Ethics: the neglected factor in computing education

Paula Roberts

University of South Australia
Salisbury East
Australia

ABSTRACT

A program is described for the teaching of ethics within mainstream computing education as part of a wider study of the social implications of computer use. The program's content and methodology aim to sensitize students to ethical dilemmas in the use of computers and to the need for the development of personal and corporate codes of practice in information technology. Examples of other short computer ethics programs show how educators in the United States and Australia have demonstrated the place for ethics in the computing curriculum. Attention is drawn to the significance for the participation of girls and women in computer based education of the inclusion of ethical and social issues in computing, as well as the identification of a gender related stance in respect of these issues. The theoretical and practical bases of the ethics programs described are supported by reference to the literature.

Main conference themes:	social issues, equity issues
Educational areas:	higher education
Study topics:	business/commerce, computer literacy, humanities/social sciences
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INTRODUCTION

The teaching of ethics has been neglected in the computing curriculum even though government, accreditation bodies, professional associations and employers have argued that an understanding of the social and ethical aspects of computer use should be included in the preparation of computer professionals. In 1992 for example the Australian Federal Government's Discipline Review of Computing Studies and Information Sciences Education [1] recommended the inclusion of social issues and ethics in the computing curriculum for secondary and higher education. In the United States DeLoughry [2] reports that the US Computing Sciences Accreditation Board (which accredits computer science programs in colleges and universities) requires instruction in computer ethics and the social implications of computing as a criterion for accreditation. Similarly professional associations such as the Australian Computer Society require that their members adhere to the Society's Code of Ethics. In South Australia an ethics component was included in a Management Information Systems subject at the University of South Australia following a survey of 250 employers who rated 'workplace ethics' ahead of key competencies in computing and accounting for inclusion in the curriculum of a Graduate Diploma in Management. In this university the ethics of computer use is now included in an introductory computing subject which is compulsory for students in arts, education and science undergraduate awards.
    This paper describes the computer ethics program at the University of South Australia and discusses its rationale, aims, content and teaching methods. In an evaluation of the program's outcomes it reports that the inclusion of social and ethical issues has had a significant effect on the participation and retention of women in computer education.

Rationale for the teaching of computer ethics
In computing education it is easy to concentrate on training students to be competent users of the tools of the computer age and to neglect encouraging their awareness of wider issues such as the extent to which computers now exert control over so many parts of their lives. Forester and Morrison [3] highlight conflicting images in the use of computers, such as the ease and speed of information handling, yet in conflict with the public's vulnerability to the unmanageable complexity and misuse of computer technology and so less reliable and predictable than other pervasive technologies such as electricity, television and the motor vehicle. Despite these dangers computers are used for critical applications in medicine, aviation, nuclear power and missile systems, sometimes with disastrous consequences.

That computerized systems are also at the mercy of misuse by human operators has led to violations of the privacy of information, large scale computer crime, software theft, the creation of viruses and the corruption of data. Governments in recent times have enacted legislation with which to punish the perpetrators of these so-called 'victimless' crimes, if they are caught. However, the true extent of computer crime is not known. Recent estimates in the United States put the figure at billions of dollars a year with few 'white collar' computer criminals detected or punished because organizations are reluctant to prosecute for fear of revealing breaches of security.

The computing profession is a new profession with an evolving code of ethics. While bound by the same obligations as other professionals to society, employers, clients, peers and professional bodies, there are contradictions in the computing professional's role which set it apart. Despite limited status and autonomy the computing professional may have control of vital information processes and have power over employers, clients and the public; power which can be abused by the easily-tempted.

The computing professional bodies have developed Codes of Ethics. However these associations are exclusive, minority groups whose academic, practical and financial requirements for membership exclude the majority of computer users from the association and its influence. Johnson and Snapper [4] examine the use of these Codes by professional bodies and question their implications for the professional behaviour of members. They point to the uncertainty of whether or not a Code is meant to apply directly to workplace dilemmas, or if it intends only to express the ethical ideals of the association in the hope of sensitizing members (and others) to these values thereby raising the ethical standards of the computer industry.

In the face of agreement for the need for an ethical base for the computer industry (yet with uncertainty as to who is to be charged with the responsibility for its provision) teachers of computing have an essential role in teaching ethics to future computer professionals. On this premise the computer ethics program which is the subject of this paper, was developed.

Aims of the program in computer ethics

The aims of the ethics program are to increase the student's:

- understanding of personal ethical behaviour and decision making;
- ability to recognize ethical issues and alternative resolutions;
- awareness of corporate ethics and possible conflict between organizational and personal values;
- awareness of the ethical dimensions of the role of computing professionals and users.

Place in the computing curriculum
In the academic literature there is limited mention of the teaching of computer ethics. However, the research reports of Searls [5] and Couger [6] were useful in the design of this program. There is a consensus amongst these authors and the current writer that the teaching of ethics in computing should be integrated within mainstream computing and not taught as a separate 'ethics' subject. It seems inappropriate that any computing curriculum which includes a study of human interaction with computers or of the societal implications of computing, should avoid an acknowledgement of the ethical issues in computing.

Content and teaching methods
The computer ethics program at the University of South Australia is a component of a compulsory, introductory computing subject for Arts, Education and Science undergraduates. While this is the first subject in a computing major for some students, for most it is the only computing subject in their university studies. The significance here is that this program may provide a once-only chance for a consideration of the ethical dimensions of computer use by practitioners who most likely will use computers for all of their working (and personal) lives.
This introductory computing subject has three strands in its focus:

- the technical properties of computers;
- the social implications of computer use;
- practical experience with applications software.

The Social Implications of Computer Use strand is a weekly, semester long program which considers the effects on individuals and society of the uses of computers in the workplace, in government, in the military, in medicine, in law, in academia and in communications.
    As they study systems and processes, people and machines, and the benefits and disadvantages of computers the students are presented with ethical dilemmas which challenge society as personal and professional lives are changed by this technology.
    At the beginning of this strand, the students consider a short, moral dilemma from a collection of scenarios by Parker et al [7] and then make an individual, written response for personal review at the end of the semester. This exercise represents a pretest for the computer ethics program which follows the sessions in the Social Implications of Computer Use and concludes this strand.
    A major consideration in teaching the ethics program is the recognition that there is likely to be resistance by students to what might be construed as didacticism or moralising. The philosophy of the program is centred on the

belief that an ethical stance cannot be imposed on others, but has to develop through a personal choice from alternatives. A successful approach which has satisfied these considerations, is the use of values clarification exercises which have sparked the students' interest in examining their own value systems. This, combined with a study of Kohlberg's model of levels of ethical behaviour [8] is presented as one possible schema for the analyzis of ethical decisions.

The students relate the Kohlberg schema to a variety of everyday situations with rueful selfdisclosures and much amusement. For example, they debate whether reducing the speed of a vehicle in a speed zone is an example of a moral decision at the highest level of 'respect for others' or at the lowest of Kohlberg's levels: 'the desire to avoid punishment from a superior power'.

These sessions represent opportunities for ethical decision making based on personal choice, while later sessions examine ethical decision making in corporate settings where there may be conflict between personal ethical standards and organizational norms. The phenomena of 'group think' and 'whistle blowing' provoke lively debate when these are related to contemporary examples which are ever present in the media. The collection of writings which support these sessions, includes those of Andrews [9] who poses provocative questions on whether organizational standards (or culture) create or merely reinforce unethical behaviour.

In another session, students bring to class and discuss their prepared responses to two of Parker's [7] 'moral dilemma' scenarios (noted above). These dilemmas have gathered responses from an Ethics Workshop of a group of 'expert' participants (computer professionals, ethical philosophers and lawyers selected on the basis of their interest in computer ethics). The range of ethical opinions of the participants supports the view that ethical behaviour is a personal, autonomous stance and is not imposed by others. Of particular interest and significance is the divergence of student response to Parker's scenarios, a divergence which in the experience of this program, is related to gender.

Gender Issues in the Ethics Program
In [10] (and in other studies which have spanned more than a decade) Gilligan has identified a 'different voice' represented by a different moral stance which appears to be distinctly feminine. Gilligan defines this as a feminine gendered 'ethic of responsibility' relying on thinking which is both contextual and relational. The experience in this university ethics program is that female students, when working with the ethical dilemma scenarios, have seemed reluctant to assume any one particular stance or have taken more time to form a moral opinion than male students. Males appear more likely to see dilemmas in what they describe as 'black and white' terms, 'it's either right or it's wrong',

while the female students spend time in trying to tease out the various nuances of the situation before arriving at a conclusion. These observations raise interesting speculations and suggestions for further research.

Evaluation of outcomes of the program
In the final computer ethics session the students re-examine their pretest ethical scenario, write another response and compare their pretest with their posttest opinions. Many students identify a change in their reasoning from what some have termed a change from 'an intellectual response to a moral response'. While it is premature to consider that a short program in computer ethics might bring about lasting attitudinal change (and obviously this outcome could be measured only over an extended period of time) there is some evidence of an increased sensitivity to the ethical and social implications of the use of computers in most of the students.

Of special significance is the reaction of female students, not only to the computer ethics program, but to its context in the social implications of computer use strand. In the evaluation of this subject by questionnaire at the end of the semester female students have rated it more highly than females in this university's other introductory computing subjects which do not include a study of the social and ethical issues of the use of computers.

It is important to note that many female students record in the questionnaire that they will now enrol in further studies in computing.

Females are underrepresented in computer based education in this university, a phenomenon consistent with Australia wide and world wide participation rates which, always poor, are declining. The female interest in what they term the 'people aspects' of computing is to be encouraged. Griffiths [11] has noted the discomfort of girls and women with the existing computer culture and has argued for teaching initiatives designed to make the study of information technology more relevant for females. Griffiths' research is supported by the findings from the evaluation of this program.

CONCLUSION

Teachers of computing are to be encouraged to include a study of the ethics of computer use and should not feel inadequate in their approach. They cannot be expected to be both able computer professionals and also to have expertise in moral philosophy, any more than a moral philosopher might also have interest and expertise in the teaching of computing. Computing teachers should feel confident that their interest in the development of their students as

professionals, rather than mere technicians, is an excellent base on which to build programs in computer ethics.

It is hoped that this paper will extend the debate now taking place in Australia on the place and pedagogy of ethics in the computing curriculum [12].

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