bioscience education

Short Communication

Assessing Analysis and Reasoning in Bioethics

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Abstract

Developing critical thinking is a perceived weakness in current education. Analysis and reasoning are core skills in bioethics making bioethics a useful vehicle to address this weakness. Assessment is widely considered to be the most influential factor on learning (Brown and Glasner, 1999) and this piece describes how analysis and reasoning in bioethics are assessed in this department. General marking notes asserting the importance of an analytical and reasoned approach while including illustrative detail are used, as well as marking notes specific to each individual question. There are a mixture of components in each answer — reasoning, appropriateness of facts, originality and organisation — which can be difficult to mark accurately. Therefore, students are assessed by several pieces of work using a trained team of markers.

Keywords: ethics, assessment, reasoning, bioethics, critical thinking.

General Principles

What should we assess? The following paragraph from the QAA Academic Standards: biosciences benchmark statement (QAA, 2007) unmistakably indicates what should be achieved in bioethics modules, along with clear implications for how they should be assessed.

> *"Whatever the subject discipline, students should expect to be confronted by some of the scientific, moral and ethical questions raised by their study discipline, to consider viewpoints other than their own, and to engage in critical assessment and intellectual argument."*

The implications of these points are:

- Bioethics should be a core component;
- It should be treated with the same seriousness with which we treat science itself;
- To be aware of example issues is not enough — students must analyse and reason as well;
- The focus is on intellectual engagement, not on learning by heart a standard answer; and
- This does not exclude facts; critical assessment includes identification and evaluation of facts appropriate to the issue at hand.

Thinking is an important transferable skill, arguably *the* transferable skill one would expect in a graduate. On the other hand, anecdotally, there is little explicit teaching of thinking in biology degrees; we all think we teach thinking, but though there are occasions when thinking is practiced, and occasions when examples of good thinking are provided, we rarely tackle it explicitly or offer practice (except in numerical skills) where the explicit purpose is to improve thinking skills. It is an advantage of teaching and assessing bioethics through analysing ethical issues and reasoning about the solutions, that here there is an important opportunity to address thinking explicitly (Pearce 2004a). Structures of argument transcend distinctions between subjects and are equally valuable in science as in ethics. Furthermore, value judgements,

central to morality, are inevitably involved in decisions about what to do, and thus science as a process of gathering and applying facts, should involve thinking that encompasses ethics.

So what should we expose students to, in order to foster analysis and reasoning? There are a variety of approaches to teaching and learning bioethics (Centre for Bioscience, 2008). In our bioethical module, students are exposed to these key components:

- the non-ethical aspects of organising their thinking, some basic points without which ethical reasoning is impossible (rejection of ethical relativism and use of value judgements);
- acquaintance with ethical theories relevant to bioethical issues;
- bioethical examples from involved biologists; and
- practice at analysing cases and writing reasoned answers.

(Pearce 2004b and 2006).

This includes introducing students to the ethical matrix devised by Mepham (2008) and thus involves the value judgements that well-being, autonomy and fairness matter.

Assessment can be a powerful lever in ensuring that all students take a subject seriously. Biology is a subject where memory plays a large part in examinations, therefore assessments in bioethics, where thinking rather than fact regurgitation is assessed, can seem risky to a student as it calls for less familiar preparation strategies. In a compulsory, predominantly bioethical module with built-in practice and formative assessment, students have the time to take on board these unfamiliar demands.

Example Questions

These are drawn from a 10-credit module 'Social Impacts of Biology' (BIO3015) (Pearce, 2006). The intended learning outcomes for the Social Impacts of Biology module state:

> *"Students should be able to describe, explain, and analyse specific example issues in moderate depth. They should be able to develop a logical, structured approach to a specific problem or to a general type of problem."*

The examination has two parts. Section A asks questions that are linked to the topic of particular lectures. They generally ask for a mix of facts and ethical analysis and reasoning, with different questions offering different proportions. Section B asks questions of a broader nature including topics that were not specifically covered in the lectures but that the students can be expected to cope with on the basis of their general knowledge and understanding, and any information provided in the question itself. Thus these questions are about wider issues than in Section A, asking broad questions or setting a scenario (real or imaginary) illustrating a general ethical problem, and requiring, preponderantly or entirely, ethical analysis and reasoning.

The student's focus should be on demonstrating analysis and reasoning. Except when the question calls for it, there are no marks for simply reviewing the factual background, but there are for appropriate use of facts in arguments. Considering these points, marking notes cannot set out *the* answer, though they can illustrate how the question might be answered. Therefore we use generic marking notes (and the University's common marking scale) together with additional notes (not illustrated here) on particular questions.

General marking notes

> *"In so far as any question is bioethical, the quality of the argued case is the most important factor, but students will need to use appropriate facts too."*

"In answers to the section A question, one consideration is the completeness and accuracy of the facts required by the question. However it is equally important that the answer is well-organised and clearly explained and that where an argument is indicated this is also clearly explained."

"In Section B the main requirement is for a well-organised and well-argued case; the student does not have to know a particular factual area but any facts or surmises relied on should be accurate or reasonable."

"In both sections, it is irrelevant whether any conclusion is one that the marker agrees with or not."

The example examination questions below illustrate the difference between Section A and B questions. The last question also illustrates the use of an imaginary scenario.

Section A questions

"What are the current ethical issues in transplanting organs and tissues between people? How would you resolve them?"

"Outline the legal requirements of current legislation that controls experiments with animals and identify and comment on the underlying ethical principles. Discuss to what extent this legislation could be a model for how we treat animals outside experiments."

Section B questions

"Explain whether or not cultures of human cells such as stem cells should be given the same ethical consideration as humans."

"Imagine that the tusk of the almost extinct Borneo zebra provides an effective treatment for AIDS. Removal of the tusk is lethal. There are just enough Borneo zebra to cure 10% of people in Africa with AIDS. The Borneo zebra cannot be farmed. There is a strategy to prevent the extinction of the Borneo zebra but it will take ten years to be effective and nobody is sure it will work. Explain what we should do."

{Clearly the Borneo zebra is an imaginary beast. To date students have not been distracted by a zebra having tusks.}

The answers students give generally show that they can analyse and reason, but struggle to do so rigorously. However, the ability to be rigorous is generally not easily acquired, and certainly not in a single module. But if students, through realising the complexity of bioethical issues, and particularly in response to being assessed and seeing feedback, try to think more carefully, then that is an achievement which can support and encourage further development of analytical and reasoning skills through the rest of their lives.

Seminars

Students need practice in order to tackle these examination questions. Lectures provide example issues and examples of reasoning, but the essential preparation is made in the seminars (Pearce, 2006). In these, students work in groups to analyse and discuss an issue. Demonstrators give help, moving from group-to-group to provide comment and advice much as demonstrators do in laboratory classes. The types of question discussed in the seminars are similar to those set in the examination. At the end of the seminar students spend 30 min writing an individual argued case informed, amongst other things, by the prior discussion. This is marked later and returned with feedback (Pearce, 2006).

Comments on consistency and accuracy of assessment

Consistency in assessment is a prerequisite for accuracy though it does not guarantee it. It is difficult to achieve even in the marking of some routine biology and inconsistency between scripts for one marker, particularly when tackling large numbers of scripts, may be a bigger problem than differences between markers (Brooks, 2004).

The marking of analysis and reasoning in bioethics requires balancing judgements of a mix of qualities: are facts included that are capable of helping the argument, are they used appropriately, how well structured is the argument, how well made and how original is each point, is the overall argument original, does the conclusion follow from the argument? Different students might use radically different approaches and thereby probably different mixes of the above components, and still create equally effective answers. It is unlikely that we could write mark schemes that were simple enough to be usable yet sophisticated enough to apply to a wide range of possibilities.

Each question in the examination is marked by one person and no more than three academics are involved in the marking of the paper. Moderation according to standard University rules ensures fairness. Also, the final mark for the module is based on a total of five items, three seminar pieces each contributing 10% of the total marks, and two examination answers each contributing 35% of the total marks. This also helps to ensure that the overall mark is fair.

However, students rely on the marks from their seminar work to indicate how well they are doing in tackling the subject, so we would like to be very accurate in our marking of the seminar. Currently a group of five markers share the marking of the seminar work. This number is necessary because of the class size and turn-round time. We have tried to understand the basis of discrepancies in marking between markers by a blind marking of the same pieces of work. This showed the same comments were made on the component parts of the answers and similar comments on the answer as a whole. However, the overall mark has to reflect the balance of good and not so good points and give recognition for attempting to make a difficult point sometimes without success, and it was in this balance that judgements differed. Team marking and discussion within the team of the marking of particular answers should help to achieve accuracy as well as reproducibility. Communities of markers, within and across institutions, could help to standardise marking more widely (Watts, 2007).

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