinion: *“Those pupils and staff that do enter into discussion tend to be so passionate that they either feel threatened and/or stop listening to the opposing views”* (Science teacher).

Nearly all RE teachers and most Science teachers were covering both scientific and religious explanations of the origins of life. Although there is a spread of opinion about the importance of tackling religious views in science, more think it is important than not important to do so – this is particularly the case among RE teachers. Science teachers were more divided in their response and, if it turns out that it was lower engagement with the topic that led to the poorer response rate among Science teachers, the non-respondents might be even more inclined to consider it unimportant. At each end of the spectrum there was fervent opinion: Science (and some RE) teachers who insisted beliefs had absolutely no place in Science; RE (and
some Science) teachers who thought such coverage was essential to provide a balanced view.

The majority of RE teachers expressed confidence in handling scientific theories about the origin of life in their lessons; Science teachers were not quite so confident about their ability to cover the religious aspects. However, as there is little or no co-ordination between the departments in most schools, it raises the question of whether such confidence is misplaced. How are these teachers judging their performance in tackling what, for most of them, is outside their specialism? An RE teacher in School B acknowledged the unexpected difficulty of teaching a scientific theory to students who had not yet been introduced to it in Science: “when we tried to explain [the Big Bang] to 13 year olds we realised what an enormous thing we’d bitten off”.

The topic of the origin of life seems to arouse more controversy in the Science classroom than the RE classroom and, perhaps as a result, Science teachers are more likely to consider it controversial. Most of the examples given involved situations where one or two students had adhered to a literalist religious position and refused to engage with scientific explanations. But being controversial was not necessarily a negative. Several teachers welcomed the opportunities it provided for the development of critical thinking through discussion and debate. However, previous research (Hanley, Osborne and Ratcliffe, forthcoming) suggests that some Science teachers might struggle to adapt their teaching style to a more discursive approach without training and support.

The case study of school B shows that, even in an environment where most students share a similar religious background, they do not share a common way of conceptualising the relationship between science and religion. The three groupings which emerged can be mapped onto Barbour’s fourfold taxonomy (Barbour, 2000). Thus ‘resistors’ see science and religion in conflict and the ‘engaged’ perceive them as independent spheres. ‘Explorers’ are perhaps moving towards the typology of dialogue or of integration as evidenced by this exchange:
P1: Everything we do every day is science – so it’s simple things that we think science cannot prove completely…

P2: Or has yet to prove

P1: … or has no theory on, them kind of things we think ok, a Great Mind’s controlling that

Further research, including lesson observation, is planned in School B and the intention is to carry out similar investigations at other case study schools, including a Christian faith school.

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