

[W2] Engaging with the ethical implications of science

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INTRODUCTION

Perhaps the first question that many will ask is 'Why should we engage with the ethical implications of science?' It may be argued that as scientists our job in research is to investigate the universe and in teaching, to enable our students to understand current hypotheses and the reasons why they are held. We deal, the argument continues, in data and evidence gained by rigorous experimentation, observation and measurement - the Baconian approach to understanding the world. Ethics, i.e. the attempt to systematise questions of morals, questions of right and wrong, surely lies outside our remit.

Such a view is not, however, endorsed by the authors of the QAA benchmarking statements, which stress that students across a range of disciplines, including biological sciences, should be aware of and be able to demonstrate understanding of the ethical and social implications of advances in their subject (QAA, 2002). We believe that the reasons for this are clear; it is no longer appropriate to regard the sciences as existing in isolation. Scientific activity is part of our culture, supported by and embedded in society. That is not to say that we regard the findings of science as socially constructed, a position that we firmly reject. Nor is it to say that science is warmly embraced or even understood by the whole of society: it very clearly is not. However, science is surely accountable to the society that supports it, and that accountability includes being aware of the wider implications (see Bryant et al, 2005). In biological sciences especially, those wider

implications are growing fast. Modern biological and biomedical science is giving us power to manipulate the lives of other living organisms and of other humans in ways that were undreamed of only a few years ago. Society is therefore faced with dealing with the new possibilities that arise from scientific advances. But in our view, scientists cannot opt out at this point. At the very least, they have the responsibility to communicate clearly what is possible and what is not, to make sure that the science and its possible applications are understood so that ethical considerations are rooted in reality. We would go further, and suggest that scientists should also participate in the debate itself or, as the title of this paper suggests, be able to engage with the ethical implications (see, for example, Willmott, 2004).

HOW DO WE HELP SCIENCE STUDENTS TO ENGAGE WITH THE ETHICAL IMPLICATIONS?

Inevitably, given our fields of interest, we (the authors) have most experience of ethics teaching focussed around biological and biomedical issues. As we have already stated, these are currently areas of particularly intense ethical debate. This is not to say, however, that other disciplines such as chemistry and physics are devoid of suitable topics. Indeed, a fairly cursory survey reveals the existence of a number of web-based resources already directed at these subject areas. For example, Case Western Reserve University hosts the Online Ethics Center for Engineering and Science (<http://onlineethics.org>) and there are other portals specifically associated with

Chemistry (e.g. <http://www.istl.org/01-spring/internet.html> and <http://www.lib.duke.edu/chem/ethics>; see also Coppola, 2000). In the realm of Physics, the cold fusion' affair and Millikan's oil-drop experiments are broadly discussed (see, for example, Thomsen, 1999, and Goldfarb and Pritchard, 2000). The Joint statement on skills training, to which all of the UK Research Councils are signatories, specifies that all research students should be able to 'demonstrate awareness of issues relating to the rights of other researchers, of research subjects, and of others who may be affected by the research, e.g. confidentiality, ethical issues, attribution, copyright, mal-practice, ownership of data and the requirements of the Data Protection Act' (see, for example, EPSRC, 2003). We have found Shamoo and Resnik (2003) to be a particularly helpful text in this regard.

Thus, ethics education is of relevance to all fields of science. It is our conviction that the methodologies outlined below, although 'road-tested' in the biosciences, are readily transferable to other subject areas, even if the specific examples are harder to identify.

Ethical theory and moral philosophy

In the end, ethics is about making decisions, decisions about what is a right or appropriate course of action. A simple statement of this kind hides all manner of complexities, including the theoretical background to ethical decision-making. It was brought home to JB some years ago that moral philosophers, like scientists, have their own language and part of that language is the description and definition of the various ways in which ethical decisions are made. JB had not heard of the terms *deontological* or *consequentialist* until he participated in a group that was writing a response to a Human Fertilisation and Embryology Authority (HFEA) consultation. However, the use of terms such as these that define different ways of making moral decisions made him realise that different

people may use different systems in their ethics and that their worldview may affect the use of those ethical systems. Thus, we, in our respective universities, consider it important that students have a basic grasp of ethical theory so that first, they have insights into why they hold their views or reach their conclusions and secondly, so that they can recognise the types of argument used in debate or discussion. It is certainly not our job to try to tell our students **what** to think; however, we hope that our courses teach them **how** to think. Armed both with a good working knowledge of the science and this basic grasp of ethical theory, our students are well placed to participate usefully in the debate.

Focussing on the issues

As we have already stated, if ethics is to mean anything, it means coming to a decision. The debate is essential, but eventually a course of action must be decided on. For example, over the past two years, the HFEA has debated a number of cases in which it was desired to create *in vitro* an embryo that, if allowed to develop to full term, would be a stem cell donor for a sick older sibling (see <http://www.hfea.gov.uk/PressOffice/Archive>). This 'saviour sibling' scenario presents extensive opportunities for ethical debate but unless that debate is aimed at reaching a conclusion, it is of no use at all to the families involved: the prospective parents need to know whether the procedure will be permitted. We therefore make extensive use of **scenarios** and **case studies** in teaching bioethics (Bryant and Baggott la Velle, 2003). In other words, we employ a form of problem-based learning. Students work on these as individuals, or in pairs or groups but the key aim is to get them to make a decision. Thus they need to decide which factors in the case study are relevant and what relative weight to give to each of those factors as they make their decision. It is very valuable to get the students to analyse their reasons for reaching their conclusion. This will give insights into the way that they as

individuals make ethical decisions and may, in some groups, illustrate how different world views lead to different outcomes.

The previous point is important. Many students may assume that their culture and worldview is universal. It is very valuable that students come to realise that different worldviews may give rise to different ethical decision-making processes (e.g. deontological, based on duty to follow certain courses of action *versus* consequentialist, based on evaluating the outcome of an action) or may lead to significant factors being weighted differently (e.g. in 'double-effect' situations where a treatment to relieve pain may hasten death). This point can be further emphasised in **role-play** where students (or sometimes academic staff) research and present different positions within a particular ethical **debate**. One of us (JB) has been involved in role-play concerning the utilisation of rain forest in South America (see Bryant et al, 2002). Other successful role-plays, reported from the USA involve students taking the roles of the real participants in the national debate on stem cell research (Fink, 2002; Rubin, 2004). Further, role-play may be extended into full-scale **drama**, which is a very powerful tool in presenting the human emotion and tension in some current medical ethical debates. Thus one of us has been involved with the drama department in his university in producing a play, *A Present for Anna*, about saviour siblings (exstream@exeter.ac.uk).

Viewing and listening

Producing *A Present for Anna* did not directly involve biology students although it was clear that the drama students gained great benefit from the exercise. However, the play itself is a great teaching tool, involving the audiences in actually deciding whether to permit the creation of a saviour-sibling embryo, once again emphasising that real ethics is about making decisions. The play was toured to high schools and to some universities, and for the latter, supplemented the bioethics teaching that was already taking place. Other theatre companies, notably Y touring

(www.ytouring.org.uk) have a strong track record for productions that illustrate dilemmas in contemporary science, including *Pig in the Middle* (about xeno-transplantation) and *Genes R Us*.

Even in the absence of a suitable play, there is vast resource of both fictional and documentary material available on **DVD and video**. For example, the film *Gattaca* portrays a world in the near future in which the genetically selected 'Valids' have privilege over the naturally-conceived 'In-valids'. The film provides extensive opportunity for discussion of a range of ethical issues, including embryo selection and genetic discrimination¹. A number of TV 'drama-documentaries' have also been produced, including the highly acclaimed *Born with Two Mothers* about a mix-up at an IVF clinic, which results in one woman giving birth to a different couple's child (see Ashcroft, 2005 and Channel 4, 2005, for a consideration of some of the ethical issues which could be developed out of a screening of the programme).

The BBC science series Horizon has been accused of 'dumbing-down' in the recent past, yet several recent episodes have relevance for teaching about ethics. Notable amongst these are *Who's afraid of designer babies?* (BBC, 2005) and *The dark secret of Hendrik Schön* (BBC, 2004). The latter is useful on two levels, for a discussion of nanotechnology, but also as an example of dishonesty and a lack of research integrity.

Similarly, news footage of current developments can provide pithy illustrations around which discussion can be developed. For example, one of us (CW) has developed an exercise utilising a few minutes of Channel Five news about the first application for permission to clone human embryos for therapeutic purposes. This short report lends

¹ Although, from our knowledge of high school teaching, many of our students may have seen the film as a teaching aid during their last two years at school.

itself to a discussion of the science involved in the procedure, the ethical implications of the work, and the ethical reporting of one's work to the media. This reminds us that, of course, whenever students watch a play or video, we need to encourage 'active' watching and it is sometimes helpful to produce a checklist of points to watch out for or to consider as they are viewing.

A further method that has been successful employed to help students engage with the ethical dimension of the subject involves **production of websites** on a specified ethical theme (Willmott and Wellens, 2004). Alongside a number of generic skills, such as teamwork, researching of material and the use of web-authoring software, the stated requirement in the exercise that all student sites should reflect the 'diversity of informed opinion' reinforces awareness of the importance of worldview in decision-making, and an appreciation for those who hold a different viewpoint.

CONCLUDING REMARKS

It is clear that teaching ethics lends itself to non-lecture forms of teaching, with emphasis on group work, interactive learning and student-centred learning. However, that is not to say that we have abandoned totally the **lecture** format, either delivered by university staff or invited speakers (see Willmott *et al*, 2004). For example, imparting the basics of ethical theory is probably best done in a lecture, but even then the lecture(s) may be punctuated by brief thought experiments and well-structured illustrations. It is also important, for any particular issue, to ensure that the students are aware of the current situation, particularly for topics that have not been covered in their more 'conventional' science courses.

Finally, it is our experience that bioethics lends itself well to development of skills in science communication. The ethical angle provides a ready-made 'hook' for engaging with the public who may well have strong views on these issues, even if not knowing much about

the science. We are thus developing science communication exercises based on bioethical issues and hope that these will equip our graduates to **communicate clearly** with wider audiences.

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