THE PLACE AND PEDAGOGY OF ETHICS IN THE COMPUTING CURRICULUM

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INTRODUCTION

It would be easier to assert that there is no place at all for the teaching of ethics in the computing curriculum than to ponder the question of its place and its pedagogy. Certainly, if we see computing science as merely an understanding of the technical characteristics of computers and ignore the human component, then the teaching of this new technology is simple.

How different is the teaching of computing from the educational requirements of other technologies? Certainly, society (and its legal system) would not allow the education of a novice motorist to be limited to a technical understanding of the internal combustion engine. The rules of the road, an understanding of the rights and responsibilities of drivers, safe (and defensive) driving practices, and, in more recent times, an understanding of the environmental impact of motor vehicles, are accepted as essential learnings for motorists, and, in respect of many of these criteria, they are a pre-requisite for obtaining and retaining a licence to drive. As well as a licensing system which regulates who shall and who shall not use the technology of the motor vehicle, there are legal penalties for its misuse which are visible to all.

But what of computers ... or more importantly what of computer users? There is no licence required to use a computer, no certification or verification of the expertise of software developers who design the computer systems for critical applications in manufacturing and medicine, aviation and warfare. There is no Hippocratic oath which binds computer users to a code of behaviour which acknowledges the sanctity of an individual’s personal data, the right for safe-keeping of money deposited in trust in an easily manipulated computer record, the ownership of, and entitlement to reward for intellectual property, and no universal standard which judges that computer hackers, and the saboteurs who create computer viruses, are common felons.

The computing professional associations (such as the Australian Computing Society) have developed Codes of Ethics, but these associations are exclusive, minority groups and their influence on the general computer user is limited. Their academic and practical criteria for membership exclude the majority of computer users.

The majority of computer practitioners are set free on an unsuspicious world, a world made increasingly more vulnerable through the ease of use and access to computer systems, and the rapidly expanding number of users who know the pleasures of computer use, but have little understanding, if any, about the responsibilities of working with computers.

Johnson (1985) points to contradictions in the concept of the computer user as a professional, suggesting that the typical user in a business setting is a subordinate whose lowly status does not reflect the considerable power this person may have in the controlling vital information processes within their organisation, a power which is open to abuse. Hearnden (1989) supports this view, pointing out that ‘input crimes’ are the most prevalent form of computer crime, as familiarity with computer systems suggests opportunities, and as the wealth processed by computer systems becomes available to many more people.

Johnson and Snapper (1985) criticise the use of a Code of Ethics by professional bodies, particularly the citing of Examples of Conduct (such as those used by the Australian Computer Society). They argue that it is not at all clear how the code should be used, or whether it could or should be enforced if such a situation were to occur. They question whether the practitioner should base their decision on the code (a set of generalisations) rather than on their own judgement which is bound to a specific context. They ask whether the code implies that the association would become involved, to the extent of helping the practitioner find new employment if this became necessary.
The Australian Computer Society's Code stops short at stating that it will 'support' members who are involved in ethical dilemmas.

Other writers, such as Ladd (1985), see little value in an association code, arguing that ethical principles cannot be imposed on others because the notion of ethics itself presumes that persons are autonomous moral agents who are 'self-directed' and not 'other-directed.'

Ladd contends that a more positive role for the computing bodies is the expression of the ideals of these associations in the hope of sensitising others to these values and thereby raising the ethical standards of the computing industry. Equally important, he believes, is the role these professional bodies should play in fostering debate within the community on issues of major ethical concern, such as determining the uses of technology, and in applying these associations' considerable collective influence (unlike the small voice of the individual computer user), towards doing something about such matters.

Ladd's views suggest both a justification for including ethical issues in the computing curriculum, and broad aims centred on sensitising future practitioners to ethical principles, an awareness of the use and misuse of computers, and identifying avenues of influence (such as the professional bodies) for challenging assumptions related to the use of computers. Further justification for the inclusion of studies in the social and ethical implications of computing is provided by the Federal Government's inquiry into education for the information technology industry (DEET, 1992). There is also growing support in business (Couger, 1989; Roberts, 1994) for courses in ethics for employees, with some corporations running their own programs.

With this rationale, a study of ethics has been included in an introductory computing subject at the University of South Australia. This paper describes its content, methods, and relationship to other programs described in the literature, as a contribution to the emerging debate on the place and pedagogy of ethics in the computing curriculum.

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Couger (1989) describes an ethics component of a capstone (foundation) course for undergraduate Information Systems majors at the University of Colorado. Couger tried a variety of pedagogical approaches before 'effectively personalising' what many students view to be an abstract subject by involving the students in an on-campus initiative.

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There is scant mention in the literature of the teaching of ethical principles in computing, despite the requirement of the United States Computing Sciences Accreditation Board (which approves computer science programs at colleges and universities) for the teaching of the 'social implications of computing' as a criterion for accreditation. Deoughrey (1988) points out that half the institutions applying for accreditation have had to strengthen their instruction.

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strand in this foundation subject covers the technical characteristics of computers.) The students spend the first weeks of the semester studying the uses of computers in the work-place, in government, the military, medicine, law, academia, and in worldwide communications. As they study systems, processes, people and machines, the benefits and disadvantages of computers, the students are presented with the ethical dilemmas confronting society, as personal and professional lives are changed by this pervasive technology. As the focus narrows to the practice of computing, the ethical questions identified by Forester and Morrison (1990) are useful:

- "What are the intellectual property rights of software developers?"
- "Is copying software a form of stealing?"
- "Should software developers be held responsible for computer malfunctions?"
- "Are so-called "victimless" crimes, (for example against banks), more acceptable than crimes against human beings?"
- "Is the computer hacker a hero or a malicious meddler who tries to discover information by deceptive or illegal means? Is computer hacking a crime equivalent to theft?"
- "Should the creation of viruses be considered deliberate sabotage and punished?"
- "Is information on individuals, stored in a computer, an invasion of privacy and to how much protection are individuals entitled?"

Against a backdrop which challenges society's acceptance of the influence which computer systems exert over people's lives, the ethics component follows naturally in a sequence which considers the values of the student as a computing practitioner, thereby personalising ethical issues, and moving away from the view of ethics as an abstract subject, (also noted by Couger, 1989). Firstly the concept of 'value' is explored in relation to beliefs, attitudes, activities or feelings which satisfy the criteria of:

- having been freely chosen
- having been chosen from among alternatives
- having been chosen after due reflection
- having been prized and cherished
- having been publicly affirmed
- having been incorporated into actual behaviour
- having been repeated in one's life.

Personal values are explored through clarification exercises (Raths et al., 1966 and others) in which the students examine their own value base implicit in their life and career aspirations. The students in this current study have shown considerable interest in this self exploration (as noted also by Kholberg and Gilligan, 1971). These exercises extend to discussions of how a commercial organisation, government department or instrumentality, or a professional body might establish a values base for their modus operandi, and make this public in a code of practice, by which their personnel or members are bound. The program moves from values clarification to an examination of the stages of moral reasoning identified by Kohlenberg (1981):

Stage one: A person is primarily motivated by the desire to avoid punishment from a superior power.

Stage two: A person is primarily motivated by the desire to satisfy their own quasi physical needs.

Stage three: A person is primarily motivated by the desire to be accepted by another individual.

Stage four: A person is primarily motivated by the desire to be accepted by the institutions which others approve, by fulfilling the institutional expectation and roles.

Stage five: A person is primarily motivated by keeping the variable and conditioned contracts and conventions which they have deliberately entered into for their own benefit and the benefit of others.

Stage six: A person, primarily motivated by their own conscience and judgement, seeks to apply that with consistency and respect for others.

The students are invited to examine and share situations where moral reasoning can be related to Kohlenberg's stages. These situations may involve, for example, driving within a highway speed limit (stage one or stage six?), or wanting to do good because it makes you feel good as one student suggested (stage two or stage three?), or trying to impress a lecturer, that is, getting a higher grade, by writing an essay which reflects the lecturer's views rather than the student's views (stage two or stage four?), engaging in less than ethical practice in order to survive in their part-time employment (stage four) or, in fighting to keep a University campus from closing and enjoying the 'rare opportunity' (as another student put it) of operating sometimes at states five and six. These honest and lively discussions are spiced with humour and brave declarations of what 'bugs' students in the frequently unjust and powerless situations, as well as the ethical dilemmas they experience in their personal, working and academic lives.

Early in the computing subject, the students experience (without attention being drawn to its significance) a very practical ethical dilemma. The first assessment exercise involves working with a partner in a simple survey and spreadsheet presentation of the heights of 200 students on campus. There are opportunities here for falsification of the data, that is, in manufacturing data instead of gathering it by questioning 200 randomly selected subjects.

As students in the computing laboratory watch their peers keying in data, it is obvious that some are creating their data on the spot. As well, there are opportunities for discarded printouts and charts to be used by the unscrupulous and submitted as their own effort. (This behaviour is recognised by tutors in the too perfect 'natural' curve of the height survey and in duplications of student assignments.)

There may be inequities of effort and expertise between the partners, but both will share the same mark for the assignment. ('Unjust!') is the outcry, but such is life in the workplace, where, increasingly, workers are required to perform tasks collaboratively. With the benefits of hindsight, the students are asked, how might fairness and trust be built into collaborative work with computers? 'By first working out an agreement or contract about equal sharing of the work, and with everyone agreeing not to cheat on the data collection, and knowing you can trust your partner about meeting deadlines without having to keep checking upon them', the students demand. Are these students developing a code of ethics for collaborative work? It seems highly likely that they are.

Much more can be teased from this exercise. For example, a discussion of the falsifying of research results, and the demonstration (in a paraphrase of the old adage about statisticians), that 'computers don't lie, but liars compute.' Also, the use of the discarded printouts revisits the ethical issue, 'Is copying software stealing another's intellectual property?'

This university course, like the others cited above, uses prepared scenarios of ethical dilemmas. A scenario is presented to the students at the start of the semester for their written response and retention for consideration once more at the end of the semester. Almost without exception their second response is more tightly reasoned and detailed than their first, and many students have changed their
opinion on which parts of the scenario constitute unethical behaviour. Parker, et al. (1990) is a useful resource for studies in ethical dilemmas relating to varied aspects of computing practice. These scenarios have been reviewed by a forum of 27 computing professionals, philosophers, and academics. Of significance are their disparate responses, evident in a table supplied at the end of the scenario and the behaviour (by consultants, employers or employees) that the experts have, or have not, judged to be unethical — a timely reminder that it is difficult to arrive at right answers to ethical problems.

A scenario, valuable for student use, involves varied ethical issues (Parker et al. 1990, pp. 167–173) relating to an Information Manager’s unofficial monitoring of electronic mail and his reporting to senior management on employees’ use of the system for personal purposes.

Like the ethics programs mentioned previously, the current study aims chiefly to sensitize students to ethical issues which they may face as computing practitioners. It examines also the conflicts which may arise between corporate ethics and personal values. Gellerman (1986), Jackall (1988), Andrews (1989) and Coady (1993) present views relevant to discussion of “whistle blowing.” A study of this phenomenon prompts a return to the Kohlberg stages for a consideration of the personal risks and costs of operating at stage six.

Imply in all the studies detailed in this paper is the opportunity for students to examine their existing attitudes towards ethical issues in computing, and, in the light of more information or divergent views on these issues, to confirm or reform their stance. There is no suggestion of didacticism in any of these programs.

Despite the paucity of models in the literature, these courses represent well-established programs which have evolved through systematic evaluation of each presentation. As such they provide useful examples of effective curricula developed by computing teachers who have received no formal training in morals and ethical reasoning.

OUTCOMES

In an evaluation of the ethics in computing program at the University of South Adelaide, students comment on whether or not they believe the aims of the course have been met. While a minority of students are negative or ambivalent towards the ethics program, most students refer to a growing ethical sense. Typical responses in the evaluation questionnaire are: “I suppose I’ve always known how to behave, but never really focused on ethics before” and “I liked the stages, they’re not really a challenge, but I wish I could be there at stage six some of the time. I’m too selfish, I guess, or lazy” and “I find myself thinking about my values now. Some are not so hot, but on the whole I guess I’m pretty straight.”

Most students comment favourably on the ethical dilemma exercise and report seeing what appeared (at the beginning of semester) as a simple and insignificant problem, transformed into a web of ethical issues as they return to this exercise later in the program. A typical comment: “When we first did this exercise, I thought why didn’t the manager just tell the guy to stop, but later I could see it wasn’t as easy as that and other things had to be fixed.”

Students appear less interested in conflicts between organisational and personal values, except in respect of the phenomenon of ‘whistle blowing.’ Here students are divided in their opinion of the value of this dramatic act in resolving serious questions of ethics. There is some evidence here that female students differ from males in their response to ethical issues, but this is beyond the scope of this paper and is matter for further investigation.

From a teacher’s viewpoint, there appears to be an increasing awareness of the ethical dimensions of their role as computer users on campus. Behaviour in the computer laboratories improves by the end of the semester. Students appear more co-operative and less competitive and the ‘cheating’ phenomenon seen in the early exercise is rarely repeated in later work.

The authors of several ethics programs detailed in this paper are, naturally enough, cautious in claiming that the aims of the courses have been met. Ethical reasoning and its associated practice is difficult to measure, and, in its representation of attitudinal change, would be valid only if measured over a period of time. Yet there is evidence of increased awareness, that is, the sensitising of students to ethical issues in computing, which has been recorded by all these writers. In terms of developing Ladd’s “autonomous moral agents,” this appears, at least, a satisfactory first step.

REFERENCES


