Authenticity in Learning, Teaching and Assessment: Perspectives from a Course in Professional Ethics for Software Engineers

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ABSTRACT

The teaching of a course on professional ethics provides an interesting perspective on the values underlying teaching and learning; in such a course, the values of the teacher and the values of the student are more openly debated than in most educational environments. In this work, we investigate a number of value questions within the context of a new course on professional ethics for software engineering students.

The study makes two main contributions to the literature on teaching practice. Firstly, a deficiency is identified in conventional techniques for teaching and assessing courses on professional ethics; specifically, we contend that current case study approaches to ethics teaching lack the *experiential element* which is so crucial in understanding the nature of complex ethical dilemmas. A new approach to ethics teaching is proposed, which is based on reflection through a personal diary. Secondly, an evaluation of the diary and case-study techniques is used to explore an important theme in education; the authentic communication of values.

Our findings suggest a central irony that challenges the notion of authenticity in assessment; students invest little effort in a piece of work that is not assessed, but assessing a piece of work fundamentally changes the way in which students approach it. Additionally, our findings expose a conflict between role and person in teaching, which is particularly apparent within the context of ethics teaching. The same conflict between role and person is present in professional software engineering practice; furthermore, professional codes of conduct may exacerbate this conflict by distancing personal values from professional values.

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Finally, I would like to thank *eucalyptus tetrodonta*.

For Sara

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CHAPTER ONE

Introduction

This study arose from consideration of the following question; *how should professional ethics be taught?* Like many questions in teaching practice, this apparently straightforward query raises many complex issues. What are the values espoused by a particular profession? Is it the task of a teacher simply to communicate those values, or would that constitute indoctrination? How are values communicated in teaching and learning? What is the origin of values, and why are some implicated in teaching more strongly than others? In this work, we address many of these questions within the context of a specific university course; a module on professional ethics taught to undergraduate and postgraduate software engineers.

Software engineers are individuals who analyse, design, implement and test computer programs. Although the term *software engineer* suggests a status comparable with other members of the engineering profession (such as electrical, mechanical and civil engineers), it is generally held that software engineers suffer rather lower status than their peers. Perhaps the main reason for this is that rigorous techniques for creating computer software are only just emerging, with much software development still being conducted in an *ad hoc* manner. Indeed, inadequacies in the tools of the software engineering trade have recently been exposed in a number of high-profile disasters. These have shaken public confidence, and left an impression that software engineers have too much power and insufficient social responsibility.

Certainly, technical innovations in software engineering are proceeding far in advance of our understanding of the legal, ethical and social implications of computer technology. Medical ethics, legal ethics and business ethics are all established fields of academic study, but the field of computer ethics is still in its infancy. Furthermore, teachers in science and engineering disciplines tend to perceive ethics as a topic which is divorced from their pedagogy, and often lack the skills needed to teach it effectively. As a result, many university degree courses in software engineering impart technical skills, but do not teach equivalent skills in ethical and legal reasoning. In short, graduates leave university with little understanding of the ethical implications of software development, and are often poorly equipped to uphold the standards of behaviour demanded by professional organisations.

Professional training for software engineers

Professional bodies such as the British Computer Society (BCS) and the Association for Computing Machinery (ACM) have responded to the perceived crisis in professional standards in two ways. Firstly, they have introduced codes of ethics which formally state the values that are important to the profession as a whole (e.g., Anderson *et al*., 1993; BCS, 1992). Historically, such codes provide a means by which a professional organisation can control its membership, and therefore convince the public that it deserves to be self-regulating. Additionally, the BCS and ACM codes are intended to function as aids to individual decision making, for use when members of these organisations are faced with ethical dilemmas in their professional lives.

The second response of professional organisations has been to encourage the inclusion of professional ethics topics in the curricula of software engineering degree courses. This has been achieved both by publishing recommendations for curriculum design (e.g., Turner, 1991; Huff and Martin, 1995), and by placing constraints on the content of accredited courses. For example, in order to qualify for accreditation by the BCS or ACM, degree courses in software engineering must now contain a unit on social, ethical and professional issues.

Inevitably, courses on professional ethics that meet the BCS and ACM requirements tend to stress the importance of professional codes of conduct. As such, they place more emphasis on the collective moral stance of the profession rather than upon individual moral decisions. Indeed, it has been argued that ethical codes embody a rather impoverished view of ethics, by suggesting that the solution to an ethical dilemma is simply to consult the opinion of a larger collective (Laudon, 1995). One could argue, then, that even with the inclusion of such courses in the software engineering curriculum, students still do not acquire the intellectual tools needed for ethical decision making in a professional context.

Values in higher education

While professional bodies are attempting to establish a consensus on the values that are important to the software engineering profession, a remarkably similar debate is currently taking place in higher education. In much the same way that the software engineering profession is under increasing public scrutiny, so higher education is facing increased expectations from students, parents, employers, government and the professions; the recent HEFCE teaching quality assessment exercise, which rated the teaching proficiency in every British university department, is perhaps the most visible evidence of this.

As a result, universities are being asked to re-examine long-established practices, and to enunciate the aims and objectives of teaching and learning in unambiguous terms. For example, in its 'graduateness' project, the Higher Education Quality Council is attempting to clarify the core properties that characterise a graduate (HEQC, 1995; 1997). Value questions are playing a central role in this process; just as

professional software engineers have debated their values in order to establish a code of conduct, so the values that underlie teaching and learning in higher education are now being questioned.

The significance of this change in attitude should not be underestimated. Although values are inextricably linked with teaching and learning, they have usually been implicitly accepted rather than openly discussed. In fact, this failing of higher education has been recognised for some time, as Churchill (1982) notes:

> *If teaching occurs, moral values are present, though frequently these values go unacknowledged ... the urgent questions are* what *moral values are taught, and what theory of education will be rich enough to reflect this practice.*
>
> *(Churchill, 1982, page 306)*

Indeed, Collier (1988) observes that even those values which are characteristic of academic culture have rarely been the subject of debate:

> *Teaching tends to focus on conceptual clarification and precision and ... tends to thrust students into a world of intensely abstract verbal or mathematical debate remote from the observation of human realities. There is little explicit discussion of value questions, even of the values of logic, precision and freedom of research which are distinctive of the culture.*
>
> *(Collier, 1988, page 25)*

The focus of this dissertation is upon the teaching and assessment of a course on professional ethics for software engineers, but we also address some of these value questions. Values are intimately connected with ethics; values are beliefs about right and wrong and good and bad, whereas ethics involves the debate of assumptions about values, both as general ideas and applied in the private life of individuals. Hence, a course on professional ethics provides a particularly intriguing vehicle for investigating value questions in teaching and learning. Furthermore, a course on professional ethics provides a context in which the values of the teacher and the values of the student are more openly debated than in most teaching environments.

Overview of the dissertation

In the remainder of this dissertation, we address issues in the teaching and assessment of a course on professional ethics for students of software engineering. Our work contributes to the literature on teaching practice in two respects. Firstly, we identify deficiencies in conventional techniques for teaching and assessing courses on professional ethics, and propose some novel techniques. More specifically, we contend that current case study approaches to ethics teaching lack the experiential element

which is so crucial in understanding the nature of complex ethical dilemmas. A new approach to ethics teaching is proposed, which is based on reflection through a personal diary. Secondly, we use an evaluation of the diary and case-study techniques to explore a critically important theme in education; the authentic communication of values.

CHAPTER TWO

Teaching professional ethics

In order to evaluate current approaches to the teaching of professional ethics, we must have an understanding of the goals of such teaching, and an appreciation of the way in which the teaching and assessment of professional ethics is influenced by institutional context and curriculum design. These factors are considered here, together with other important issues in ethics teaching such as indoctrination. Subsequently, we evaluate existing courses in professional ethics and conclude that they suffer from a common deficiency.

Goals in the teaching of professional ethics

Perhaps we should begin by stating what a course in professional ethics is *not* intended to provide; a moral education. As Churchill (1982) has noted, 'morals' and 'ethics' are two quite distinct concepts, although they are regularly confused and conflated. The former term refers to human behaviour (such as issues of good and bad or right and wrong), whereas 'ethics' denotes rational, systematic reflection upon this behaviour. Undergraduate students already have well-developed moral viewpoints; hence, the focus of professional ethics teaching should be on the critique of existing values, rather than upon the formation of a moral identity (we do not dispute, though, that the communication and modification of moral values is implicit in any teaching situation). Furthermore, a course on professional ethics should provide students with concepts and analytical skills that will enable them to resolve both personal and professional dilemmas. We argue, therefore, that a course on professional ethics should not make a strong distinction between personal and professional decision making; rather, professional ethics is the application of general moral principles in a particular context. Our perspective is elaborated in the remainder of this section, which discusses three issues which might be considered as goals in the teaching of professional ethics (see also Callahan and Bok, 1980; Huff and Martin, 1995).

Firstly, a course on professional ethics should *stimulate an awareness of moral issues*. Any course on ethics should emphasise that we exist within a complex web of moral relationships, and that we all have a moral identity that influences our perceptions and our actions. This is a particularly important goal for students of software engineering, since they are often unaware that the application of computer

technology raises fundamental moral questions of right and wrong and good and bad. A course on professional ethics must provide practice in the identification of ethical issues, and it should do so in a way that conveys something of the complexity and difficulty of ethical decisions; in other words, the course should be an emotional experience as well as an abstract intellectual exercise. Most importantly, students must critically examine their own values, and should appreciate that 'gut reactions' to ethical dilemmas may change after further reflection upon the issues.

Secondly, professional ethics teaching should *develop analytical skills*. Fundamental skills are needed in rational argumentation, so that students are able to justify their ethical thinking coherently and consistently (in fact, students of computer science and software engineering may acquire these skills in other areas of the curriculum, such as in courses on logic and artificial intelligence). Moreover, students should acquire the skills necessary to clearly articulate their arguments. Development of these skills requires the exploration of concepts such as 'right' and 'good', moral rules and general ethical principles, most likely through the consideration and evaluation of several schools of ethical thought.

Finally, a course on professional ethics should *elicit a sense of personal and professional responsibility*. Any discussion of ethics presupposes that individuals have some degree of moral autonomy. A course on ethics should explore this in practice, both in terms of personal responsibility for moral choices and in terms of obligations to professional organisations. As such, the course must confront some old and difficult questions such as 'why should one act morally?'

One goal that is notably absent from our list is that a course on professional ethics should change student behaviour. Courses on professional ethics *may* influence student conduct; however, we do not propose that this should be an explicit goal of a course on professional ethics, because in practice it is unlikely to be unachievable. Similar reasoning has been articulated by Callahan and Bok (1980):

> *Many educators ... believe there is no point in teaching an ethics course unless it will assure improvement in student conduct. We have concluded that this is not an appropriate explicit goal for a course in ethics. At the least, it would be naive to pin one's hopes for improvement in behaviour on any course. Moreover, to bring about such changes, professors might engage in highly questionable techniques of manipulation. These would not only be inappropriate; they would also beg some important moral questions ... that are precisely those the students should be free to debate.*
>
> *(Callahan and Bok, 1980, page 54)*

Certainly, there is little evidence in the literature to suggest that courses on professional ethics modify student conduct. Typically, evaluations of courses in ethics indicate a change in student *attitude*, but this does not necessarily translate into a change in *conduct* (e.g., Penn, 1990). For example, Wong (1995) has shown that

student attitudes to software piracy altered after a short course on professional ethics, but that their conduct did not; students simply made unauthorised copies of software more discreetly.

Callaghan and Bok also suggest that changing student behaviour should not be an explicit goal of a course on professional ethics because of concerns about manipulative teaching practices. This point is more contentious. A teacher may have an intention to change behaviour at the foundation of their pedagogy, but such a stance need not be ethically unsound so long as it is made public. Equally, an intention to change behaviour does not *necessarily* lead to 'highly questionable techniques of manipulation', or to the restriction of the freedom to debate.

Indoctrination and professional codes of conduct

The quote above from Callahan and Bok (1980) implies that indoctrination should be a matter for concern when teaching courses on professional ethics (by the term 'indoctrination' we mean an attempt to influence individuals to adopt certain values, in a way that prevents or inhibits debate on their validity; see also Flew, 1972; Collier, 1988). Indeed, it is often debated whether courses on ethics should be taught at all; we live in a pluralistic society which is generally tolerant of individual values, and the teaching of ethics may be seen as endangering this ideal. Pluralism is very much apparent in university society; undergraduate and (especially) postgraduate courses are populated by students from many countries, with diverse religious and ethical backgrounds. Furthermore, some of these students may already have experienced indoctrination, having come from countries in which behavioural change is an explicit goal of the education system (for example, see Spiecker and Straughan, 1991).

The issue of indoctrination is particularly significant with regard to the teaching of professional ethics, since a certain set of values are clearly being espoused – the values of the profession (Luegenbiehl, 1992). As we have already noted, many professional organisations have established codes of conduct which formally state the values that are important to the profession as a whole, and these codes often play a central role in professional ethics education. Such codes of conduct also have a powerful influence over the members of a profession, since they provide a mechanism by which the profession can control its membership. By demonstrating such control, a professional organisation gains two benefits; increased public trust (leading to higher social status for its members) and a defence against external regulation.

The aim of ethical enquiry is to ensure that values are not accepted uncritically. This goal must be achieved through the critical analysis of traditional values, but it need not involve any attempt to subvert them; students can be encouraged to reflect upon their own values without being encouraged to reject them. A more specific concern, then, is that individual teachers might attempt to indoctrinate students according to their own agenda. Such actions would be contrary to the very notion of higher education, which holds that students should develop their own moral and intellectual viewpoints. However, the relationship between teacher and student is never

'value free'; even when there is no premeditated attempt to indoctrinate, students are exposed to the values of their teachers (for example, see Churchill, 1982; Ferguson, 1986). As Collier (1993) observes, attempts to establish a 'climate of trust' may prove unconvincing, since an unspoken pressure towards an appearance of trustingness may itself be interpreted as a manipulative act. Indoctrination, then, might best be avoided by an impartial consideration of many diverse viewpoints. For example, rather than simply presenting a professional code of conduct as a set of unbreakable rules, the purpose of the code and its implications should also be debated. However, the extent to which impartiality is desirable – or possible – is itself a complex issue, to which we shall return in chapter 4.

Another factor which may be considered a form of 'indoctrination' arises from the imbalance of power between teacher and student (the 'authority-dependency' relationship; see Abercrombie, 1993a). University teachers speak from a position of authority on technical issues, and hence students may also gain the impression that the teacher's views on ethical issues are the 'right' ones. This problem may emerge through lack of experience in teaching ethics – an inexperienced teacher may simply preach his own moral code, rather than investigating different ethical issues and perspectives. A similar difficulty may also arise in situations where students are exposed to a single course in ethics, which is taught by a single member of staff. For this reason, Callahan and Bok (1980) suggest that ethics should ideally be team-taught, so that students are exposed to a range of different perspectives. Such an approach may be particularly effective when it combines teachers from diverse disciplines. However, there is a real danger that insights from different disciplines will be presented in parallel, rather than combined in the solution of a common problem. Effective team-teaching requires tight integration, and a willingness for those involved to wrestle with material from their colleagues' disciplines.

The place of professional ethics in the curriculum

It is often stated that professional ethics should not be taught in a single course at all; students should engage in explicit discussion of ethical issues when they arise in all of their courses (Little and Sauer, 1990; Martin and Holtz, 1992; Bellardo, 1992). Certainly, the confinement of ethical issues to a single course may distance them from the remainder of the curriculum; from our perspective, such a course might fail to demonstrate the close relationship between the technical aspects of software engineering and their social and ethical context.

Unfortunately, this ideal is faced with practical difficulties. Many universities have adopted modular degree schemes, which compartmentalize the course material and impose prerequisites and co-requisites. Distributing the teaching of professional ethics between many such modules is bound to reduce its impact; this is a particular concern, since the teaching of professional ethics already has a low status in engineering departments. Teachers of technical subjects may not be competent to orchestrate debates on ethical issues, or may do so grudgingly; either way, the course may lack

intellectual depth. Additionally, many 'technical' modules do not provide a context in which professional ethics can sensibly be discussed; for example, it is hard to imagine ethical issues arising in a module that teaches theoretical foundations of computer science. Providing a separate module on professional ethics should at least ensure that the subject is taught by faculty who are both motivated and competent.

It should be noted, however, that a number of authors have suggested ways in which professional ethics can be integrated across the software engineering curriculum. For example, Martin and Holtz (1992) propose a scheme in which first year undergraduate students study a module on computers and society, with a strong emphasis on ethical issues. This is followed in subsequent years by a series of case studies that are presented in core computer science modules, and by a social and ethical impact study which forms part of the final-year dissertation project. Hence, Martin and Holtz's scheme represents a compromise between the 'concentrated' and 'distributed' approaches to the teaching of ethics discussed above. Other authors have suggested ways in which ethical issues can be incorporated in the study of technical topics. Gotterbarn (1997) has shown that carefully-chosen computer programming problems can also be used to illustrate the ethical implications of technical decisions. Similarly, McLean (1993) argues that an analysis of social and ethical issues should be taught as an integral component of software analysis and design methodologies (see also Rogerson, 1997a).

Another consideration is the timing of a course on professional ethics; should ethics be introduced at the beginning or the end of a professional education? There are arguments for both approaches. Introducing ethics early in the curriculum allows students to be alerted to issues that might arise in later modules. Alternatively, at the end of a course students have a good appreciation of the profession (albeit mainly in terms of technical skills), and may be in a better position to understand the significance of professional ethics. Both approaches also have their critics; for example, McLean (1993) claims that final-year courses in ethics may disorient students, by asking them to reconsider everything that they have been taught from a new, ethical perspective.

Assessing a course on professional ethics

Courses in professional ethics present a number of challenges for assessment. Individual values are variable, and hence the interpretation of moral dilemmas is largely subjective; there is no single 'right' answer. What, then, constitutes good or competent work in ethics? This problem seems particularly daunting from the perspective of science and engineering teachers, who are used to quantitative assessment of work that can more easily be labelled as 'right' or 'wrong'.

However, there is no reason to believe that standards of logic and argumentation are different in the field of ethics than in any other discipline. Arguments in the field of computer science are often made in the language of mathematics, but arguments phrased in the language of values can be evaluated in much the same way. Acceptable reasoning in ethics should be logically coherent and factually adequate. Students

should also be required to demonstrate their ability to identify ethical issues (as distinct from purely social or legal issues), to show an understanding of ethical theory, and to show how this theory can be applied in practice. In short, the final solution to an exercise in ethical reasoning is perhaps less important than the process by which it is derived.

Callahan and Bok (1980) suggest that the most appropriate way of evaluating progress in ethical reasoning is to observe tutorial discussions and to read examples of the student's written work. The latter can be obtained through formal examination, although writing that is generated away from the pressures of the examination hall is likely to be more considered. Indeed, formal examination does not appear to be a desirable means of evaluating a course on ethics; perhaps its only value is as a means of motivating students (see Bligh, 1990, for a general discussion of the motivational role of formal assessment). We have already noted that students (and faculty) tend to perceive courses in professional ethics as 'soft'; the absence of formal examination would surely reinforce this prejudice.

The institutional context

The teaching of professional ethics is profoundly influenced by the institutional setting of the course; the values and internal politics of the university determine whether, how and when such a course is taught. For example, we have already noted that modularisation of degree programmes may restrict the manner in which professional ethics can be taught.

At the start of this chapter, we suggested that an important goal in the teaching of professional ethics is to demonstrate to students that technology is not value free. Unfortunately, many faculty need to be convinced of the same thing. Courses in professional ethics are regarded by many staff in science and engineering departments as time wasted on vacuous philosophical discussion, which would be better spent on the rigorous study of technical topics. Worse still, many faculty consider courses on professional ethics to be 'easy', and may even perceive them as contributing to the lowering of academic standards (Callahan and Bok, 1980). Given this attitude amongst faculty, it is not surprising that students also perceive such courses to be a 'soft option'. Further, many faculty in science and engineering departments consider that since ethics is not a 'technical' subject it can be taught by anyone regardless of experience; a colleague once memorably described my module on professional ethics as 'the kind of course that new lecturers cut their teeth on'.

In short, many scientists and engineers consider their disciplines to have transcended philosophical issues of morality, and regard courses on ethics as simply resurrecting irrelevant questions. Consequently, ethics is often perceived as something which should only be taught by philosophers and theologians (indeed, in many universities it is taught only by such academics). A similar attitude has arisen in other disciplines. For example, medical ethics has come to be seen as an issue separate from the technical and scientific considerations of medicine, largely because of the change

in hospitals from charitable institutions to businesses that compete for health care funding (Loewy, 1986). The perception of courses on professional ethics may also differ between the old and new university sectors. At a recent national workshop on teaching ethics in the computer science curriculum, approximately 90% of the attendees were from the former polytechnics (invitations to the meeting were sent to every computer science department in the country). Similarly, national conferences on computer ethics tend to attract more participants from the new universities (Rogerson, 1997b). Such differences are clearly influenced by many factors, but may be accounted for in part by a greater emphasis on vocational and management skills in the new universities, in which ethical and social issues are seen to play an important role.

The institutional setting may also influence the teaching of professional ethics on a practical level. Science and engineering departments are generally biased towards a 'traditional' teaching style, in which formal presentations are delivered in layered lecture theatres. As a result, there is often a shortage of seminar rooms that can be used for activities that are well suited to ethics teaching, such as role play. For example, the Department of Computer Science at Sheffield is situated in the engineering block of the university, in which there are no seminar rooms capable of accommodating more than twenty people.

Finally, we note that universities provide a moral context for teaching, learning and research; they are places where values are communicated, evaluated, modified and transgressed. At a time when there are great changes in higher education, teachers and students are often faced with moral conflicts. Ethical issues that arise in the life of university staff and students can be a valuable resource for ethics teaching. We return to this powerful idea in the next chapter.

Existing courses in professional ethics for software engineers

A number of courses in professional ethics for software engineers have been described in the literature. Many of these emphasize the use of case studies, which might be real-life examples (Chaney and Simon, 1994), or fictional writing that is intended to illustrate a particular aspect of ethical conflict (Kallman and Grillo, 1993; Gotterbarn, 1997). Morrison and Forester (1990) identify advantages of both kind of case study: real life examples demonstrate that the course material is grounded in fact (and is therefore of practical importance), whereas contrived scenarios can do more to express the depth and complexity of ethical dilemmas. Miller (1988) summarises the case study approach, and the motivation for it, as follows:

> *The idea is straightforward: the professor distributes or presents material concerning the use of computers (relevant to the particular course being studied) and then students and the professor discuss questions about the material. Cases can be fictionalised scenarios, news items, book excerpts, interviews, and the like. Ideally, the professor should encourage students to question assumptions and to*

> *identify the values at stake in the case. The case studies show that technical computer science concepts are intertwined with questions society must ask and answer when people use computers.*
>
> *(Miller, 1988, page 39)*

Case studies may be presented in an individual course on professional ethics, or may be integrated into technical courses at many points in the curriculum. The latter approach is favoured my Martin and Holtz (1992):

> *By repeatedly being confronted with case studies in courses throughout their [degree programme], students (and professors) will come to realise that concern about social and ethical issues is an important underlying context in their computer science education.*
>
> *(Martin and Holtz, 1992, page 141)*

Group discussion is another commonly used approach for teaching professional ethics. For example, Wong (1995) suggests that student groups should discuss a particular topic (such as privacy, employee monitoring, responsibility for software errors and so on), and then report a summary of their discussion to the whole class (see also Martin and Holtz, 1992). Similar techniques have been reported as being effective in other fields of ethics teaching, such as medical ethics (Loewy, 1986). In contrast, Penn (1990) argues that skills in moral reasoning are better developed when group discussions are used in conjunction with formal teaching of logic, moral philosophy and theories of moral development. Certainly, there is a danger that unstructured group discussion will expose students to a diverse range of ethical viewpoints without explicitly teaching moral reasoning. However, there are many ways in which group discussion can be organised to meet specific teaching objectives (for example, see Jacques, 1989; Abercrombie, 1993b).

Recently, an initiative has been established to define the core content and pedagogical objectives for integrating professional issues into the computer science curriculum (Huff and Martin, 1995). This so-called 'ImpactCS' project is modelled on the ACM Computing Curricula Report of 1991 (Turner, 1991), and has developed a conceptual framework for curriculum design in which social, ethical and technical issues are considered as different, but interacting, dimensions. Within each dimension there are several categories of analysis; for example, the social dimension involves the consideration of individuals, organisations and nations, whereas the ethical dimension considers individual and professional responsibility, together with ethical issues such as the use of power, honesty and deception, privacy and so on. A particular technical issue will impact upon many levels of social analysis and several different ethical issues, all of which must be considered. Hence, the authors contend that social, ethical and technical issues in the computer science curriculum must be considered in an integrated manner. Of course, many factors complicate the implementation of such a curriculum. For example, modularisation may limit the degree of integration that is

possible, and individual teachers may lack the skills needed to effectively address every dimension of analysis.

The 'ImpactCS' project has also identified a number of ethical principles and skills to which students should be exposed. These are designed to be particularly relevant to software engineers in relation to their professional work, but are also sufficiently general to be of wider use. Ethical principles include 'ethical claims must be defended with reasons' and 'ethical choices cannot be avoided', and ethical skills include 'identifying ethical principles and stakeholders', 'applying ethical codes' and 'arguing from example, analogy and counter-example'. The authors do not make any specific recommendations regarding teaching techniques, although they encourage both the integration of ethical issues in technical laboratory and tutorial work, and the inclusion of courses in the curriculum that deal specifically with professional ethics.

Summary and discussion

In this chapter, we have considered the goals of a course on professional ethics, and have discussed a number of important issues that influence the manner in which the subject is taught and assessed. A number of existing courses on professional ethics for software engineers have also been considered. We are now in a position to identify some of the deficiencies in current approaches to professional ethics teaching, and to propose solutions to these problems.

Effective teaching of professional ethics demands a different approach to the formal lecture presentations which so dominate teaching in the disciplines of science and engineering. This issue is now widely appreciated, and the courses described above go some way towards exploiting appropriate teaching techniques such as small group discussion. However, most existing courses on professional ethics are based on the analysis of case studies, which are treated in much the same way as problem-solving exercises in the study of technical subjects. Hence, students may see work in professional ethics as being no more than an abstract intellectual exercise.

In short, we believe that what is missing from the teaching of professional ethics is the *experiential element*. Like all philosophical enquiry, ethical enquiry in the context of professional practice can only be fully appreciated by personal involvement (see also Lyotard, 1992). Moral dilemmas encountered through the analysis of case studies do not engage the student in the same way as a real moral dilemma; they do not convey its subjectivity, nor its complexity.

Our thesis is greatly influenced by the work of Collier (1984; 1988; 1993), who has argued forcefully for the importance of an 'experiential element' in the learning of moral judgement. Collier makes an important connection between depth of understanding and depth of emotional experience. Strong and sustained feelings for a close relative convey a much greater understanding of that person than one feels for a casual acquaintance; for the same reason, students should have more than a superficial engagement with ethical issues:

> *There would appear to be an urgent need ... for education systems to include programmes which prepare students for recognising, and learning to think critically about, subjective perceptions and value questions. To develop such insight, in a form which influences one's active professional judgement, the usual lecture courses are inadequate; the learning must have an experiential element and indeed 'existential' basis; it must be 'felt in the bones'. The existential dimension required in the exploration and analysis of value issues will only be secured if students become personally involved in the study of the motivation and morality of human situations.*
>
> *(Collier, 1993, page 287)*

In summary, Collier argues that it is necessary to teach ethics in a context which evokes a felt personal response from the student, and that without such an experiential element, a course in ethics will have no lasting influence on professional practice. How should such an experiential element be achieved?

Collier (1993) suggests that personal involvement can be stimulated by group work in which students debate ethical issues, perhaps in response to fictional writing or film. However, we have already identified a deficiency in the group discussion approach: it may expose students to many different moral viewpoints without explicitly teaching ethical reasoning. In addition, even small group discussions may suffer from uneven participation, due to student-teacher power relationships and other aspects of group dynamics (Barger-Lux, 1984; Rowland, 1991). These problems can be overcome, but to do so requires careful structuring of group work and considerable experience on the part of the teacher.

Alternatively, we propose that the 'experiential element' can be achieved through students reflecting upon their own practice as university students. Practice as a student is training for practice as a member of a profession. In both contexts, an individual has responsibilities that may be placed in conflict; to teachers, sponsors and other students; or to clients, employers and the profession. Moreover, university life is a source of real ethical dilemmas that provide a rich resource for ethics teaching. Of course, simply existing in the university environment and facing day-to-day ethical problems is not sufficient; it is widely recognised that in order to make effective use of first-hand experience it is necessary to reflect upon it (e.g. Kolb, 1984; Boud *et al.*, 1985).

The grounding of professional ethics teaching in the reflection of personal experience raises many questions. Is it reasonable to expect students to reveal personal experiences that they may consider 'private'? Do students have the skills necessary to describe what may be subtle personal experiences, either verbally or in writing? Will students present a true record of their experiences and feelings, or will their responses be directed towards the perceived values of the teacher? In the following chapter, we describe the methodological foundation for a study which attempts to investigate these difficult and important issues.

CHAPTER THREE

Methodology

We have identified a dimension that is missing from many existing courses on professional ethics; the *experiential element*. Here, a new course in professional ethics for software engineers is described, which attempts to enhance the experiential dimension of learning by encouraging students to reflect upon their own practice as students. In order to assess the effectiveness of this approach, a study was undertaken as part of an ongoing process of action-research. In the remainder of this chapter, we explain the working hypotheses for our study and the methodological tools which were used to evaluate them.

A course on professional ethics for software engineers

A course was developed which broadly covered three subject areas; aspects of law relevant to software engineering, social implications of technology and professional ethics. Only the latter is considered in detail here; the precise nature of the remaining parts of the syllabus are less relevant to our current study. The course content and mechanism of assessment are considered below, and the structure of the course is summarised in appendix A.

Course content

The topic of professional ethics was introduced in two ways. First, students were exposed to lecture material on moral philosophy. This discussed two accounts of the origin of moral judgement (naturalism and rationalism) and three theories of moral standards; utilitarianism, intuitionism and Kantian ethics. It was stressed that although moral philosophy is not a problem-solving tool in any simple sense, it can expose beliefs that are internally inconsistent, or which rest on a factual assumption that is false. The practical application of moral philosophy was demonstrated by considering a case study, which students were encouraged to view from the perspective of each of the three moral philosophical schools. By adopting this approach, we hoped to illustrate the insights that different schools of philosophical thought can bring to a scenario, and to emphasize that the solution to an ethical dilemma is subjective rather than absolute.

Secondly, students were introduced to the notion of professional codes of conduct. Two such codes were presented (the ACM Code of Ethics and Professional Conduct and the BCS Code of Conduct), and their motivation and role in professional practice were debated. Again, a case study was considered which demonstrated the utility of ethical codes in professional decision making.

The portfolio assessment

As noted above, we aimed to enhance the experiential dimension in the study of professional ethics. Consequently, a portfolio assessment was devised which consisted of three components; written responses to case studies, a personal diary and a critical evaluation of the portfolio's contents.

Portfolio assessments are commonly used in the humanities, but are somewhat new to science and engineering teaching (Collins, 1992). A portfolio is a container of collected evidence with a purpose; in the current context, the purpose was to provide evidence of knowledge and skill in professional ethics, integrated from personal reflection and written responses to case studies. Students were told that evidence in the portfolio could consist of writing, or of newspaper clippings or journal articles that were relevant to the theme of the portfolio.

The first component of the portfolio was a sequence of written responses to case studies. These scenarios were distributed at approximately weekly intervals, so that they closely corresponded with the lecture topic in that week (see appendix A). Students were asked to complete each case study during the week in which it was distributed, so that their capacity for ethical reasoning could be considered over time. Each case study was a short piece of fictional writing (approximately 500 words) devised to illustrate a particular aspect of professional ethics. As such, the case studies usually described a moral dilemma facing a professional software engineer or software project manager. For example, in the week in which software copyright laws were discussed, the scenario related to a company employee facing a conflict between his own best interests, and those of a third-world economy and a commercial software house (see appendix B). Other scenarios related to issues such as privacy, conflicts between client and employer, honesty and avoidance of harm. The scenarios were adapted from the text by Kallman and Grillo (1993).

After the first three case studies had been completed, they were submitted by the students for review. This provided an opportunity for feedback, and ensured that the case studies were being completed in chronological order. Furthermore, these scenarios were completed before the students were exposed to the lecture material on professional ethics (moral philosophy and professional codes of conduct). Hence, students employed their own intuition to analyse the first three case studies, whereas the second batch of case studies were approached from a philosophical perspective, and by applying professional codes of conduct.

Case studies were included in the portfolio assessment for three reasons. First, they emphasised the connection between concepts in the lecture material (such as copyright

law, liability, computerisation of the workplace) and the implications of these issues for professional practice. Secondly, by evoking an emotional response to a fictional ethical dilemma, the case studies might contribute to the 'experiential element' of the portfolio assessment. Finally, case studies are widely used in professional ethics teaching (e.g., Morrison and Forester, 1990; Martin and Holtz, 1992; Gotterbarn, 1997). It was therefore instructive to consider the effectiveness of this 'standard' technique with the second component of the portfolio; a personal diary.

The personal diary was conceived as a means by which students could reflect on their own practice. Whereas case studies concern the fortunes of fictional characters, a diary communicates personally experienced emotions. We hoped, therefore, that reflection on ethical dilemmas arising in student life might provide a strong experiential dimension to the portfolio. Students were asked to write about specific incidents in their lives as software engineering students, which occurred during the semester and raised ethical questions. Additionally, it was suggested that the diary might contain reflections upon material in other modules that raised ethical issues, or upon newspaper articles or television programmes that raised ethical issues and were related to information technology. A preference was stated for diary entries that were related in some way to computer science or software engineering, but this was not a hard restriction. Given that the diaries might contain 'private' reflections, students were given an assurance that the confidentiality of their writing would be respected:

> *It is accepted that your portfolio may contain writing that is personal and perhaps private; hence, it will be treated in confidence and will be read only by myself during marking. For the same reason, your work will not be returned to the pigeon holes when it is marked; you may collect it from the computer science office.*
>
> *(Extract from student assignment hand-out)*

We considered it essential that the diary should represent a record of (possibly changing) attitudes over time. Consequently, students were asked to keep diary entries at regular intervals (preferably weekly), and to ensure that each diary entry was dated.

The third component of the portfolio assessment was a critical evaluation of its contents. Collins (1992) suggests that such an evaluation is a crucially important aspect of portfolio assessment; similarly, we would argue that reflecting upon the contents of a portfolio is a necessary step in learning from it. To be specific, students were asked to indicate whether they thought that the course had improved their capacity to reason about ethical issues, using evidence from the portfolio to support their answer. Students were also asked to discuss whether they found it easier to analyse the case studies after covering the lecture material on moral philosophy and professional codes of conduct, again using evidence from the portfolio to justify their answer. General discussion of the portfolio assessment was also required; students were asked to indicate what they thought they had learned from completing the assessment, and whether they considered the assessment to be a worthwhile exercise.

Comparison with similar approaches

The diary element of the portfolio assessment described above is quite novel, at least within the field of professional ethics teaching for software engineers. To the best of our knowledge, only Martin and Holtz (1992) have described a similar approach. In their framework for ethics teaching, software engineering students are required to keep a diary of ethical dilemmas that arise during their final year project. This diary follows the same form as a case study report, in which students compare their actions to professional codes of conduct. The diary forms the basis of an impact statement, which describes the ethical and societal implications of the software product developed during the project.

Our approach differs from that of Martin and Holtz in a number of respects. First, it places less emphasis on professional codes of conduct; students were asked to reflect critically upon their own practice, but were not constrained to applying professional codes of conduct in order to do so. Secondly, our assessment emphasizes change over time; students were asked to complete diary entries at regular intervals, and to scrutinize these writings for evidence of changing attitudes. In contrast, the dynamics of the diary entries are largely ignored in Martin and Holtz's approach.

A similar idea to our portfolio assessment has been applied in ethics teaching for health care students (Barger-Lux, 1984). In this study, diary entries were used to support reflection upon reading assignments and accompanying 'reaction questions': students were also encouraged to record issues arising from their own clinical experiences. Barger-Lux indicates that this approach was chosen because of its perceived advantages over group discussion:

> *Readings and reaction questions support the intellectual activity of philosophical reflection by students in an unhurried, private, low-threat atmosphere ... To respond to the reaction questions, students ... think through the issues and present their points and conclusions ... in their own words. Such an approach differs in important ways from the relatively hurried pace and typically uneven participation of discussion sessions.*
>
> *(Barger-Lux, 1984, page 919)*

Diaries have also been employed by Durgahee (1997) in the teaching of nursing ethics. Here, the diary was used by students to record important incidents in their nursing practice that impacted upon their personal and professional reactions, thoughts or feelings. Students were encouraged to share their diary entries in group story-telling sessions, but could elect to keep parts of the diary private. Durgahee's motivation for the diary is the same as our own; to enhance the experiential dimension in ethics teaching:

In order to learn from situations, students need to experience or observe them. If the situations are to be dissected and analysed, they should be recorded adequately in a reflective diary or an appropriate journal to capture the experience.

(Durgahee, 1997, page 136)

Recently, Beveridge (1997) has described the use of reflective diaries in mathematics teaching. At the end of each lecture, students are asked to write about the thoughts that are uppermost in their minds. On completion of the course, these notes are reviewed and a set of summary reflections are prepared, which look for changes over time. In this respect – capturing the dynamics of learning – Beveridge's motivation for the diary is similar to our own. Additionally, he suggests that reflective diaries enhance learning by enabling students to notice and *feel* their successes; again, this is close to the idea of the experiential element ('feeling it in your bones') which motivates our current study.

Research issues

The portfolio assessment described above suggests a number of research issues, which we believe have important implications for the teaching and assessment of professional ethics and, indeed, teaching practice in general. Our working hypothesis is that *the diary element of the portfolio assessment will enhance the experiential element of the professional ethics course*. More specifically, we propose that the diary will evoke more of a 'felt' response than case studies, and that this will enhance the student's learning experience. A related hypothesis, then, is that *the diary has advantages over traditional case study approaches to ethics teaching*.

Clearly, the diary will only enhance the experiential element of the professional ethics course if students use it to record and debate their 'true feelings'. By this, we mean that their writing should be a genuine expression of their beliefs, desires and deliberations. However, such a true record may be compromised by factors such as indoctrination and student concerns regarding privacy. The role of these factors in our course, if any, is therefore an important research issue. The portfolio assessment also raises other questions. In particular, we should ask whether the portfolio was an effective means of assessing competence in professional ethics, and whether this was compatible with students' notions of a 'fair' assessment. Also, since students are being asked to reveal personal and perhaps private thoughts, the portfolio raises the issue of trust.

Another research issue concerns the relative usefulness of moral philosophy and professional codes of conduct in the solution of ethical dilemmas. This is more than just a comparison of two 'problem solving' techniques, however; it entails questions of values and value priorities that have implications far beyond the software engineering profession.

The action-research methodology

The issues raised above were investigated as part of an ongoing process of action-research. Briefly, the term 'action-research' refers to a process of critical enquiry which brings about increased understanding and improvement in a practice, environment or system (for example, see Winter, 1989; Bell, 1993; Cohen and Manion, 1994; Wellington, 1996). Perhaps the most widely accepted definition of action research is the one given by Carr and Kemmis (1986):

> *Action research is simply a form of self-reflective enquiry undertaken by participants in social situations in order to improve the rationality and justice of their own practices, their understanding of these practices, and the situations in which these practices are carried out.*
> *(Carr and Kemmis, 1986, page 162)*

Different accounts of the action-research methodology place varying emphasis on the processes that it involves; for example, Ashcroft and Foreman-Peck (1994) regard action-research as being 'evaluation-led', whereas Boud *et al*. (1985) place a greater emphasis upon the process of reflection. However, it is widely agreed that action-research is a cyclical process, which involves phases of planning, implementation, observation and evaluation, reflection, re-planning and so on. Hence, the study described here is just one cycle in the action-research process; our hypotheses have been informed by previous experiences of professional ethics teaching, and the results from this study will be carried forward to a subsequent cycle of action-research.

Winter (1989) proposes a number of principles for the conduct of action-research, one of which – *reflexive critique* – is of particular relevance to the study described here. Winter introduces the notion of 'reflexivity' in order to address an apparent paradox; teachers make many judgements in the course of their professional practice, but how can one analyse the process of making these judgements without simply imposing another set of judgements? Winter contends that all judgements are reflexive (self-referential), in that they reflect one's own assumptions, values and interpretations. However, the inevitable reflexivity of a judgement does not preclude the objective examination of its validity. Rather,

> *The recognition and analysis of the reflexivity of a statement (through the questioning process of a research stance) is a way of appraising it, of increasing its validity by showing more fully its foundation.*
> *(Winter, 1989, page 42)*

In other words, the recognition that statements are underpinned by reflexive judgements (rather than immutable 'facts') allows the statement to be analysed by considering other interpretations. By 'reflexive critique', then, Winter implies a process of investigation in which the validity of a claim can be assessed by examining

the experiences in which it is grounded. Intriguingly, then, the action-research study described here involves a close relationship between matter and methodology; we seek to investigate the experiential element of student learning in a course on professional ethics, but to do so requires an investigation of the experiences which underpin my judgements as a teacher.

Data collection

Data was gathered from several sources as a means of methodological triangulation (Bell, 1993; Cohen and Manion, 1994). More specifically, we collected data from questionnaires, interviews and documents that formed part of the student's portfolio assessments (diary entries, analyses of case studies and critical evaluations). Additionally, I recorded intriguing events and subjective impressions in my own research diary.

Powney and Watts (1987) distinguish between two types of questionnaire; 'open' (suitable for exploring an issue) and 'closed' (suitable for checking an interpretation or choosing between interpretations). Since the study was testing definite hypotheses, a 'closed' questionnaire was used which required responses to seven questions on a seven-point Likert scale (see appendix C). Additionally, the critical evaluation part of the portfolio assessment invited students for general comments on the form of the project and the usefulness of the ethics diary, and it was felt that this provided information which might otherwise have been obtained from an open questionnaire. The questionnaires were administered to a sample of 22 students after the completion of the professional ethics course, but before the grade for their portfolio assessment had been returned. The sample was chosen such that equal numbers of male/female and undergraduate/postgraduate students were included in the study. Additionally, some preference was given to students who played an active role in tutorial discussions during the professional ethics course, since it seemed likely that they would engage seriously with the issues raised in an interview (to use the terminology of Smith, 1972, they showed a high degree of 'task involvement'). Twenty students returned the questionnaires and were invited to attend a subsequent interview; the remaining two students were dropped from the study. No piloting of the questionnaire was carried out in the current study, because all questions except the last had been used in a similar study during the previous academic year. Participants in the previous study had not raised any concerns regarding the clarity of the instructions or ambiguities in the questions. In retrospect, however, it would have been preferable to pilot the questionnaire on the same student group to which it was administered; we return to this point in chapter 5.

The interviews were intended to allow participants to pursue their own thoughts and concerns about a number of topics, without feeling unduly constrained and with minimal prompting. Consequently, we adopted an 'informant interview' approach (Powney and Watts, 1987) which was based upon an interview plan and a set of possible prompts, but was otherwise quite loosely structured. The interview plan is

reproduced in appendix E. The main concern of the interviews was to investigate the hypotheses stated above, and to investigate and clarify comments that students had made in their portfolios. Interviewees were told that they were participating in a piece of educational research, which was evaluating the professional ethics course and might be used to improve the course in future years. Each of the 20 students was interviewed individually in the author's office; these interviews took place over a period of five weeks, commencing one week after the return of grades for the portfolio assessment.

Interviews were recorded onto audio tape and transcribed. They varied in duration between 25 minutes and 45 minutes, depending upon on the loquacity of the interviewee. Additionally, an interview plan was completed for each interviewee, in order to record the extent to which each prompt was required (see appendix E).

Each recording was transcribed within a few days of the interview. A drawback of this approach was that it could have biased later interviews, since I started to develop expectations of interviewee's responses to each question. However, we hoped that any such bias would be minimised by closely adhering to the interview plan; with few exceptions, questions were phrased exactly as shown in appendix E.

On the other hand, prompt transcription of the recordings allowed a critical evaluation of my interview technique before all the interviews were completed. Weaknesses in my technique were very much apparent in early interviews. One interviewee persistently talked at a tangent to the question he was asked, and I seemed incapable of directing him back to the intended line of enquiry. Another interviewee was very unresponsive, and I was reluctant to prompt him in case I strayed too far from the interview plan. Indeed, my close adherence to the plan probably placed too great a restriction on the evolution of the interviews. Listening to the recordings, it is clear that many interesting issues emerged at the end of a session, when interviewees were asked if they had anything else to add (appendix E, question 20). If the interviews had been less structured, and if I possessed greater skill as an interviewer, such situations could have been developed in a methodologically sound manner, and would have generated interesting and relevant data.

A final methodological issue concerns the relative weight of the evidence obtained from interviews, questionnaires and student portfolios. We have no reason to believe that any of these sources is less reliable than the others; by default, then, all these sources of evidence have been treated as equally valid.

Summary

In this chapter, a new course in professional ethics for software engineers has been described. A key element of the course is a portfolio assessment, which consists of a collection of diary entries, responses to case studies and a critical evaluation of the portfolio contents. We hypothesise that the diary will introduce an experiential element into the study of professional ethics, and will therefore demonstrate advantages over conventional teaching techniques based on case studies.

To evaluate these hypotheses, and to investigate a number of other issues

concerned with the teaching of professional ethics, we engaged in a process of action-research. Data was collected from the portfolio assessments, questionnaires, interviews and my own research diary. In the next chapter, an analysis of this data is presented and a common theme is identified which runs through issues in teaching, learning and assessment – the notion of *authenticity*.

CHAPTER FOUR

Authenticity in learning, teaching and assessment

In this chapter, we consider evidence from student portfolios, questionnaires and interviews in order to evaluate our working hypotheses. The discussion is structured by examining the notion of *authenticity* from a number of different perspectives. Initially, this became the focus of our approach because of concerns about the 'authenticity' of diary entries; in other words, whether students would write their diaries in a manner that genuinely reflected their values and value priorities. On further consideration, authenticity emerged as a much wider concern, which follows a common thread through many aspects of professional ethics teaching.

We first consider authenticity from the perspective of student learning. One of our hypotheses is that the diary element of the professional ethics course enhances the experiential aspect of learning. However, this will only be the case if students use the diary to reflect authentically upon their feelings and dilemmas. We therefore investigate factors that might compromise authenticity, such as issues of privacy and indoctrination. We also hypothesise that the diary has advantages over traditional case-study approaches to ethics teaching. Hence, the relative merits of the diary and case-study techniques are considered, with particular emphasis on their ability to introduce an experiential element into the learning experience.

Secondly, authenticity is investigated with respect to assessment. What is an authentic assessment, and how does this relate to the student's notion of a 'fair' assessment? We also consider difficulties in assessment that arise specifically in relation to ethics teaching.

The notion of authenticity is also investigated from the perspective of the teacher. Teaching ethics raises legitimate concerns about indoctrination, and in an effort to address these concerns a teacher may attempt a 'neutral' presentation of the course material. Is this an authentic action, or does it imply an undesirable division between role and person in teaching practice? We also briefly address a related issue in software engineering practice, which concerns the role of ethical codes of conduct and personal values in professional decision making.

In the remainder of this chapter, italicised quotes indicate extracts from interviews. Extracts from my research diary and from student portfolios are annotated as such.

Authenticity in learning

One of the key issues in this study is whether a greater experiential element can be introduced into a course on professional ethics. We consider two ways in which this might be achieved; a conventional approach based on analysis of fictional scenarios, and a new approach based on reflection through writing a personal diary. In this section, we consider whether the diary and the fictional scenarios really did enhance the experiential aspect of the course by acting as media for personal reflection, and investigate the student's perceptions of these two different learning approaches.

Perspectives on the diary

For most interviewees, keeping a diary was a novel experience; only two stated that they regularly kept a personal diary. However, most interviewees (15) regarded a diary in a manner that was consistent with its intended use in the professional ethics course; as a medium for recording and reflecting upon significant personal events.

> *Personal thoughts ... on the few occasions when I've written something like that, its for something amazing that happened and I want to clear up in my mind exactly what has happened. Its not so much the record, its the things that have emotional content, I try to write those down.*

> *Interesting stuff during the day ... that I'd like to think about, but time hasn't permitted ... certain events that happen during the day that I'd like to record.*

For two students, a diary was a much more mundane record of appointments and anniversaries, and another three students stated that they didn't know what they would write in a diary if they kept one:

> *I don't know, I've never really thought about it. That's probably why I don't keep one – I don't know what to put in it.*

> *Umm ... I don't really know, because I've never considered keeping a diary, so from that point of view I've never actually had to think about what it would contain.*

These responses are particularly intriguing given that the interviews took place *after* the diary for the professional ethics course had been completed; this may indicate that some students didn't fully understand the purpose of the diary assessment, or that they made a conceptual distinction between a personal diary and the diary kept for the ethics course. We return to this issue later.

Osborne and Martin (1989) have suggested that an exploration of student

experiences in an ethics course can be cathartic; it presents an opportunity for debating unresolved issues which might be causing the student some anxiety. We saw some evidence that the diary was being used in this way. For example, one student wrote several diary entries about his decision to leave a part-time job, expressing regret that he had let down his employer at a time when they were short-staffed. During interview, the student indicated that he had used the diary to reflect on this issue:

> *I had a lot of trouble with a job that I took and gave up again, so [the diary entries] were a lot to do with what was happening and what I was thinking ... things that happened in my first day, and my decision to stop working there because it was taking up all of my time.*

In a similar manner, a postgraduate student used a diary entry to reflect upon her decision not to inform an employer that had mistakenly overpaid her:

> *I don't think I'll ever spend the money. It's sat in the building society and I dread the day that I get a phone call from the company. Obviously they get audited, but I don't know how easy it would be to spot such a mistake. I would have to plead ignorance. The longer it gets the worse it looks. I suppose I will always have that feeling of guilt deep down.*
> *(Extract from student portfolio)*

Evidence from the student portfolios and interviews suggest that, as hoped, many students were using the diary to explore their own experiences as part of the process of studying professional ethics. This conclusion is also supported by the questionnaire results; 85% of students agreed with the statement 'the diary helped me to relate the course material to ethical dilemmas arising from my own experience as a computer science student'. It should be noted, however, that some students wrote mainly about current events rather than their own personal experience; we consider why this might have been the case below. Although it was our intention that students should write predominantly about their personal experiences, these diary entries were not necessarily a failure; in most cases, students were not simply describing current events, but had chosen events that they felt strongly about and were analysing why they felt strongly about them. Even in this way, then, students were exploring their own values and value priorities.

Perspectives on the scenarios

We now consider the extent to which the scenarios introduced an experiential element into the ethics course. Our first consideration was whether the scenarios were judged by interviewees to be 'realistic' (it seemed unlikely that the students would identify closely with the scenarios if this were not the case). The majority of interviewees (17) did agree that the scenarios were realistic; however, a minority (3) suggested that some

of the scenarios were a little exaggerated, or described events that were unlikely to 'get so out of hand'. The notion of 'realism' was not pursued in the interviews, although from the transcriptions it is clear that most interviewees equated the realism of a scenario with its plausibility:

> *They seemed to be things that you might read about in the news, or people saying 'this happened'.*

> *They were fairly topical and were things that could occur in the work place.*

Additionally, several interviewees noted that realism was a prerequisite for serious engagement with the scenario:

> *Yes, they were all believable ... this medical one certainly. If they were too far fetched you'd just get stupid answers.*

> *If I was going to place myself in their shoes [the characters] then obviously the scenarios would have to be realistic to some extent.*

Given the general acceptance of the scenarios as realistic, it was perhaps surprising to find that most interviewees (14) were unable to identify closely with the predicaments described in the scenarios. Many interviewees stated that they could not relate to the situations that the characters were in, and expressed a detachment between their own feelings and those of the scenario characters:

> *It was fairly detached, because from the scenario you've already given us a background of what that person is like ... and therefore you still have to answer it in the way that he would be like ... what you have to do is transpose yourself onto them, and use their reasoning rather than your own.*

These findings suggest that realism is a necessary element of a fictional scenario, but that realism alone may not be sufficient to engage readers in an investigation of their own values. In particular, the last quote raises doubts about the authenticity of the students' responses to the scenarios: their responses could have been an expression of the implied values of a fictional character, rather than an expression of their own values (in other words, the reader was thinking 'what should this character do next?' rather than 'what would I do next if I was in this character's position?'). Why might the authenticity of the answers to the scenarios be compromised in this way?

One possibility is that the dilemmas described in the scenarios took place in an unfamiliar context. The scenarios were adapted from a text by Kallman and Grillo (1993), which focuses on the ethical problems facing managers and company

decision-makers in the computer industry (it is usual for such books to adopt this perspective; see also Forester and Morrison, 1990). Several interviewees stated that they found it hard to identify with the dilemmas facing the characters, because they had little understanding of the commercial backdrop:

> *It was mostly business, wasn't it? I've not ever had any contact with business ... I'd try and put myself in their position, but I've never been in that situation myself.*

> *I didn't identify with them very closely ... a lot of them were industrial, and I haven't worked in industry yet.*

One significant exception to this trend was a mature student with experience in the management of a local council office:

> *I identified with the managers quite closely ... I've had reasonable managerial experience for four years, so I know what I consider is the manager's duty in a working relationship ... I appreciate that you have to set an example, its not just policy alone ... the one I felt strongly about was the one about hiring and sacking people, and the need to motivate people.*

Indeed, when asked which of the scenarios they identified with most closely, the majority of interviewees usually chose scenarios which they could relate to their own experience. Many of the students identified with a scenario concerning the unauthorised copying of software, which is reproduced in appendix B (it has already been noted that software piracy was a popular topic for diary entries). The following interviewee was typical, but again expressed reservations about relating to the issue in a commercial context:

> *There was one about copying the software ... I suppose we could identify with that because we've all done it ... its okay for us to do it now, but if we were in business we'd have to act differently, so it was difficult to identify that way.*

Another scenario which some interviewees identified with closely concerned the development of a virtual reality simulator for training military personnel. This scenario prompted one interviewee to reflect upon his recent application for employment in the defence industry; another interviewee had previously debated the issue with a friend:

> *The one where he was developing virtual reality for defence work, because that's like a job I've applied to ... it made me think about whether I should or not. I definitely identified with that one.*

> *I identified with the one about the defence machine, because one of my flatmates last year was offered a job in that area, he was going to do guidance systems for missiles, and we had a big conversation about whether he should take the job.*

Many interviewees also identified with a scenario concerning prejudice against an HIV-positive hospital patient, which was only peripherally related to computer science. This scenario raised an issue which appeared to be much more emotive to some interviewees than the scenarios based purely on computer science issues:

> *Some you could talk about ... like the hospital one, you could visualise what was happening and say 'OK, this is right and this is wrong'.*

> *I did connect with the army one and the last one with the nurse ... I guess it was the hypocrisy, like in the last one the immediate reaction was that the nurse was wrong, but I didn't think that she'd done anything wrong.*

Indeed, it would appear that many interviewees failed to identify with the case studies simply because they didn't concern emotive subjects. This failing in the scenarios was clearly identified by one interviewee, who was asked to suggest improvements that could be made to the course:

> *It might be interesting if some of the scenarios were changed ... using subjects where you're likely to have a strong opinion ... most of them you just bumble through and don't really connect much ... scenarios like abortion, people are more likely to have a strong opinion on that.*

This quote suggests that scenario-based teaching of professional ethics in the domain of computer science is hindered by an intriguing paradox; we argue that the teaching of professional ethics should contain a strong experiential element (students should 'feel it in their bones'), and yet scenarios based purely on computer science issues appear to evoke very little emotional response. Of course, the characteristics of the particular scenarios used in our study also have a bearing upon this finding. However, our conclusion is supported by a number of other studies, which have found that many abuses of computer software and data are not considered 'unethical' by undergraduate computer science students. For example, in a recent study at the City University of Hong Kong (Wong, 1995), most students thought there was nothing wrong with software piracy, or with the unauthorised use of personal data for commercial gain. Similar findings have been made in computer science departments and business schools in the USA (Forcht, 1991; Im and Van Epps, 1992; Leventhal *et al*., 1992). In one such study, more than half the students polled admitted involvement in activities such as software piracy and obtaining unauthorised access to private computer

systems, but did not perceive that they were doing anything wrong (Forcht, 1991). One of the interviewees in the current study, a second year undergraduate student, alluded to this attitude:

> *Nothing that happens with computers these days is really particularly unusual ... most of the ethical issues have more or less been cleared up some time ago, or at least have been debated to the point where I no longer bother to think about them too much ... computer scientists are such an amoral bunch that maybe [the moral philosophy] was needed to upset the balance. This does seem to be a subject in which morality is low down on the list of requirements ... it seems to be part of the culture, or maybe its just part of the mind set of people who enjoy computer programming.*

It may be significant that in this quote, the interviewee refers to 'computer scientists' generally and not to computer science *students* specifically. Indeed, many academics and computing professionals are implicated in computer misuse (particularly software piracy), and hence students receive ambiguous signals about computer ethics (Solomon and O'Brien, 1990; Slater, 1991). We shall return to this issue later. The 'mind set' that the interviewee alludes to has been comprehensively discussed in the literature, and is usually attributed to a tendency for computer abusers to rationalise their acts. For example, those who gain unauthorised access to computer systems claim that weaknesses in the nation's computer networks are being pointed out (Samuelson, 1989). Others claim that no real harm is done, or that harm is done only to an organisation (which can more easily be rationalised) and not to an individual (the so-called 'Robin Hood' syndrome; Hafner and Markoff, 1991; Harrington, 1996). The latter factor may be particularly important in explaining why the scenarios used in the current study failed to elicit a strong emotional response; of the six scenarios used, only two focused on the implications of an unethical act for an individual, rather than an organisation. Another factor may be a tendency to disregard the human element when debating ethical aspects of computer technology (Laudon, 1995). Common statements such as 'computers cause unemployment' imply that technology is an autonomous force and therefore deny a basic fact; all ethical issues arise through human agency.

It should be noted that Wong (1995) also found systematic differences between the attitudes of undergraduate and postgraduate computer science students to computer misuse; postgraduates generally considered that the unauthorised use of personal data was unethical, and were less certain that there was nothing wrong with software piracy. Although our study included both undergraduate and postgraduate students, no data was collected which specifically addresses this issue; it was not our aim to investigate attitudes to computer misuse *per se*.

A final explanation for the failure of students to identify with the scenarios was suggested by the following interviewee, who was asked how closely he related with

the scenario characters:

> *Not at all, mainly because they're fictional. If they were real characters I'd feel far more for them than people who've been completely made up and fictional ... they are just fictional characters, what happens to them doesn't particularly matter. If I'd known that they were real people and you were writing about something that actually happened, I'd have identified with them a great deal more.*

This quote suggests another interesting perspective on the issue of authenticity. We hoped that by presenting students with scenarios describing ethical dilemmas, they would reflect upon their own values when considering a solution to that dilemma. However, the interviewee suggests that scenarios that are presented purely as fiction are insufficient to stimulate serious personal reflection. In short, if we require an authentic response from the reader, the stimulus itself must be authentic.

In summary, we have identified three factors which prevented many students from identifying closely with the scenarios; lack of context, failure to address emotive issues, and presentation of scenarios as pieces of fiction rather than authentic accounts. As a result, many students reasoned about the scenarios in a detached manner, rather than through consideration of their own values.

It should be noted, however, that some interviewees did identify closely with the case studies. Interestingly, for one interviewee this was because of a characteristic of the scenarios that has already been addressed above: the lack of context. For this interviewee, the lack of context in the scenario descriptions presented a barrier to understanding the scenario characters, prompting him to adopt an approach based on personal reflection:

> *I think it was to a certain extent what I'd do ... weighing up the situation from my point of view ... it was the easiest way to do it, because you didn't really know enough about [the characters]. You got a brief introduction to who they were, what their job was, what their current dilemma was but ... it was easier to do it from how you would handle it if you were similarly placed.*

In summary, our findings generally suggest that the diary entries introduced a greater experiential element into the ethics course than the analysis of fictional scenarios; more specifically, when writing the diary entries, students were more likely to reason about their own values and value priorities. Inevitably, though, the responses of individual students to the diary and scenarios were subjective and considerably influenced by personal experience. One general finding was that students usually found the diary entries harder to write than the analyses of the fictional scenarios; evidence of this came both from the interviews, and from the critical evaluations written by the students as part of their portfolios:

I found it difficult to think about the ethical issues that might occur in the day. Before, I hadn't really analysed whether something was an ethical issue – if it was, I'd sort it out automatically without thinking about it. So having to stop and think about whether it was an ethical issue or just a decision that had to be made ... that was difficult for me.

I think that sometimes consistency of your ethical views is hard, in the sense that it's easier to say what a fictional character should do than what you would do if actually in his/her place.

<div align="right">

(Extract from student portfolio)

</div>

Undoubtedly, these comments reflect the fact that the fictional scenarios did not approach the complexity and depth of the real ethical dilemmas that students wrote about in their diaries. Real social situations consist of a complex mixture of factors, from which one must filter out the information relevant to the underlying ethical debate. In contrast, the fictional scenarios used here were quite condensed, so that information related to the ethical dilemmas was presented in a comparatively straightforward way (see also Morrison and Forester, 1990).

Authentic accounts and fictional accounts

So far, we have presented evidence that the diary entries were a successful mechanism for engaging students in a consideration of their own values and the priorities between them. However, this could only be the case if students wrote the diary entries authentically; that is, if their writing really did reflect their own values and value priorities. We now consider the notion of authenticity in this context, and in particular consider reasons why the authenticity of the diary entries might be compromised.

It has already been noted that for many students, the process of writing the diary was a difficult one. One possible reason for this was that students were generally unfamiliar with this form of course work, and perhaps didn't fully understand the motivation for the diary, or what it should contain. An indicator of this uncertainty was the extent to which the diary stimulated conversation within the student body:

[I discussed the diary with] people off the course, asking what they were writing about. What kind of format, and what kind of things people were discussing.

People kept asking what your ideas were, because a few weeks had gone by and they hadn't thought of anything, its like 'Oh, what've you found, what've you found'.

In some cases, then, the authenticity of the diary entries may have been compromised because students didn't understand its purpose as a mechanism for reflection. As a

result, some students submitted diaries that were rather superficial commentaries on news stories or other events, rather than subjective, personal writing. An entry in my research diary, made in the second week of the professional ethics course, also suggests that there was some uncertainty about the diary:

> *A lot of students have asked about the diary this week. The commonest problem seems to be that they simply don't know what to write about. Some seem to relish the opportunity to talk about their personal experience, others seem less sure - 'nothing has happened which raises an ethical issue'. One asked about the confidentiality of what he was writing, concerned that I would 'turn him in'. Another student joked that the main purpose of the diary was to provide me with something 'juicy' to read.*
>
> *(Extract from my research diary)*

This entry in my research diary also suggests student concerns about privacy. Although students were reassured of the confidentiality of their diary entries, many were still reluctant to write about their thoughts and feelings. Again, this has implications for the authenticity of their writing; students should not be expected to reveal what may be intimate personal experiences unless they have complete trust in the tutor and are certain of confidentiality. One student expressed his concerns about privacy particularly clearly, both in his first diary entry and during interview:

> *I think a diary is and should be something very private, which is not handed to somebody else .... So I have been thinking this over until this weekend, and I came to the conclusion that I will mainly describe ethical issues which have arisen while reading newspaper articles and perhaps some issues discussed in courses. I don't want to describe personal incidents, which happen to me in everyday life, as I won't write it down truthfully if I know that somebody will read it later.*
>
> *(Extract from student portfolio)*

> *I mainly wrote about events I read about in the newspaper ... I pointed out in my first diary entry, its not easy for me to write down personal issues ... I don't really want to give them away ... its too personal to me.*

Just over half of the interviewees (11) expressed similar concerns about privacy and, like the student quoted above, many of these opted to write predominantly about newspaper articles rather than their own personal experience. This response was a little surprising, given that many reassurances were given that the diaries would be treated in confidence, and that special arrangements were made for the return of the marked work to ensure that confidentiality was respected. In retrospect, however, more could have been done to foster an atmosphere of mutual trust. For example, students were

expected to reveal their diaries to me, but my own research diary was not revealed to them (indeed, they were not even aware that I was keeping a diary). Sharing my diary with the class might have helped to establish a more trusting relationship between us.

Interestingly, the issue of privacy was also raised in a second context; discussions between students about the contents of each other's diaries. Although we have already noted that the diary appeared to stimulate much debate in the student group, several interviewees commented upon the tendency of their peers to protect the 'ideas' in their diaries. For example:

> *At the start everyone was going around saying 'Oh, that must be an ethical dilemma' and then people suddenly denied having started their diaries or doing anything until it had all been done, kind of thing ... I think because they didn't want people to think 'Oh, that's a good idea, I'll write about it'. So, nobody really spoke about it until it had all been handed in.*

Apparently, some students declined to share the contents of their diaries with one another, but this was not because of fears that 'personal' writing would be revealed. On the contrary, the issue in this quote is one of competition between peers. It seems doubtful that students would behave in the same way had the diary not been assessed; in other words, the free exchange of ideas about a piece of course work was inhibited because the work was assessment-led. Vandome and his colleagues (quoted by Rowntree, 1977) have eloquently described this pernicious side-effect of assessment-led course work:

> *Students feel they will gain through the poor performance of others and suffer by imparting their own knowledge to fellow students. In this way, a potentially rich source of knowledge – communication of ideas among students – tends to be stifled. To the extent that is does take place, any exchange is biased by the way in which student's 'self-image' and his image of his fellows is affected by their grades.*
>
> *(Rowntree, 1977, page 56)*

Some interviewees stated that they were unable to write from personal experience because they were never faced with ethical issues, or because they considered the ethical issues that did arise to be insubstantial or irrelevant to the theme of the course (the extract from my research diary on page 33 also alludes to this problem):

> *That was one of the biggest problems ... analysing what would be appropriate to write about and what was just going to be complete garbage, space filling ... not that many events happened to me. What did happen was actually quite minor, and was a bit difficult to put down in the diary.*

*My day seems to just be get up, go to lectures, do some work at home,
see my mates and go to bed. Nothing of great ethical or moral standing
seems to happen to me.*

The guidelines given to students stated that they should write approximately half a
page for each of at least six diary entries, and that the diary should be related to their
lives as computer science students where possible. Some interviewees interpreted
these guidelines quite rigidly, and as a result may have dismissed ethical issues which
were worthy of thought:

*I suppose there could be lots of moral things that happen in ordinary
life ... but I don't whether I could have stretched some of them out to
half a page or so ... I don't know whether they were important enough
to put in. I was trying to think of things that were relevant.*

Of course, it is equally possible that ethical issues did arise during the semester, but
that students failed to identify them. The following interviewees indicated that this
could have been the case:

*I didn't think there was going to be [enough issues to write about] to start
with, and then you notice more as you think about it more, so it wasn't a
problem in the end ... you could see more and more things happening. But
to start with, I was thinking 'I'm never going to get six entries'.*

*There weren't as many moral things as I expected, or there were and I
missed them.*

Another reason why the authenticity of the diary entries may have been compromised
is because students found it hard to express in writing what may have been rather
complex and subtle experiences (see also Callahan and Bok, 1980). We expected this
problem to be particularly significant in the current study, since it is widely recognised
that students in the science and engineering disciplines often have poor written
communication skills. Several interviewees alluded to this problem:

*Its difficult to express your feelings in writing ... that partly why I don't
keep a diary now.*

*I was writing things down things that I felt, but maybe wasn't able to
express them as I wanted to ... in general, what I wrote was pretty true
but just occasionally it was hard to put into words.*

It was difficult putting feelings into words.

The notion of 'authenticity' was further investigated by asking interviewees whether they considered their diary entries to be a 'true record' of events that occurred in the semester. The majority of interviewees (13) agreed that this was the case. Interestingly, a higher number (17) responded positively to the questionnaire statement 'the diary was an accurate account of incidents occurring in my life during the semester', suggesting that some students made a distinction between a 'true' record and an 'accurate' one. This interpretation is further supported by the following quote from a second year student, who states that a detailed, accurate account of events may not necessarily be a 'true' one:

> *In the diary I went through some of the events in a lot more detail than I ever would do as a true representation, and in the case of a couple of events they got moved from about a month before the diary into the diary. But everything happened ... everything was a real event, and as far as I remember accurate.*

What, then, did interviewees understand by the term 'true record'? Investigation of this issue raised some interesting perspectives, which again have a bearing on the notion of an 'authentic' account. Two interviewees suggested that the diary was motivated or constrained by the requirements of the assessment:

> *I didn't recognise a lot of ethical situations which came along during the day. Unless you instantly recognise those and think about them later, I don't think [the diary] is a true representation of what happens, because you're forcing yourself to write about things that might not be ... you know ... ethical issues.*

> *I found I was making myself think things rather than what I really thought ... you know, I was thinking about the course so I thought 'Oh yes, I do think that' whereas in normal life I wouldn't have thought it naturally ... so it was my true feelings, but feelings that were found through thinking about the course.*

Recall that our notion of an 'authentic' account implies a subjective and personal piece of writing which reflects the values and value priorities of the author. For these interviewees the diary entries were not authentic because they were neither completely subjective nor completely personal; indeed, the interviewees suggest that they were written through an unnaturally intense process of self-analysis ('forcing yourself to write' or 'making myself think things').

For other interviewees, the diary entries were not a 'true record' precisely because they were written in the authentic manner that we hoped for; they were subjective accounts, whereas a 'true record' would have been a totally objective one:

[The diary entries] were a reflection rather than a record ... a reflection is an opinion of what happened, a record is a statement of what happened. A true record is to analyse events that happened to you, and to write them down as more of a true record of what actually happened ... its not an opinion, its a statement.

I wouldn't say its a true record unless it covers everything ... its just the truth from my point of view ... the truth, but not the whole truth.

Everyone's got their own representation, it may sound glib but its true ... I mean, what I think happened and what [name of friend] thought happened is often something totally different, and as far as we're concerned they're both the true record ... a true one would have to be something that's almost totally impartial. A tape recorded interview is a true representation.

Many interviewees associated a 'true record' with one that was factual, rather than fictional. The issue of a fictional account was investigated further in the interviews, because it was anticipated that students might write fictional diary entries for a number of reasons (concerns over privacy, a lack of personal events to discuss, or perhaps a tendency to elaborate). This line of investigation was suggested by a diary entry submitted by a student in the year before the current study, which explicitly raised the issue of fictional writing (note that this diary entry also parodies the last line of the case study reproduced in appendix B):

Diary entry: Monday 27th March. The issue: truth, honesty and deceit.

A computer science student was asked by her lecturer to submit some material outlining incidents which had raised ethical issues during the semester. She looked at the portfolio of her work as the hand-in date loomed closer. It was pathetically thin.

Fear gripped her heart as she began to wonder if this assignment would be less than perfect. Surely she could fabricate a few entries and make up a few events? As long as they sounded realistic then the lecturer would never know. The student thought and she thought some more. She didn't know what to do.

(Extract from student portfolio)

Additionally, comments made by students during the current study suggested that the writing of fictional diary entries was a possibility, as recorded in this extract from my research diary (the rationale for my reply is articulated below):

As I was handing out the scenario for this week, a student at the back of the lecture theatre asked 'you know these diary entries ... can we make

them up?'. I replied that I would expect him to write from personal
experience. Other students in the row joked that they would now have to
do unethical things in order to have something to write about.

(Extract from my research diary)

In fact, we found no evidence that the writing of fictional accounts was widespread; only 10% of students responded negatively to the questionnaire statement 'the diary was an accurate account of incidents occurring in my life during the autumn semester'. Additionally, the interviews indicated that most students who responded negatively to this statement did so because they wrote mostly about news stories or because they moved events in time, not because they wrote fictional accounts. Indeed, one interviewee stated in quite strong terms that his diary was factual:

[A true record is] a true report of what actually happened, not fictitious
if that's what you're driving at ... and I haven't elaborated either,
although I suppose you could. You could take a little story and build it
up into something more substantial, but I didn't need to do that, I wrote
about things as they happened.

For another participant, the questionnaire statement regarding the 'accuracy' of the diary was tantamount to an accusation of cheating:

One of the students came in to complete a questionnaire, sat down in
my office and started filling it in. When he reached the question about
the diary entries being a true record, he gasped and said 'what are you
trying to do here, make us admit that we've cheated?' I tried to
reassure him, telling him that he should answer truthfully, and that his
answer wouldn't affect the mark for his work.

(Extract from my research diary)

The interview transcriptions suggest that this was an emotive issue for students, who often associated the term 'fiction' with deceit and fabrication. Several students indicated that they probably could have written fictional entries in their diaries, but that it would have felt dishonest:

It would have defied our objectivity, because it was supposed to be a
diary about ethical dilemmas, and to make something up would have
been unethical.

It wouldn't have made much difference, but I wouldn't have felt happy
doing it ... I'd rather do it truthfully ... whoever marked it wouldn't
know if it had happened or not ... but I wouldn't feel comfortable, I'd

just like to put what really happened down, otherwise its not a true diary, just a piece of fiction.

In the second of these quotes, the interviewee suggests that writing fictional diary entries 'wouldn't have made much difference'. Is this really the case? More specifically, we should ask whether the fictional basis of a diary entry invalidates its authenticity; in other words, does writing an account of a fictional dilemma still engage the author in a consideration of his own values and value priorities? On first consideration, we might assume that writing a fictional diary entry is no better than analysing a fictional scenario of the kind discussed above. However, there is a difference. All fiction is autobiographical in some sense: the author identifies with the characters that he creates in some way, even though he may not be totally identified with any one of them. Hence, even writing fictional diary entries may encourage students to reflect upon their own values and the priorities between them. Indeed, Rowland and Winter have suggested that fictional writing provides a powerful mechanism for enquiry into professional practice (Winter, 1989; Rowland *et al*., 1990; Winter, 1991; Rowland, 1991).

That said, it seems likely that the emotional response to a hypothetical dilemma that is conceived by oneself is likely to be less intense than the reaction to an unanticipated real-life situation. Several interviewees expressed similar concerns when asked about the implications of writing fictional diary entries:

I guess it would have been different, because I wouldn't have thought so deeply about the issues involved ... writing the diary made you think about what was behind all the decisions and what provokes them.

It wouldn't have the same kind of emotional content really, would it? If something's actually happened to you, you'd have a far more personal opinion of it than if you'd made up an event ... it wouldn't be a personal event, it would be another scenario.

In summary, we have identified a number of factors which may have compromised the authenticity of student's diary entries; some students did not fully understand the diary as a mechanism for personal reflection, while others had concerns regarding the privacy of their diaries. Many students found it difficult to express complex thoughts and feelings in words. Additionally, some interviewees suggested that the diary engaged them in an unnaturally intense process of self-analysis which went beyond personal reflection; they were 'forcing themselves to think things'.

Authenticity in teaching

We now consider the issue of authenticity from a second perspective; the actions of the teacher. In particular, we focus on issues relating to indoctrination and the way in

which values pervade the relationship between students and teachers.

Indoctrination and 'value neutral' teaching

In chapter 2, we noted that indoctrination is a particular concern in the teaching of courses on professional ethics. Certainly, it was not our aim to espouse a certain set of values or a particular concept of professionalism, nor was it to encourage students to adopt such values or concepts. Rather, the emphasis of the course was on critical enquiry and self-awareness; traditional values were analysed without attempting to subvert them (the purpose of ethical inquiry is, after all, to ensure that such values are not accepted uncritically). We should note, however, that 'indoctrination' may occur even when the tutor has no conscious intention to do so; teachers speak from a position of authority on technical issues, and hence students may also gain the impression that the teacher's views on ethical issues are the 'right' ones. Consequently, it was decided that the issue of indoctrination should be investigated in the interviews.

Concerns about indoctrination were raised only by a small number of interview transcriptions; for example, the interviewee quoted on page 36 refers to ideas in his diary that he 'wouldn't have thought naturally', although in the context of the whole quote it is not clear that indoctrination is really the issue here. Indeed, we found little evidence in the interview transcriptions to suggest that indoctrination should be a concern. On the contrary, several students commented that the lecture material was presented in a rather 'neutral' way:

> *I didn't notice very many of your own opinions ... I didn't realise until now that there weren't.*

> *I thought that the way [the scenarios] were written was very clever, in that you couldn't really find out what your opinion was ... I suppose in one way that was why they were sometimes quite hard, because you might see a question where you think 'it's obvious what he wants me to write here' but you couldn't really see that at all.*

Reassuringly, many interviewees stated that the course had improved their awareness of ethical issues or their capacity for ethical decision making, but disagreed that it had made them 'more ethical'. For example:

> *When I was doing the diary and scenarios it wasn't being a more ethical person, it was being able to write down what I thought, not just a gut feeling that 'I think it should be this' but not knowing why. I was able to express myself more concisely and more meaningfully.*

> *I don't think it's made me a more ethical person, but I think it's taught me that I should think about what I believe, and be able to defend it and express it.*

Similarly, most interviewees (14) indicated that they did not think that it was the aim of the course to make them more ethical:

> *The aim of the course, I thought, was to get people to think a bit, before they did anything, or where others were going to be affected by their actions ... I don't know if the aim was to make people more ethical, it was just to make them think about things a bit more.*

> *In a sense ... to help us make our judgements better, but I don't think it's forcing us to think one way or the other, it's just giving us tools to think about things.*

> *I wouldn't have thought so ... that would be assuming that the students weren't that ethical to start with, and that you are the right person to teach them how to be more ethical.*

In the last of these quotes, the interviewee suggests that when teaching a course on professional ethics, it would be inappropriate for the tutor to adopt a position of moral superiority. What stance, then, should a tutor adopt when teaching such a course? A related issue is raised by the quotes on page 40, which imply that a course on professional ethics can be taught in a 'value neutral' manner. Is it really possible to conceal one's values when teaching professional ethics (or, indeed, any subject), and if so, is it desirable to do so?

A conflict between role and person in teaching

We have noted that indoctrination is an important and difficult issue in the teaching of professional ethics (not least because students may interpret the teacher's opinion as the 'right' one even when there is no *intention* to indoctrinate). So, should a teacher try to present an impression of neutrality? (clearly, some interviewees thought that this was the case in my ethics course). Surely, such an approach would not be authentic. Actions in teaching are only legitimate if they genuinely reflect one's own values; one cannot defend decisions and opinions if they are not genuine. We would prefer, therefore, that teachers state their ethical position and allow students to query it. However, should this mean that any opinion is acceptable? For example, if a teacher of a course in professional ethics genuinely believes that an illegal act is morally acceptable, should he express this opinion? Such an action might be regarded as incompatible with the role of a professional educator, yet to say otherwise would not be authentic.

In short, our findings suggest a conflict between professional roles and personal values in teaching. This conflict arose several times during the professional ethics course. On one occasion I was confronted with the issue during a tutorial discussion; the corresponding entry in my research diary suggests that this was a rather uncomfortable experience:

> *During the tutorial today, one of the MSc students brought up the subject of software theft. He told me that he had considered copying Microsoft Word from a friend, until he heard that it was possible to buy it at a discounted price through the University. He also said that the lecture material we had covered on copyright law had made him think twice, although I suspect whether he was just telling me this because he thought it was what I wanted to hear. At the end of our conversation, he asked 'anyway, can you honestly say that you have never copied software yourself?'. I mumbled for a while, but basically avoided giving him an answer.*
>
> *(Extract from my research diary)*

The issue of this conflict also arose during the interviews, and was made particularly clearly by one interviewee when questioned about the influence that the lectures had on his diary entries (in the following extract, the acronym 'SSADM' refers to a common methodology for analysing and designing software systems, which the interviewee was taught in another course):

> *I think it's a bit of a dilemma, because I'm not sure whether what you were saying is what should be, or whether it's the feeling within yourself. It might be something like 'this is the course and I have to teach it', but you as an individual don't think so ... is it reality ... is it 'this is Guy Brown and I strongly believe in this'?*
>
> *I strongly oppose some techniques in SSADM, and our lecturer also feels that way about certain things, but obviously he's got to teach it, even though he himself wouldn't promote it. You could tell straight off. But with your course it was a bit difficult to know ... does Guy Brown believe in professional ethics? Say you are working out in industry, and you find yourself in some strange situation where your promotion depends on you making your boss happy, but what he wants you to do is not really right. Will you do it?*
>
> *I think that 90% of the time, it's just someone who's paid money to teach something from a book. They might be advocating something to you, but they have a different agenda.*

The conflict between role and person in teaching has previously been discussed by Buchmann (1986). She contends that teachers are bound by obligations to fulfil their

role. One obligation is to students, to take an interest in their learning, but there are also obligations to more remote agents; professional bodies, university policy makers and the discipline itself (or, using Becher's (1989) terminology, the 'academic tribe'). Further, she claims that the requirement for authenticity in teaching should not remove the obligations associated with the teacher's role; a proper regard for authenticity in teaching should involve making authentic choices within a framework constrained by externally imposed standards. Morrison and Forester (1990) make a similar recommendation in a paper that specifically addresses the teaching of computer ethics:

> *While it is true that pedagogical authorities can have an undue amount of influence on students' views ... it is even more unhealthy for authorities to engage in some form of 'ethical celibacy' in order to impart an impression of neutrality. It is far healthier to admit one's position and to encourage students to question it.*
>
> *(Morrison and Forester, 1990, page 42)*

Education is never value-free

Buchmann's argument suggests that it is neither authentic nor desirable for teachers to conceal their values. Perhaps we should question, though, whether concealing one's values is possible at all. The interviewees quoted on page 40 suggest that they detected very few of my opinions during the lectures, but does this mean that the course was taught in a 'value neutral' manner? The following interviewee suggests an answer:

> *The bias wasn't that obvious, in fact to be perfectly honest I don't think there was much of a bias, it was more in the topics that you picked rather than the way you presented them.*

As this interviewee suggests, even if my own values were not openly discussed during the presentation of the course material, they influenced the selection of that material and the emphasis that I placed on different topics. A similar observation has been made by Churchill (1982):

> *Even when we are not teaching ethics (perhaps especially then), moral values are taught. Values are embedded in teaching styles and strategies and in the general environment of the classroom, laboratory, or hospital ward ... value dimensions are not merely an additional component of our teaching, but are definitive of the intellectual and social ethos in which education takes place. It is in this sense that values are not only present, but central in teaching. Moral values are taught ... unless one artificially (and inaccurately) confines the term 'teaching' to the transmission of formalised units of knowledge.*
>
> *(Churchill, 1982, pages 301-302)*

Education is never value-free; indeed, values such as the basing of arguments on evidence and logic are central to academic culture (Collier, 1988). As Ferguson (1986) concludes, values pervade all relationships, including the relationship between student and tutor:

> *Values ... will be expressed in my attitude to world order, to my own national order, to the educational system, to my institution, in my personal teaching and scholarship, in my extra-curricular contacts and activities, and in my personal life.*
>
> *(Ferguson, 1986, page 71)*

Nevertheless, the finding that some students considered my course on professional ethics to be taught in a 'value-neutral' manner remains an unsettling one. On reflection, it seems clear that I was reluctant to admit my ethical position on some issues; a conflict between professional role and personal values is apparent in my own teaching practice.

Authenticity in assessment

We now consider authenticity from a third perspective; the notion of an authentic assessment (see also Mitchell, 1989; Wiggins, 1989; Collins, 1992). What are the characteristics that an assessment should have in order to be authentic? Mitchell (1989) suggests the following:

> *Authentic assessment means evaluating by asking for the behaviour you want to produce. Authentic assessment isn't a single method. It includes portfolios, collections of student work. The list is limited only by the criterion of authenticity: is this what we want students to know and be able to do.*
>
> *(Mitchell, 1989, page 5)*

Similarly, Wiggins (1989) suggests some principles that are necessary for authentic assessment. He proposes that criteria for success in the assessment should be publicly known, and that the assessment should be dynamic (in other words, it should capture change over time). Additionally, the scoring should include an element of self-assessment, should allow students to identify their strengths and weaknesses, and should allow them to demonstrate what they do well. Finally, he suggests that authentic assessments should encourage the integration of skills and knowledge acquired from different sources, and should promote pride in ownership.

The assessment of the professional ethics course satisfied many of these requirements for authenticity. Students were asked to compile a portfolio of diary entries and commentaries on fictional scenarios, together with a critical evaluation of the portfolio which discussed its strengths and weaknesses. The portfolio therefore

contained an element of self-assessment, and involved the integration of knowledge from different sources (deciding what evidence to include in the portfolio may also be regarded as a form of self-assessment). Further, the assessment was dynamic; tasks were completed at regular intervals throughout the semester, and students were asked to comment on the changes in their ethical reasoning over time. The purpose of the assessment was clearly stated to the students, and the criteria by which it was assessed were carefully documented and distributed at the start of the course.

In summary, we chose a portfolio as the mechanism of assessment for the professional ethics course because of a conviction that it was both authentic and fair. Collins (1992) has previously argued the same point:

> *Portfolios have the potential to be a form of authentic assessment ... because there are different classes of evidence, and many different documents within each class, portfolios should be multisourced. The many options for evidence allow portfolios to be fair.*
>
> *(Collins, 1992, page 460)*

When questioned during interview, the majority of interviewees (18) indicated that they believed the assessment to be fair. However, what is a *fair* assessment, and how does this relate to the notion of an authentic assessment? Evidence from the interview transcriptions suggests that the two concepts are closely related. Many interviewees identified characteristics of a 'fair' assessment that were similar to the criteria for authenticity listed above; indeed, one interviewee characterised a fair assessment in much the same terms as Mitchell (1989) describes an authentic one:

> *It's a fair assessment if you know what you want students to get out of the course, and you can test if they have picked that up.*

The same interviewee went on to suggest another characteristic of a fair assessment; that the criteria for success should be clearly stated. Again, this concurs with our notion of an authentic assessment:

> *I guess it's abiding by the rules that were laid out at the start of the course, and actually assessing what, and to the degree, that you said you would at the start of the course ... not moving the goal posts.*

Another interviewee stressed the benefits of a multisourced assessment, one of the criteria for authenticity proposed by Wiggins (1989) and Collins (1992):

> *I think it was fair because it tested different aspects of the way you could have learned or applied your knowledge, and not many courses do that. Somebody could have completely missed the point in a couple of scenarios and had the whole course been marked on that, they*

> *wouldn't have done very well ... but if they had shown that they really did really understand and did know what they were talking about in their diary, because it was something personal and it wasn't some hypothetical situation, then they wouldn't have suffered so much.*

Several interviewees commented on the dynamic aspect of the portfolio assessment, and seemed appreciative that the workload was spread over a whole semester:

> *The way that the diary and scenarios built up over the course was a fair way, because it helped you learn things as you went along rather than just testing everything at the end.*

Interviewees were also asked if they had concerns about an assessment in which the 'answers' were very subjective, given that there were many possible interpretations of the scenarios and that the contents of the diary were quite loosely specified (see page 17). All interviewees indicated that they thought it was possible to assess the work fairly. Many suggested that a fair assessment should focus on the justification for statements, rather than the statements themselves. Additionally, several interviewees noted potential problems in assessing work on ethics, such as a conflict between the values of the teacher and student:

> *It's not like a maths question and there's a wrong answer ... I'm not sure how you'd choose the criteria, I guess it would be judged on the rationale behind the answer.*

> *It can be a problem if you get a very radical point of view coming across, either from the student or the lecturer ... that could influence the manner in which it is marked.*

> *It's the job of the marker that he doesn't think that because it's not the same belief as himself he marks it differently ... it's quite personal for the marker. The marker has to put himself in the position of the student. But I think the marking was more a test of how to defend a point of view, rather than just stating a point of view.*

Again, this emphasis on processes rather than products is consistent with the notion of an authentic assessment. In short, it would appear that interviewee's perceptions of a 'fair' assessment correlated closely with Mitchell's (1989) concept of an 'authentic' one. We might conclude, therefore, that an authentic assessment is also a fair one.

Challenging the notion of an authentic assessment

We have presented evidence that, in the sense introduced by Mitchell (1989), the

portfolio assessment for the course was an authentic one, and that from the students' perspective this corresponds with a fair assessment. However, other evidence from the interview transcriptions suggests that the idea of a portfolio assessment (or, indeed, any kind of assessment) as 'authentic' is problematic when considered from the perspective of the teacher.

To paraphrase Mitchell (1989), authentic assessment is knowing what you want your students to know; in other words, the assessment clearly communicates a requirement for a certain kind of behaviour that the tutor considers desirable. In some sense, then, an authentic assessment embodies the values of the teacher who devises it. Equally, the assessment only satisfies its goal if it elicits the required behaviour from the student. In the context of the professional ethics course, the goal of the assessment was to engage students in a discussion of their own values and value priorities. The success of our assessment therefore rests on the authentic communication of values by two agents: the teacher (whose values shape the form of the assessment) and the student (whose values shape the form of the portfolio). We have presented evidence that our assessment satisfies the first aspect of authenticity, but what of the second? Did the assessment encourage students to consider their own values, and to openly communicate them in the portfolio?

In fact, we have already presented evidence which suggests that the contents of many portfolios did not genuinely reflect the values of the author. For example, consider the diary entries. For many interviewees there was a conceptual gap between a personal diary and the diary kept for the course. One indication of this was the tendency of some students to dismiss minor incidents or incidents not directly concerned with the field of computer science, which might otherwise have been recorded in a personal diary (see page 35). Some students didn't record events in their diaries because of concerns about privacy. Additionally, many students indicated that because the diary was assessed, they took much more care in writing it that they otherwise would:

> *It would probably have been lower quality if it wasn't assessed, I wouldn't have paid so much attention to it ... although if you said you had to hand it in or you would fail the course work part of the course, then it would get it handed in, but it would be of lower quality.*

In short, the interview transcriptions suggest that making the diary an assessed piece of work fundamentally changed the way in which it was written. So, an assessment that satisfies the criteria for 'authenticity' suggested by Mitchell (1989) may not be entirely successful from the perspective of the teacher, because it does not guarantee an authentic response from the student.

It is particularly instructive to consider the notion of authenticity in the context of a portfolio assessment (see also Collins, 1992). The term 'portfolio' is usually associated with a collection of work that is compiled for a specific purpose, and the contents of the portfolio will depend upon the nature of that purpose. For example, a

photographer will compile a portfolio of pictures quite differently when entering a portrait competition and when applying for a job as an architectural photographer. In the same way, the contents of a portfolio assessment will vary depending upon its purpose. In the assessment of the professional ethics course, this was most noticeable in the diary component of the portfolio, which many students wrote in a substantially different manner to the way in which they would write a personal diary.

In many ways, a portfolio presents an image. As the contents of a portfolio vary with its purpose, so does the image that it presents. Indeed, this image may be directed quite deliberately; a photographer will construct a portfolio to present an image of flexibility, or to suggest his expertise in an area that he perceives to be the preference of a potential client. In the same way, students may direct their writing towards what they perceive to be the values of the teacher. One interviewee acknowledged this possibility when questioned about the notion of a 'true record', and another student raised the issue in the first entry of his diary:

> *[A true record] means that events obviously took place and weren't just made up, and things happened at the time you said they happened ... and that the feelings that you write about and your opinions and your moral stances are really what you believe to be true, and you're not just writing it because its what you want someone else to read.*

> *I think the very idea of us writing personal diaries poses ethical questions. For instance, should I write about what really happens to me and how I really feel about it, or should I write what I think will get me the best marks for this assignment?*
>
> *(Extract from student portfolio)*

In fact, there was little evidence from the current study to suggest that students directed the contents of their portfolios toward their perceptions of my own values (indeed, as noted on page 40, many interviewees indicated that my values were hard to discern). One exception to this was a diary entry in which a student explained his decision to relent from a life of software theft after hearing my lecture on copyright law, which struck me as a rather miraculous transformation. The entry from my research diary on page 42 alludes to a similar claim made during a tutorial discussion.

In summary, our data suggests that an assessment which satisfies the criteria for authenticity suggested by Mitchell (1989) may not be entirely successful from the perspective of the teacher, because it may not elicit an authentic response from the student. Furthermore, the interviews suggest a central irony which challenges the notion of an authentic assessment: students invest little effort in a piece of work that is not assessed, but assessing a piece of work fundamentally changes the way in which students approach it.

Authenticity in professional decision making

In the last part of this chapter, we address the notion of authenticity in regard to professional decision making. The focus of this section is on software engineering practice rather than pedagogy, so the issues are dealt with briefly. However, many of the issues considered here are quite general and have implications for a number of professions, including teaching.

Moral philosophy and professional codes of ethics

Students were introduced to two techniques for the analysis of ethical dilemmas; moral philosophy and professional codes of ethics (specifically, the codes of the British Computer Society and the Association for Computing Machinery). The questionnaire and evidence from student portfolios both indicated that most students found the moral philosophy more helpful than the professional codes when analysing fictional ethical dilemmas. For example, only 50% of students completing a questionnaire agreed that the professional codes were a great help in analysing fictional scenarios, but 85% agreed that the moral philosophy was a great help. Evidence from the portfolios suggested that most students found the professional codes easier to understand and apply, but that they gained greater insight through the consideration of moral philosophy. One student outlined the reasons for his preference in the critical evaluation of his portfolio:

> *One area where the moral philosophy certainly did help was in evaluating the scenarios. The various techniques helped to provide a framework around which to probe and evaluate the situations. They helped to point out areas which were worth discussing in detail, even if none of them in the end actually formed much of a basis for my opinions of the scenarios.*
>
> *The codes of the BSC and ACM were in comparison almost totally useless in looking at the scenarios. The terms and recommendations that they suggest are so vague that they couldn't be used as a basis for making absolute decisions about any of the situations which I evaluated. At the same time the codes also do not seem to be general enough to provide a moral framework for making decisions either.*

Other students made the following observations:

> *I didn't like the BCS code because I don't like it when people tell me what to do ... I like to think for myself.*

The ethical codes are just someone else's attempt to relate moral philosophy to computer science, which is what I was trying to do in the scenarios and diary entries myself.

(Extract from student portfolio)

These quotes are interesting because they suggest a conflict between professional values and personal values, an issue that we have already discussed in the context of teaching practice (see page 42). Indeed, other commentators have criticised professional ethical codes precisely because they imply a segregation of personal and professional values (e.g., Luegenbiehl, 1992). For example, the guidelines for the ACM code of ethics state that they should 'serve as a basis for ethical decision making in the conduct of professional work' (Anderson *et al.*, 1993). Should one's own values have no influence on the decisions that are made in a professional context?

Again, we can consider this issue from the perspective of authenticity. To make ethical decisions solely on the basis on a professional code is not authentic; it does not truly reflect ones own values and value priorities. As Buchmann (1986) has noted in the context of teaching practice, authentic choices must be made within a framework constrained by externally imposed standards (in this case, professional codes of ethics). Some evidence has been presented that the students in our study were sensitive to this issue. Our findings should be of concern to policy makers in professional computing organisations, who see ethical codes as a key element in acquiring professional status for software engineers and computer scientists; after all, the students interviewed here are the next generation of computing professionals.

CHAPTER FIVE

Summary and conclusions

This chapter concludes our study with a summary of the main findings. In addition, we consider the effectiveness of the research methodology used here, with particular emphasis on the merits and disadvantages of interviews and questionnaires. Student perceptions of the course are also briefly considered, together with a discussion of the placement of the course in the curriculum. We conclude with a list of recommendations that are aimed specifically at teachers of professional ethics courses, but also have implications for teaching and assessment in general.

Summary of main findings

Our two hypotheses were confirmed; the diary introduced an experiential element into the teaching of professional ethics, and proved more effective in this regard than conventional techniques based on case studies. Additionally, other significant findings were made in three areas, and these are summarised below.

Firstly, a number of reasons were determined for the failure of students to identify closely with the scenarios. It is necessary for scenarios to be realistic, and the students in our study perceived the scenarios as such, but realism alone may not be sufficient to engage readers in an investigation of their own values. In some cases, students did not identify with the scenarios because they took place in an unfamiliar context (management and policy-making decisions in large corporations), or because they did not concern emotive issues. This latter factor may be partly explained by the focus of the scenarios on the fortunes of companies rather than individuals, because the scenarios did not concern the dilemmas of 'real' people, or because they presented ethical dilemmas in a rather condensed form. However, for many of the interviewees, the subject matter of the scenarios simply did not induce a deeply felt response. This suggests that professional ethics teaching in the field of software engineering is faced with a paradox; such teaching must include an experiential element in order to be effective, but scenarios based purely on computer science issues evoke very little emotional reaction.

Secondly, from our perspective the portfolio assessment was 'authentic', and from the students' perspective it was 'fair'. However, although a 'personal diary' was requested as part of the portfolio, many students wrote the diary for the assessment

quite differently from the way in which they would write a diary for themselves. Additionally, students indicated that they would have expended much less effort on a portfolio that was not assessed. Our findings, then, suggest a central irony that challenges the notion of an 'authentic' assessment; students invest little effort in a piece of work that is not assessed, but assessing a piece of work fundamentally changes the way in which students approach it.

Finally, our study identified a conflict between role and person in teaching. Teachers should admit their ethical position and encourage students to question it, but this does not mean that any opinion is acceptable; authentic choices must be made within a framework that includes one's own values, and the values of the profession (which may be expressed as externally imposed standards). This conflict was apparent in my own teaching practice; although my values were expressed through the choice of course material and the form of the assessment, I was reluctant to admit my own ethical position on issues such as software theft. The same conflict between role and person is present in professional software engineering practice. Furthermore, professional codes of conduct may exacerbate this conflict by forcing a wedge between personal values and professional values.

Critique of the research methodology

The limitations of the data collection techniques employed in our study are well known. Bell (1993) notes that interviews are time-consuming, both in terms of the time required for the actual interview and subsequent transcription of the audio recording. We certainly found this to be the case; approximately 70 hours were invested in the recording and transcribing of interviews. Bias is another potential problem, particularly when the data is gathered by a solitary interviewer as it was in our study (Powney and Watts, 1987; Bell, 1993). Given that I had strong opinions on many of the issues investigated in the interviews, particular care was taken in this respect; with few exceptions, questions were put to interviewees exactly as stated in the interview plan (see appendix E). In this way, bias in the interview process was minimised. Indeed, although I had very clear expectations of the likely outcome of the interviews, they generated a number of unanticipated findings.

On a more specific level, several aspects of the interview plan were unsatisfactory. The interview plan contained lists of possible prompts, with a space to record the extent to which the prompt was required. Initial attempts to complete these details during the interview proved to be a distraction to the interviewees, who sometimes lost their train of thought while trying to ascertain what was being written on the form. Consequently, most of these forms were completed after the interview had finished.

Another concern was the wording of the prompt for the eighth question on the interview plan, 'was it easier to make the diary entries up, rather than write about real events?'. The first few interviews suggested that the authenticity of the diary entries might be a sensitive area for some interviewees, and that this question could be interpreted as an accusation of cheating. Hence, this prompt was not used in most of

the subsequent interviews.

A similar concern was raised about the sixth item on the questionnaire, which asked whether the diary was an 'accurate' account; one student appeared to interpret this as an accusation of cheating (see page 38). Additionally, the wording of the first question ('This course has significantly increased my ability to deal with ethical issues in an objective and rational way') seems rather unsatisfactory in retrospect. Students were introduced to the concepts of objectivity and rationality in the course material on moral philosophy, but nevertheless the question may be too open to interpretation. That said, the same question was used in a questionnaire prior to the current study, and no participants reported that it was unclear or ambiguous.

On a related point, we decided that it was unnecessary to pilot the questionnaire in the current study, because all but one of the questions had been used in a similar study during the preceding year. In retrospect, this decision raises two methodological problems. Firstly, one of the questions had not been piloted at all; any flaws in this question were therefore undetected. Secondly, an assumption was made that student groups in different years could be regarded as homogeneous. In fact this is unlikely to be the case, particularly since both groups included a number of postgraduate students who originated from different cultures and varied in their English language skills.

A final point concerns the size and content of the sample. Twenty students were selected for interview, such that equal numbers of male/female and undergraduate/ postgraduate students were included in the study. No systematic differences in attitude due to gender or level of study were apparent in our data, although this may be a reflection of the relatively small sample size. Equally, it is possible that such differences were apparent but that I failed to detect them. Ideally a larger sample should be considered in future studies, although the time-consuming nature of the interview technique remains a problem in this respect.

Students' perceptions of the course

It was satisfying to find that students generally perceived the course on professional ethics to be enjoyable, interesting and useful; 95% of students who completed a questionnaire indicated that they considered the course to be 'an essential element in the training of software engineers and computer scientists'. However, some students expressed reservations about the practical usefulness of the material on ethics and moral philosophy. Several interviewees suggested that this material was likely to be less useful than the course material on legal issues:

> *I was expecting it to be far more specifically on the legal bit that the moral bit ... having all the moral stuff coming into it was a bit of a shock, to be honest. I was expecting it to be more on the legal stuff, more practical ... it seemed fairly theoretical for a lot of the time.*

> *The ethics was interesting, but I'm not sure if its useful from a practical*
> *point of view.*

The course was taught to undergraduate students, and also to postgraduate students from the Pacific Rim, North America, Europe, the Middle East, Africa and India. One interviewee expressed concern that the material on ethics did not take sufficient account of these cultural differences:

> *I have reservations about the moral philosophy and the ethics. You've*
> *got people from a wide cross-section of the world, different cultures ...*
> *does this really apply to everybody?*

This may be a significant failing of the course. Cultural differences were alluded to briefly during the lectures on moral philosophy and played a role in one of the scenarios (see appendix B), but were not considered in detail. Given the global spread of information technology, cultural differences are undoubtedly worthy of greater attention; indeed, Bynum and Rogerson (1996) suggest that the global debate of ethics and values forced by computer networks will be of profound historical importance.

For some students, the course simply confirmed their fears that it was an 'arts' subject. The following interviewee was obliged to take the course in order to gain BCS accreditation, but would have preferred not to have done so:

> *I didn't think I was going to enjoy it, because of the title ... I'm not very*
> *good at arty subjects, like essays and things like that ... I hate writing*
> *essays, and I thought it was going to be all essays ... I think it appeals*
> *to people who are good at arts, and it's good for people who aren't*
> *technical, it gives them an outlet. I wouldn't have chosen it as an*
> *option.*

Some responses of this kind were expected, given the prevailing bias towards technical skills in software engineering education (see chapter 2). Equally, however, some interviewees appreciated the value of acquiring 'non-technical' skills:

> *You can't have a course that's totally one sided, and just looks at things*
> *from a technical point of view. Not everyone doing the course is going*
> *to go into the technical side ... some of things that you learn about are*
> *more for managers, people making decisions.*

The position of the course in the curriculum

It was noted in chapter 2 that the placement of professional ethics in the software engineering curriculum is a contentious issue. Arguments have been made both for integrating professional ethics with the teaching of technical subjects, and for teaching

ethics in a separate module. Additionally, advantages have been claimed for introducing professional ethics in the first year of an undergraduate degree course, and for teaching the topic in the final year.

Our course on professional ethics was taught to second year undergraduate students in the form of a one-semester module (10 teaching weeks and 2 reading weeks). A more integrated approach to professional ethics teaching is probably desirable, but would fit uncomfortably with the University of Sheffield's modular degree structure. Historically, professional ethics has always been taught at second year undergraduate level in the Sheffield Computer Science and Software Engineering degree courses, although a curriculum review in 1995 suggested that the course should be moved to the first year; I opposed this change, for reasons that are expressed below.

Students' opinions on the placement of the course in the curriculum were not specifically investigated in our study, but did become apparent from informal conversations following the structured interviews (at the conclusion of each interview, participants were asked to make additional comments and suggestions; see appendix E). One interviewee made a number of interesting observations:

> *I think it's right in the second year, because you can use what you've learned in your third year and apply it to your projects, and I don't think you need to know it in the first year to be honest, you just need to know the basics. You've got to learn about how things are done, the way in which things are done, before you can learn whether you should be doing them, or analysing what you should be doing ... and if it was in the first year it would probably get brushed aside to some extent and forgotten about. It's a different kind of course completely ... before they've learned much about computing, they might see it as unimportant and irrelevant, whereas in the second year it puts it in context with everything else you've done.*

Introducing professional ethics in the second year of a three-year degree course appears to be a good compromise. As the interviewee suggests, a detailed investigation of professional ethics is probably inappropriate at the first year level, since students lack the context provided by technical courses. Equally, skills in legal and ethical reasoning may be important for the final year of study, which may involve project work with an industrial client. Similarly, we would agree that a course that covers ethical and legal concepts might be too 'different' to fit comfortably into first year study, particularly since the course described here involves a rather unconventional form of assessment.

Recommendations

In the light of the findings described here, four recommendations can be made regarding the teaching of professional ethics. Although our study specifically

concerned a course in professional ethics for software engineers, we feel that many of these recommendations are generally applicable.

First, our findings suggest that an 'experiential element' can be introduced into the teaching of professional ethics by encouraging students to reflect upon their own practice as students. A personal diary in an effective medium for this reflection.

Secondly, we note that case studies may also be an effective teaching tool, but with some qualifications. Case studies are more likely to evoke an emotional response if they are presented as fact, rather than fiction, and if they concern the implications of ethical dilemmas for individuals, rather than organisations. Furthermore, the case studies should be presented in a context with which students are familiar. Our findings also suggest that most ethical issues in computer science do not induce a deeply felt response; it may be more effective to incorporate emotive issues that are unrelated to information technology into case studies in computer ethics.

Thirdly, we suggest that it is not sufficient for an assessment to be 'authentic' from the teacher's perspective; an assessment must also permit an authentic response from the student. Unfortunately, assessment faces a central irony; students are likely to invest little effort in work that is not assessed, while assessing a piece of work may cause students to compromise its authenticity. Whether this paradox is avoidable should be a matter for further investigation; ideally, assessments should be devised which motivate students and also encourage them to respond authentically.

Finally, we note that students generally find moral philosophy more insightful in the analysis of ethical dilemmas than professional codes of conduct. However, the latter are easier to understand and apply. Both approaches therefore have something to offer, and we recommend that both should be taught in courses on professional ethics.

Concluding remarks

The cycle of action-research requires that planning and implementation of research initiatives should lead to changes in practice. We therefore conclude by describing the changes that will be made to the teaching and assessment of the course on professional ethics.

In the light of the recommendations made above, it is clear that the case studies employed in the portfolio assessment should be rewritten. Too many of these currently focus on the circumstances of companies, rather than individuals, and concern contexts which are unfamiliar to students. The failure of computer science issues to evoke a strong emotional response is a harder problem to address. However, our study has at least identified issues that are emotive for some students (e.g., invasion of privacy, development of military technology) and those that are not (e.g., software piracy, computer fraud).

The issue of authentic assessment is also a difficult one to address. Currently, the portfolio assessments are graded with a percentage mark; it may be more appropriate to grade them only as pass/fail. However, this does not solve the underlying problem; that assessment changes the manner in which students approach their work. Another

approach might be to assess the case study and critical evaluation parts of the portfolio, but not the diary entries (recall that the authenticity of the diary entries was of particular concern). It remains to be seen whether students would simply disregard the diary part of the portfolio as a result.

Finally, my own role as the teacher of a course in professional ethics must be an issue for further reflection. As a teacher, I value openness and honesty. I value authenticity. Why, then, was I reluctant to admit my ethical position? In short, this study has exposed a conflict between my personal and professional values of which I was largely unaware.

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APPENDIX A

Course structure

Week	Lecture Material	Assessment
1	Introduction and course themes Introduction to English Law	Scenario I: *Abuse of the electronic mail system in a large company*
2	Introduction to intellectual property law Copyright, Designs and Patents Act Tutorial on copyright law	Scenario II: *Conflict between personal gain and international copyright law*
3	Contract law Tutorial on negotiating a contract	Scenario III: *Ethical and contractual conflicts between two software companies*
4	Liability law Tutorial on liability for defective software	
5	Introduction to moral philosophy Ethical codes for computer scientists Tutorial on moral philosophy and ethical codes	Hand in scenarios I, II, III Scenario IV: *The consequences of withholding information during the development of an expert system*
6	Privacy and the freedom of information Data Protection Act Tutorial on data protection	Scenario V: *Developing software for military applications*
7	Computer misuse and computer crime Computer Misuse Act Tutorial on computer crime	Scenario VI: *Invasion of privacy in a hospital patient information system*
8	Information technology and the quality, quantity and organisation of work Tutorial on information technology and work	
9	The information society	
10	Summary and conclusions Revision and exam technique	Hand in completed portfolio

APPENDIX B

Example case study

Arthur Smith was a manager working for a large company specialising in pumping equipment, SuperPump PLC. His last job was to manage the creation of a marketing branch in Scotland, where he was responsible for installing all the hardware and software. He had to network PCs for each of 25 offices in a large building, and install spreadsheet, word processing and custom software. Arthur completed the job in four months, even though his immediate supervisor, Sarah Vimes, had allowed him six months. Sarah was the senior Information Systems manager for SuperPump.

In his next posting, Arthur was sent to a small African state, Mungoon. He was hoping to repeat his performance in Scotland, but he'd been in Mungoon for four months already and progress was slow. Arthur knew that if he was going to keep his job, he had to get things moving. Sarah had told Arthur that the office in Mungoon was important; it could be the gateway to business throughout Southern Africa. She had told him that the office needed to be profitable within six months, but based on his previous performance she expected him to do better than that.

Arthur was not happy about this. The pace in Mungoon was very slow, due to its restrictive bureaucracy. The only compensation was that Mungoon's economy was not well developed; anything that SuperPump could do to boost the country's economy would be well appreciated and would reflect well on the company. Arthur had no problem with the hardware. SuperPump simply shipped PCs from its headquarters in Essex, he just told Sarah how many he needed. The shipment had arrived, and was being installed. The real problem was software.

SuperPump used two commercial software packages, FluffWrite and FluffSheet. Arthur had been in contact with the manufacturer of these packages, MicroFluff, for the past two days. In the UK, the cost for site licences for each package was £1000 for 10-19 users and £2500 for 20-49 users. He was surprised to learn that, for international sites (including Mungoon), the costs would be £2500 and £5000, respectively.

Arthur called his local manager, Mick, a native Mungoonian familiar with MicroFluff's software. Mick estimated that, allowing for growth, they needed 35 copies of each package. However, he had only budgeted about £500 for software costs. Arthur was concerned; the cost of the software would exceed budget by £4500. However, Mick had no worries. He told Arthur that they didn't have to order direct from MicroFluff; unauthorised copies of the programs could be obtained in Mungoon for as little as £2. Arthur was worried; surely that must be a violation of copyright?

Again, Mick saw no cause for concern. He told Arthur that UK copyright laws didn't apply in Mungoon, which wasn't a signatory to international copyright conventions. It was possible to get as many copies of the software as Arthur needed, or SuperPump could just buy a single copy of each package from MicroFluff and make their own copies. Mick said that he could also arrange for a local printer in Mungoon to make high-quality copies of the manuals for as little as £1 each. This was why he had budgeted such a small amount for software; the total cost would be well below £500. Mick asked Arthur for a quick decision. Time on the project was running out. Arthur Smith thought. And then he thought some more. He didn't know what to do.

(adapted from Kallman and Grillo, 1993, pages 111-112)

APPENDIX C

Questionnaire

Questionnaire for COM217/651: Professional issues in IT

Please complete each of the following questions by circling one number. Answers are treated in confidence and have no bearing on the marking of the portfolio.

Name: _____

1. What is your level of study?

1	2
Undergraduate	MSc

2. This course has significantly increased my ability to deal with ethical issues in an objective and rational way.

1	2	3	4	5	6	7
Strongly disagree	Moderately disagree	Slightly disagree	Uncertain	Slightly agree	Moderately agree	Strongly agree

3. The lecture material on moral philosophy was a great help in analysing the ethical dilemmas in the fictional scenarios.

1	2	3	4	5	6	7
Strongly disagree	Moderately disagree	Slightly disagree	Uncertain	Slightly agree	Moderately agree	Strongly agree

4. The BCS and ACM codes of conduct were a great help in analysing the ethical dilemmas in the fictional scenarios.

1	2	3	4	5	6	7
Strongly disagree	Moderately disagree	Slightly disagree	Uncertain	Slightly agree	Moderately agree	Strongly agree

5. The diary helped me to relate the course material to ethical dilemmas arising from my own experience as a computer science student.

1	2	3	4	5	6	7
Strongly disagree	Moderately disagree	Slightly disagree	Uncertain	Slightly agree	Moderately agree	Strongly agree

6. The diary was an accurate account of incidents occurring in my life during the Autumn semester.

1	2	3	4	5	6	7
Strongly disagree	Moderately disagree	Slightly disagree	Uncertain	Slightly agree	Moderately agree	Strongly agree

7. The 'Professional Issues in IT' course is an essential element in the training of software engineers and computer scientists.

1	2	3	4	5	6	7
Strongly disagree	Moderately disagree	Slightly disagree	Uncertain	Slightly agree	Moderately agree	Strongly agree

Summary of questionnaire results

Question	*Student response*
This course has significantly increased my ability to deal with ethical issues in an objective and rational way	100% responded positively (30% at 5, 45% at 6, 25% at 7, mean = 6.0)
The lecture material on moral philosophy was a great help in analysing the ethical dilemmas in the fictional scenarios	80% responded positively (10% at 2, 5% at 3, 5% at 4, 10% at 5, 40% at 6, 30% at 7, mean = 5.6)
The BCS and ACM codes of conduct were a great help in analysing the ethical dilemmas in the fictional scenarios	50% responded positively (5% at 1, 15% at 2, 20% at 3, 10% at 4, 25% at 5, 25% at 6, mean = 4.1)
The diary helped me to relate the course material to ethical dilemmas arising from my own experience as a computer science student	85% responded positively (5% at 2, 5% at 3, 5% at 4, 20% at 5, 30% at 6, 35% at 7, mean = 5.7)
The diary was an accurate account of incidents occurring in my life during the Autumn semester	85% responded positively (5% at 2, 5% at 3, 5% at 4, 20% at 5, 30% at 6, 35% at 7, mean = 5.7)
The 'Professional issues in IT' course is an essential element in the training of software engineers and computer scientists	95% responded positively (5% at 4, 5% at 5, 15% at 6, 75% at 7, mean = 6.6)

APPENDIX E

Interview plan

Interview Plan

Name of interviewee: _____   *Date of interview: _____*

Writing the diary

6. Do you normally keep a diary?

If yes, what form does your diary take?	1	2	3
If no, what do you think a diary should contain?	1	2	3

7. Would the project have been easier if you did normally keep a diary?

Did you find it hard to write a personal account of your life?	1	2	3

8. Did you talk with other people about what to put in the diary?

Who were these people? Other students? Lecturers? House-mates?	1	2	3
To what extent did conversations with these people influence what you wrote about?	1	2	3

The authenticity of diary entries

9. Were your diary entries a true record of events that occurred in the semester?

Did enough real-life events occur for you to write about?	1	2	3
Was it easier to make the diary entries up, rather than write about real events?	1	2	3

10. What do you understand by the term 'true record'?

11. Were there aspects of your life throughout the semester that you could have recorded in your diary, but didn't?

Explain why. Privacy?	1	2	3
Do you think you would have written the diary differently if you knew that nobody except yourself was going to read it?	1	2	3
Do you think you would have written the diary differently if you knew that it was not an assessed piece of course work?	1	2	3

12. To what extent were your diary entries and answers to the scenarios influenced by what I spoke about in the lectures?

Did you gain an impression of my values from the lectures, and direct your answers towards what you thought I wanted to hear?	1	2	3

The scenarios

13. How closely did you identify with the characters in the scenarios?

    Did you put yourself in the position of the characters and think   1   2   3
    'what would I do in this situation', or was it more detached than
    that?

14. Were the scenarios realistic?

    Why or why not?   1   2   3

Assessment and the course

15. Is this an appropriate topic of study for a course in software engineering?

    Why or why not?   1   2   3

16. Was the mechanism for assessment fair?

    What do you understand by the term 'fair assessment'?   1   2   3
    Was too much work required?   1   2   3
    Since the diary and answers to the scenarios are very subjective,   1   2   3
    do you think it was possible to assess the work fairly?

Finishing up

17. Having completed the course, what do you understand by the term 'ethics'?

18. Has the course made you a more ethical person?

    Why or why not?   1   2   3
    Do you think this was the aim of the course? If not, what was the   1   2   3
    aim?

19. Do you have any questions?

20. Is there anything else you'd like to add?

(Prompts are shown in italics, where 1 = no prompt needed, 2 = some prompting needed, 3 = a great deal of prompting needed).