

Opportunities offered by the national science curriculum for exploring the relationship between science and faith

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Abstract

The Australian Curriculum, Assessment and Reporting Authority (ACARA) has developed a new national curriculum on science for the whole of Australia. This national curriculum is scheduled to replace the individual state-based science curricula. The Melbourne Declaration on Educational Goals for Young Australians includes educational spiritual development as a key priority. Yet the proposed science curriculum makes only slight connection with spirituality and faith, such as by mention of ethical considerations. In this paper science-faith connections are proposed for each curriculum topic and resources are cited for each connection.

Key words

Australian science curriculum, science-faith interface

Introduction

The Australian Curriculum, Assessment and Reporting Authority (ACARA) has developed a new national curriculum on science spanning the years from Foundation to year 10 for the whole of Australia (ACARA 2012). This national curriculum is scheduled to replace the individual state-based science curricula. The science curriculum provides an opportunity for Australia to take a fresh step into science education at the school level. 'Where will that curriculum take us?' is the question to be considered in this paper.

Very obviously the national curriculum may be examined from a number of perspectives, such as by comparing Australia's national curriculum with international alternatives (Tuovinen 2011). In this paper it will be considered from the perspective of how well it encourages the development of healthy links between faith and scientific understandings and beliefs. The mandated Australian educational spiritual development is

expressed in two recent national statements on education: the Melbourne Declaration on Educational Goals for Young Australians (MCEETYA 2008), and the Adelaide Declaration on National Goals for Schooling in the Twenty-First Century (MCEETYA 1999). These two national educational goal statements will form an important touchstone for consideration of the issues involved.

Obviously many other factors impinge on the development of well-informed and healthy science-faith understandings, such as the loud voices of atheists in the popular press, the strong advocacy for Young Earth Creationist perspectives in some Christian circles, the assumed secularist stance on public education in Australia and so on. However, this paper will begin the conversation with the two official sources, the national science curriculum (ACARA 2012 and ACARA 2013a) and the national declarations on educational goals (MCEETYA 1999 and 2008).

Melbourne Declaration (2008)

The Australian Curriculum is based on the Melbourne Declaration on Educational Goals for Young Australians (MCEETYA 2008) which built on the prior Adelaide Declaration (MCEETYA 1999) mentioned above. The two key goals for education in Australia are (MCEETYA, 2008):

1. Australian schooling promotes equity and excellence, and
2. All young Australians become:
 - a. Successful learners
 - b. Confident and creative individuals
 - c. Active and informed citizens.

These two goals are elaborated and a commitment to action to achieve these goals is described over the next eleven pages in the Melbourne Declaration. The key aspects in the Melbourne Declaration that are relevant to this discussion are the following:

Goal 1: Australian schooling promotes equity and excellence.

... all Australian governments and school sectors must:

- provide all students with access to high-quality schooling that is free from discrimination based on ... religion
- ensure that schooling contributes to socially cohesive society that respects and appreciates cultural, social and religious diversity.

Goal 2: All young Australians become successful learners, confident and creative individuals, and active informed citizens.

Confident and creative individuals

- have a sense of self-worth, self-awareness and personal identity that enables them to manage their emotional, mental, spiritual and physical well-being.

Active and informed citizens

- act with moral and ethical integrity
- appreciate Australia's social, cultural, linguistic and religious diversity, ...
- work for the common good, in particular sustaining and improving natural and social environment.

Commitment to action

Promoting world-class curriculum and assessment

- ...The curriculum will enable students to develop knowledge in the disciplines of English, mathematics, science, languages, humanities and the arts, to understand the spiritual, moral and aesthetic dimensions of life, and open up new ways of thinking.

So our question is: Does the Science Curriculum for the Foundation to year 10 promote these commonly accepted and agreed outcomes, especially in terms of the spiritual and religious dimensions?

The science curriculum rationale

The Rationale for the Science Curriculum (ACARA 2013b) underpins the whole curriculum. The Rationale does not address the issue of how science might be seen in the context of religion, ethics, morality or spirituality. It appears to treat science as an isolated field of endeavour, or as a closed system in its own right. Thus for example the investigation of Universal mysteries, is only discussed in terms of investigations conducted employing empirical scientific processes. In this sense the rationale is

deficient, since it does not treat science as part of the overall intellectual fabric for educated graduates from this program, and does not argue the need to build bridges between intellectual, moral, spiritual, aesthetic and physical dimensions.

The science curriculum aims

Only two of the aims of the science curriculum (ACARA 2013c) deal with science in the wider context, these are the fifth and sixth aims which seek to ensure that the students develop (*italics added*):

- an ability to solve problems and make informed, evidence-based decisions about current and future applications of science while taking into account *ethical* and *social implications* of decisions
- an understanding of *historical* and *cultural contributions* to science as well as contemporary science issues and activities and an understanding of the diversity of careers related to science

ACARA 2013c

Again the relationship between faith/religion/spirituality and science seems to be a largely neglected area, unless it is assumed to be treated only in the more restricted terms of ethical, social, historical and cultural dimensions.

Science curriculum content

In the curriculum content the stages and topics displayed in the first two columns of the Table appear to be fruitful opportunities for exploring the relationship between faith/religion/spirituality and science.

In most cases the examples given in the curriculum, do not extend the explorations beyond the material universe, but even the first topic 'Living things have basic needs, including food and water' for the Foundation year, lends itself to a wider perspective including issues of love, trust, family life, etc. All these are related to the religious, spiritual and human dimensions of what could be argued to be the basic needs of human beings at least, beyond the strictly scientific/materialistic examples provided within the curriculum. In fact, this is the overall short-coming of the science curriculum. Very rarely do the examples, called 'elaborations', show the relevance of other human and spiritual dimensions to science, apart from ethics in terms of integrity in scientific observations, analysis and reporting, or the social effects of applying scientific principles to the society. For example in Year 8, the elaboration for 'Science and technology contribute to finding solutions to a range of contemporary issues; these solutions may impact on other areas of society and involve ethical considerations' is 'discussing ethical issues that arise from organ transplantation'.

Many of the assumptions evident in the principles above, such as the conflict theory between science and faith, need critical historical analysis and elaboration instead of the rehashing of the tired and debunked old arguments of conflict between science and Christians. For example, see

the discussions of these issues in Buxton, Worthing & Mulherin (2012) and Numbers (2009) which are relevant to the curriculum topic 'Scientific knowledge changes as new evidence becomes available, and some scientific discoveries have significantly changed people's understanding of the world', and the elaboration 'researching different ideas used in the development of models of the solar system developed by scientists such as Copernicus, Khayyam and Galileo'. Similarly the evolution vs. young earth creation conflict, which is relevant to the year 10 topic, 'The theory of evolution by natural selection explains the diversity of living things and is supported by a range of scientific evidence', needs to be approached from a more accommodating perspective, such as those adopted by Alexander (2008) and Lamoureux (2008).

However, the way that the science curriculum is implemented in schools depends on the interpretations put on it by the teachers and the schools. Schools are in a position to tackle the key issues not just on the basis of the elaborations mentioned in the curriculum document, but on the basis of the spirit and overall meaning of the principles stipulated. So if we were to take this approach, it would be possible to connect the science topics listed in the Australian curriculum in numerous ways with issues of faith, ethics, morality and religion, instead of treating science as a closed system with no relevance to the wider range of human existence and meaning we call spirituality. Thus we could take the above topics and suggest some suitable 'elaborations' that would be in keeping with the meaning of the topics, and which could be the means of making connections with issues of faith and spirituality. These were seen as being key areas to be developed in the Australian school curricula, according to the Melbourne Declaration (MCEETYA 2008).

The suggestions in the Table (third column) are presented as a way of starting the conversation about legitimate ways of developing connections between science and spirituality in Australian schools. For each elaboration some potentially relevant literature sources are cited. They are noted as potential starting points for curriculum development and conversations.

Table: Australian science curriculum topics for the Foundation year to Year 10 (ACARA 2012), with science-faith elaborations added by this author.

Stage	Topic	Science-faith Elaborations
Foundation	1. Living things have basic needs, including food and water	1. Explore the emotional, spiritual basic needs of humans (Polanyi 1974).
Year 1	2. Science involves asking questions about, and describing changes in objects and events	2a. What questions deal with issues that science can answer and what questions go beyond science? (Murphy 2001, Polkinghorne and Beale 2009)
Year 2	2. Science involves asking questions about, and describing changes in objects and events	As for 2a. above. (Ratsch 2000) 2b. How can we find answers to the questions science cannot answer?
Year 3	3. Science involves making predictions and describing patterns and relationships	3. What patterns and relationships can be investigated by scientific methods, and which ones are beyond science? (Collins 2007, Young and Stearley 2008)
Year 4	4. Living things have life cycles	4. What are the ultimate meanings of human lives? (Morris 2004, McGrath 2008) What is beyond earthly life, e.g. life after death? (Wright 2003, Alexander and Numbers 2010)
	5. Living things, including plants and animals, depend on each other and the environment to survive	5. Does the interdependence of living things and the environment simply consist of scientifically observable relationships? (Morris 2004)
	6. With guidance, identify questions in familiar contexts that can be investigated scientifically and predict what might happen based on prior knowledge	6. What questions can and cannot be investigated scientifically? (Murphy 2001, Polkinghorne and Beale 2009)
Year 5	7. Important contributions to the advancement of science have been made by people from a range of cultures	7a. What have been the motivations of scientists with deep spiritual commitment for advancing science? (Desmond and Moore 1994, Dowe 2005) 7b. What have been/are the motivations of other scientists?

		(Giberson and Artigas 2006)
Year 6	8. Science involves testing predictions by gathering data and using evidence to develop explanations of events and phenomena	8. What events and phenomena are not amenable to scientific treatment? (Collins 2007, Young and Stearley 2008)
	7. Important contributions to the advancement of science have been made by people from a range of cultures	As for 7a and b above
Year 7	8. Scientific knowledge changes as new evidence becomes available, and some scientific discoveries have significantly changed people's understanding of the world	8. What myths have developed around the advancement of science, with a view to portraying the foolishness of previous ideas? (Numbers 2009, Brooke 1991)
	9. Science and technology contribute to finding solutions to a range of contemporary issues; these solutions may impact on other areas of society and involve ethical considerations	9. In addition to ethical considerations raised by science and technology, what are the moral and spiritual impacts? (Ratsch 2000)
	10. Identify questions and problems that can be investigated scientifically and make predictions based on scientific knowledge	10. What questions and problems are not amenable to scientific investigations and predictions? (Collins 2007, Young and Stearley 2008)
Year 8	8. Scientific knowledge changes as new evidence becomes available, and some scientific discoveries have significantly changed people's understanding of the world	As for 8 above
	9. Science and technology contribute to finding solutions to a range of contemporary issues; these solutions may impact on other areas of society and involve ethical considerations	As for 9 above
	10. Identify questions and problems that can be investigated scientifically and make predictions based on scientific knowledge	As for 10 above
	11. Use scientific knowledge and findings from investigations to evaluate claims	11a. What other ways are there to evaluate claims? (Polkinghorne 1994, Kuhn 1996) 11b. What might be other values and truth tests, for example, for evaluating claims?
Year 9	8. Scientific understanding, including models and theories, are contestable	As for 8 above

	and are refined over time through a process of review by the scientific community	
	12. People can use scientific knowledge to evaluate whether they should accept claims, explanations and predictions.	As for 11a and b above
	13. The values and needs of contemporary society can influence the focus of scientific research	13. On what basis should we choose to do or not to do scientific research? (Lindberg and Numbers 1986, Murphy 2001)
Year 10	14. The theory of evolution by natural selection explains the diversity of living things and is supported by a range of scientific evidence	14. What are the apparent contradictions between evolutionary theory and religion/faith-based understandings of the origins and how might they be resolved? (Haarsma and Haarsma 2011, Alexander 2008, Lamoureux 2008)
	15. The universe contains features including galaxies, stars and solar systems, and the Big Bang theory can be used to explain the origin of the universe	15. What aspects of cosmology and origins can science explain and what is beyond it? (Holder 2004, McGrath 2009)
	16. Scientific understandings, including models and theories, are contestable and are refined over time through a process of review by the scientific community.	As for 8 above.
	12. People can use scientific knowledge to evaluate whether they should accept claims, explanations and predictions.	As for 11a and b above.
	13. The values and needs of contemporary society can influence the focus of scientific research	As for 13 above

Cross-curriculum priorities and general capabilities

The Australian Curriculum identifies a number of cross-curriculum priorities and general capabilities. One might expect that these priorities and capabilities would provide an opportunity to link the science curriculum to spirituality and religion, which were so clearly identified as vitally important aspects of human development to be facilitated by Australian schooling (MCEETYA, 2008).

The three Australian cross-curriculum priorities proposed by ACARA are:

- Aboriginal and Torres Strait Islander histories and cultures
- Asia and Australia's engagement with Asia
- Sustainability

ACARA 2012d

The general capabilities for life which should be developed across the Australian curriculum are (ACARA 2013, p. 2):

- literacy
- numeracy
- competence in information and communication technology (ICT)
- critical and creative thinking
- ethical understanding
- personal and social competence
- intercultural understanding

We can see by these lists of cross-curriculum priorities and general capabilities, that only a small slice of what would be termed spirituality is actually explicitly addressed by the Australian curriculum, especially in the science curriculum. The *ethical understanding* is certainly a step in the right direction, and some aspects of *personal and social competence* and *intercultural understanding* appear also to link closely with spirituality and religious understanding and development. For example, the issues of 'appreciate diverse perspectives', 'contribute to civil society', 'work collaboratively' and 'negotiate and resolve conflict' in the personal and social capability area (ACARA 2013, p. 88) all provide opportunities to incorporate spiritual dimensions to the teaching of these priorities and capabilities.

However, even though the *ethical understanding* general capability deals with many aspects closely related to issues of spirituality and faith, there is no explicit link made between ethical thought or action and spirituality and religion/faith positions. For example, students are encouraged in the ethical treatment of others, and to reflect on the ethics of actions in complex contexts (ACARA 2013, p. 108)

The *intercultural understanding* general capability tends to focus heavily on understanding the other, rather than on one's own cultural context, although there is some attention paid to understanding one's own position. Religion is classed as belonging within this cultural context (ACARA 2013, p. 111) but it is barely mentioned apart from the initial discussion in the introduction, whereas there is a strong emphasis on values, such as tolerance and respect for different positions.

Conclusion

So where will the science curriculum lead Australia? If we were to follow exactly what is provided in the ACARA documents, it would tend to be a very isolated view of science, as a field or discipline of study all on its own, with minimal contact with issues of spirituality, religion and faith. The main way it would connect with these issues would be via the general

capabilities aspect of the Australian Curriculum. And even this connection is rather partial, not making much room for establishing a dialogue and understanding of the links and connections between these areas. If on the other hand teachers and schools wished to interpret the science content descriptions in light of the Melbourne Declaration's expressed desire to see students develop their spiritual dimensions through all schooling, including their science studies, then it is possible to envisage suitable added elaborations of the content within the spirit of the content descriptions. After all, the key document, *Shape of the Australian Curriculum*, states:

The teaching and learning programs offered by schools are based on the Australian Curriculum, in conjunction with state or territory curriculum, and other learning opportunities and activities determined by the school.

ACARA 2012, p. 26

Examples of suitable content items have been provided in this paper, as well as resources that may be employed as sources of information on these items.

The author hopes that these suggestions may be useful for schools and teachers throughout Australia to reach beyond the apparent restrictions of the Australian science curriculum, to ensure that both scientific and spiritual education are fruitfully developed together, leading to more holistic education for Australian students.

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