Promoting positive attitudes toward science *and* religion among sixth-form pupils: dealing with scientism and creationism

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Abstract

A sample of 187 female students, attending a sixth-form study day on religious studies, completed a questionnaire containing four scales concerned with assessing: attitude toward theistic religion, attitude toward science, scientism and creationism. The data demonstrated a negative correlation between attitude toward religion and attitude toward science. However, this negative correlation was transformed into a positive correlation after taking into account individual differences in the students' views about scientism and creationism. The implications of this finding are discussed in the context of the increasing support within society for the teaching of alternatives to evolution within the science curriculum. The authors argue both that it is important to challenge scientism by developing a better understanding of the role and limits of scientific methods, and that religious belief about creation should be recognized as essentially a claim about the ontological dependence of Nature rather than about the details of its origins and development.

Keywords

creationism

creation

science and religion

scientism

Introduction

Many assume that the conventional model of conflict continues to characterise the relationships between science and religion (White, 1922; Wilson, 1998), despite the challenges to this position that have come from historians and philosophers of science, as well as most of the recent authors writing about the interface between science and religion (Alexander, 2001; Barbour, 1998; Brooke, 1991; McGrath, 1998, 1999; Padgett, 2003; Peters and Hallanger, 2006). Richard Dawkins, who mostly writes from the perspective of evolutionary biology, is among the most vociferous proponent of the conflict view, exemplifying throughout his writings a positive attitude toward science that is coupled with a strongly negative attitude toward religion and theology. Dawkins routinely contrasts the 'genuinely mysterious, grand, beautiful, awe-inspiring' view of the universe that is offered by science, with the 'puny, pathetic' and 'small-minded, parochial' perspective provided by religious faith (Dawkins, 1998: 312; 2006: 330–331; McGrath, 2005: 146).

> Even the bad achievements of scientists, the bombs and sonar-guided whaling vessels, work! The achievements of theologians don't do anything, don't affect anything, don't achieve anything, don't even mean anything. (Dawkins, 1993)

By contrast, the palaeontologist Stephen Jay Gould – although no religious believer – expressed a 'great respect for religion' and pleaded for a 'respectful, even loving, concordat' between the 'non-overlapping magisteria' of science and religion:

> So long as religious beliefs do not dictate specific answers to empirical questions or foreclose the acceptance of documented facts, the most theologically devout scientists should have no trouble pursuing their day jobs with equal zeal. (Gould, 2001: 9, 84)

While many critique the notion of a compatibility between science and religion based on Gould's radical division between the two spheres of thought (e.g. Dupré, 2003: 56–62), a similar *tone* to that of Gould is adopted by others – including another agnostic, the philosopher of biology Michael Ruse. Ruse acknowledges that our understanding of Nature may be 'changed and illuminated and made complete' by belief in a creator God and, focusing on our attitude toward the world, he proposes a theology of Nature that 'sees and appreciates the complex, adaptive glory of the living world, rejoices in it, and trembles before it' (Ruse, 2003: 331, 335). Elsewhere he asks, 'Can a Darwinian be a Christian?', and replies, 'Absolutely' (Ruse, 2001: 217). (We may note that Ruse claims, in the Preface to the latter book, that 'the loving Christian atmosphere' created by his parents and fellow Quakers in his youth was the deepest influence on his life.)

Some Christian writers have argued for a yet more conciliatory view of the relationship between science and religion, locating themselves at the opposite end of the spectrum from Dawkins by claiming that, rather than some ultimate opposition between religious spirituality or belief, on the one hand, and the methods and discoveries of science, on the other, we may speak not only of a compatibility but of a consonance between the two domains. Writing in this vein, the physicist and Anglican priest John Polkinghorne (1994: 47; 1995: 59) has referred to a 'cousinly relationship' between science and theology, describing them as 'intellectual cousins under the

skin'. This viewpoint has even been developed into a claim about the positive contribution that a proper understanding of the phenomenon of religion can make, in a variety of ways, to the development of a scientific attitude and scientific understanding (Astley, 2001). Such authors embrace a positive attitude both to science and to religion.

It appears, however, that students in school are more likely to position themselves closer to Dawkins than to Polkinghorne. Most seem to be unwilling even to walk the middle way of a Gould or Ruse. As reported in Francis and Astley (in press) 62% of the present sample agreed or strongly agreed with the statement, 'There is a fundamental conflict between scientific and religious claims', with only 19% disagreeing or disagreeing strongly; while asking the same question of another group of sixth formers revealed figures of 57% and 15%, respectively, adopting these views. Young people on average also profess a stronger *interest* in science than they do in religion, and this difference widens with age (Francis, 1992); and it is often said that adolescents discard religious belief because they find it incompatible with a scientific world-view (e.g. Greer, 1988).

But some studies have shown that what appears superficially to be a negative correlation, or at least an independent relationship, between young people's attitude to science and their attitude to Christianity may cloak a more positive underlying relationship. This relationship, it has been claimed, tends to be masked by the influence of other variables – in particular, the degree to which the young person has adopted (a) the viewpoint of *creationism* (understood in terms of the rejection of evolution and common descent as an account of the development of living things, in favour of a belief in God's special and independent creation of every form of life), or (b) *scientism* (understood here as the view that absolute truth may be obtained by

science, and only by science). In examining survey data from questionnaire studies it is possible to control for these two views, using multiple regression analysis.

A good example of a study using multiple regression analysis in this way is provided by Francis and Greer (2001), drawing on data provided by a sample of 1584 pupils between the ages of 14 and 16 years attending year nine, year ten, and year eleven classes within Protestant and Catholic grammar schools in Northern Ireland. These young people completed four reliable and valid scales designed to measure attitude toward Christianity, attitude toward science, scientism and creationism; as well as self-report behavioural measures of personal prayer and church attendance. According to these data, there was a small but significant association between a positive attitude toward science and a positive attitude toward Christianity after including creationism and scientism among the control variables within a multiple regression model. In other words, it would appear that those who were more positively disposed to Christian belief and practice were actually more likely to hold a positive view of the value of science, but that this underlying correlation was distorted and obscured in those cases where young people had adopted extreme views either about religion (creationism) or about science (scientism).

The present study seeks to test these claims within a different sample of young people, drawn from an older age group than that researched in the Francis and Greer (2001) study, both by employing modified scales of creationism and scientism, and by widening the attitude toward Christianity scale so as to measure their attitude to theistic faith in general.

Method

Sample

A sample of 187 female students, attending a sixth-form study day convened by the North of England Institute for Christian Education, completed the *Science, Religion and Life Questionnaire*. In terms of religious affiliation 22% identified as Roman Catholic, 12% as Church of England, and 19% as belonging to other Christian denominations. Just one respondent identified as Buddhist, and the remaining 47% claimed association with no religious group. In terms of public religious practice, 19% reported that they attended a place of worship weekly and a further 5% attended at least once a month; 40% attended less frequently (but at least once a year), and the remaining 36% never attended. In terms of private religious practice, 16% reported that they prayed daily and a further 11% prayed at least once a month; 34% prayed less frequently but at least once a year, and the remaining 39% never prayed.

Measures

Attitude toward religion was assessed by the seven-item Astley-Francis Scale of Attitude toward Theistic Faith (Astley, Francis and Robbins, in press), an instrument derived from the long-established Francis Scale of Attitude toward Christianity (Francis, 1978, 1989), but amended in such a way that none of the items were specific to the Christian faith.

Attitude toward science was assessed by the six-item Astley-Francis Scale of Attitude toward the Public Value of Science (Astley and Francis, in press), an instrument derived from the attitude toward science scale originally developed by Francis and Greer (1999a), but amended so as to remove those items for which

responses are influenced by the individual student's success or failure in her own study of science.

Scientism was assessed by a seven-item scale developed from the two earlier measures of scientism proposed by Fulljames, Gibson and Francis (1991) and by Francis and Greer (2001).

Creationism was assessed by a six-item scale that included three items from the earlier measure developed by Francis and Greer (1999b), and added three items that more unambiguously reflected either the acceptance of (a) creationism or (b) the evolution of all extant species through natural selection. (This scale as a whole is a measure of particularly conservative forms of creationism, such as 'young-earth creationism', although a number of its constituent opinion statements also map on to other forms of creationism and related types of evolution denial. On the variety of creationism, see Numbers, 2006 and Astley, 2009.)

All four measures were rated on a five-point Likert scale: agree strongly, agree, not certain, disagree, and disagree strongly.

Analysis

The SPSS Statistical Package was employed, using the frequencies, reliabilities, descriptives, Pearson correlation and partial correlation routines.

Results

Table one sets out the main scale properties of the four instruments (attitude toward

- insert table one about here -

religion, attitude toward science, scientism and creationism) in terms of the means and standard deviations and the alpha coefficients (Cronbach, 1951). All the scales exceed

the acceptability threshold of 0.70 proposed by Kline (1999). Table two provides more detailed information about the individual scales in terms of the item endorsement (the sum of the agree strongly and agree responses) and in terms of the item-rest-of-test correlations (the relationship between each individual item and the sum of the other items).

- insert table two about here -

Table three employs the Pearson correlation coefficients to examine the relationship between the scores recorded on the four scales. According to these data, a positive attitude toward religion is associated with high scores on creationism and low scores on scientism; a positive attitude toward science is associated with high scores on scientism and low scores on creationism; and attitude toward science and attitude toward religion are inversely related. These young respondents thus display clear evidence of their difficulty in combining positive attitudes toward both science and religion. At first sight, therefore, their position on the relationship between science and religion seems to lie closer to the views of Dawkins than it does to those of Gould, Ruse or Polkinghorne.

- insert table three about here -

In view of the clear and inverse relationship both between scientism and creationism and between attitude toward religion and attitude toward science, the final stage in the data analysis examined the partial correlation between attitude toward science and attitude toward religion after controlling for individual differences within the sample in the students' views about scientism and creation. This strategy transformed the significant negative Pearson correlation between the two variables ($r= -0.21$, $p< .001$) into a significant positive partial correlation ($r= +0.24$, $p< .001$).

Therefore, when scientism and creationism are held constant, these students *are* able to combine positive attitudes toward both science and religion. In other words, the *underlying* stance of these students seems actually to lie closer to that of Polkinghorne than it does to the one espoused by Dawkins, despite the superficial picture presented by the original, uninterpreted data. This finding has clear pedagogical implications, for it suggests that students who are taught science in ways that avoid their slipping into scientism, and students who are taught religion in ways that avoid their misconstruing creation in terms of creationism, may be freed to adopt a much more compatibilist stance in the science/religion debate.

Discussion

But can science and religion be taught in such a way that an underlying positive correlation between the students' attitudes to these two different domains of human understanding is preserved and enhanced, rather than hidden or indeed reversed? Previous researchers have argued that this is indeed possible, provided that science education includes 'an understanding of the nature of science which questions the claims of scientism', and provided that religious education incorporates 'an understanding of the Christian faith which questions the literal authority of the Genesis creation narratives' (Francis and Greer, 2001: 50). The present authors would endorse both these claims.

Our employment of the Astley-Francis Scale of Attitude toward Theistic Faith allows us to widen the second claim to cover other theistic religious traditions, as well as the broad, non-specific theism that seems to be associated with at least some forms of spirituality among young people. It should be noted, however, that the creationism scale retains two items (creation in six, 'literal' days and the creation of Eve from

Adam's rib) that best fit the biblical literalism and fundamentalism adopted by some Christian creationists.

Our data lend support to the recommendations made by others that the school curriculum should incorporate topics on science and religion, including some study of the nature of science, and should reflect scholarly interpretations of the nature of the biblical creation stories (Dieterich, 1990; Poole, 1990a, 1990b, 1992, 1995; Fulljames, 1996). Such educational strategies are likely to be effective in combating a naïve 'conflict approach' to the science/religion debate, a naïve scientism and a naïve biblical fundamentalism.

Michael Poole's writings, in particular, encourage teachers to promote a more self-critical element in science education in schools (see, for example, Poole, 1995: chs 2 and 3). Ignorance of the nature of science often finds expression in an illegitimate expansion of the naturalistic *methodological* assumptions of science beyond their proper territory, a development that can easily tempt students to adopt an ideology or metaphysics of scientism. But recent discussion about the role of creationist views in the curriculum reveal another problematic consequence of scientific illiteracy.

Surveys show that only a small minority of the British population actually endorse creationist views. For example, in a study of 7,600 responses from adult Anglican churchgoers in England (both clergy and laity), a mere 11% of the sample rejected the view that 'all living things evolved', while 69% endorsed it (Francis, Robbins and Astley, 2005: 32). Yet such views are often accompanied with expressions of support in the general population for the *teaching* of creationism and/or 'Intelligent Design' (ID) within the science curriculum. (Some proponents of ID, which is sometimes described as 'Creationism Lite', may allow that evolution has and

does take place, much of it through natural selection, but all insist that *some* features of organism are too complex to have evolved by natural selection working without the aid of divine intervention.) Results of an Opinionpanel survey conducted in 2006 showed that 63% of a sample of British university students wanted 'a range of theories' taught in UK schools, despite the fact that the majority of these respondents identified evolution as the best explanation of human origins (Opinionpanel Research, 2006).

Other research (e.g. Ipsos-Mori, 2006) makes clear that many believe that these alternative theories should be taught within science classes – contrary to the British Government's Department for Children, Schools and Families' guidance of 2007 – and not just as part of a descriptive study of a range of beliefs about God's relationship to the world in religious education classes, which is a position that could be more easily justified. Surveys of this kind rejoice the hearts of creationists, who argue that in this area 'the arguments on *both* sides should be presented, and children should be *free to choose* between them' (Watson, 1976: 103). They also witness to a misunderstanding about the character of scientific theories: in particular that, although there are no uncontroversial, universally accepted methods of determining truth or falsity within domains such as politics, morality and religion, science – along with other disciplines, such as history – is a different matter. (Some of the issues that arise in this context are discussed in more detail in Astley, in press.)

We wish to argue for two different points here. First, that a good understanding of the nature and limits of the methods of science is essential if schools are to avoid their students sliding into an unthinking scientism, which has the effect of stunting these students' underlying willingness to combine positive attitudes to both science and religion. Secondly, that a good education in the principles of scientific

thinking is also needed to prevent the growth of an uncritical creationist education movement, both within and outside schools. One of the dangers of such a movement is that it will tend to produce individuals with a negative attitude toward science that is likely to confirm them in a view that the two subjects are, or should be, in conflict.

So much for science education. What about religious education? The educational problems posed by creation texts such as those contained in the Book of Genesis may be resolved in more than one way. Attention normally focuses on ensuring that students understand the appropriate status of such stories through an appreciation of the genre of myth. Myths, most would argue, are best understood as narrative-metaphors. They are employed by religious believers who are forced to express the activity of divine beings in human terms, because heaven can only be portrayed in earthly language (Astley, 2004: chapter 4). It is obviously important for students of religion to appreciate this form of religious discourse.

There is, however, a more fundamental lesson that students need to learn. Those religions that embrace a belief in creation should not be understood to be making claims solely about the *origin* of the world and its forms of life (Astley, 2000: chapter 2). According to traditional Christian theology, a doctrine of creation that only spoke of creation as a past event would be (in John Calvin's words) 'cold and lifeless', a radical form of *deism* that acknowledged the existence of a remote God who only made the world but does not sustain it. It is the continuing preservation of the universe (*creatio continua*), 'the incessant act by which God preserves the world in existence' (Mascall, 1956: 132), that represents the heart of the doctrine of creation.

According to Thomas Aquinas, even if the world had always existed it would still be a *created* world, in that 'the world exists just so long as God wills it to, since its existence depends on his will as on its cause' (*Summa Theologiae*, 1a, 46, 1). For

theism in general, therefore, 'It is not of direct importance . . . to assert a date for the act of Creation, or even to assert that it is an act having any date at all; it may be a never-beginning and never-ending activity. But it is of vital importance . . . to assert that the existence of the world is due to the Will of God' (Temple, 1953: 37). It is this element that implies that all things that exist depend on God for their very being *now*, and that 'God is not nearer to the beginning of time than to any other point of time' (Ward, 1996: 249). Such claims are fundamental to many interpretations of religious experience. They are also central to students' recognition of the metaphysical status of many religious beliefs, which is a perspective that allows these beliefs to complement *scientific* accounts of 'how the world goes' by adding the *theological* dimension expressed in the claim 'and God sustains it all'.

In the view of Jürgen Moltmann (1985: 193), disputes over evolution encouraged the Christian doctrine of creation to be narrowed down to 'creation in the beginning' at the expense of this notion of continuous creation, and of other dimensions of the belief. Emphasising origins, as both creationists and their opponents who tend toward scientism are wont to do, can lead students badly to misconstrue the true nature of the theist's belief about creation. It also encourages a conflict theory of the relationship between science and religion, insofar as religious claims about 'beginning-creation' are taken to be logically equivalent to theories about Big Bangs and origins of species. Shifting the focus to 'preserving-creation', however, makes it much more clear that the theological concept of creation is not on all fours with *any* scientific claim. Rather, it is a way of articulating the additional metaphysical claim described above concerning the ontological dependence of all natural processes.

It is in ways such as these that educators should seek to prevent their students embracing mistaken views of science and religion that may be represented by

scientism and creationism, respectively. This should allow these students to express more clearly what appear to be their underlying positive attitudes to both science and religion, and perhaps even to acknowledge a consonance between these two different approaches to the one universe.

Table 1: scale properties

Scale	alpha	mean	sd
attitude toward religion	0.95	21.2	7.8
attitude toward science	0.78	20.8	3.4
scientism	0.77	18.9	4.3
creationism	0.83	14.1	4.4

Table 2: scale items

	r	agree %
attitude toward religion (theistic faith)		
I find it hard to believe in God*	0.79	37
Prayer helps me a lot	0.85	31
I think going to a place of worship is a waste of my time*	0.62	17
I know that God is very close to me	0.85	28
God helps me to lead a better life	0.89	29
I know that God helps me	0.90	31
God means a lot to me	0.89	35
attitude toward science (public value)		
More scientists are urgently needed	0.36	29
Scientific discoveries do more harm than good*	0.42	8
Science is very important for a country's development	0.61	63
Money spent on science is well worth spending	0.62	47
Science will help to make the world a better place in the future	0.66	39
Science is relevant to everyday life	0.55	75
scientism		
Science can give us absolute truths	0.55	24
Science alone can provide truths about nature	0.54	31
Science will eventually give us complete control over the world	0.50	14
Theories in science can be proved to be definitely true	0.55	38
The laws of science will never be changed	0.43	16
Theories in science are never proved with absolute certainty	0.42	49
Nothing should be believed unless it can be proved scientifically	0.46	8
creationism		
The animals and plants we know today have evolved from earlier species*	0.58	78
All the adaptations of living things can be explained by natural selection*	0.38	43
I accept the idea of evolution creating everything over millions of years*	0.69	61
God created all the species of animals and plants directly	0.70	16
I believe that God made the world in six days of 24 hours	0.63	9
God made woman out of man's rib	0.67	13

Note *= these items are reverse coded

Table 3: correlation matrix

	creationism	scientism	attitude toward science
attitude toward religion	+0.67***	-0.41***	-0.21**
attitude toward science	-0.51***	+0.28***	
scientism	-0.37***		

Note ** = p< .01; *** = p< .001

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