

Teaching ethical issues in Information Technology: how and when

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1. Introduction

Information technology is of course a very much a taken-for-granted part of everyday life today. There are, however, many ethical issues that need to be considered and developed in I.T. This article will firstly consider some of the philosophical issues surrounding ethics and then examine some of the various ethical issues in I.T. specifically. Some of the different methods for teaching ethical issues in I.T. will then outlined as well as a consideration about when it is appropriate to teach these different ethical I.T. issues.

2. Philosophical issues surrounding 'ethics'

The question of 'what are ethics' has always been a central part of philosophy. So, any meaningful discussion about ethics must surely begin with a philosophical enquiry. The Stanford Encyclopedia of Philosophy refers to the great philosophers Aristotle, Socrates and Plato, saying that:

Aristotle conceives of ethical theory as a field distinct from the theoretical sciences. Its methodology must match its subject matter – good action – and must respect the fact that in this field many generalizations hold only for the most part. We study ethics in order to improve our lives, and therefore its principal concern is the nature of human well-being. Aristotle follows Socrates and Plato in taking the virtues to be central to a well-lived life. Like Plato, he regards the ethical virtues (justice, courage, temperance and so on) as complex rational, emotional and social skills (Stanford Encyclopedia of Philosophy, p.1).

The Encyclopedia continues, saying:

...Aristotle is deeply indebted to Plato's moral philosophy, particularly Plato's central insight that moral thinking must be integrated with our emotions and appetites, and that the preparation for such unity of character should begin with childhood education... (Stanford Encyclopedia of Philosophy, p.2).

Meanwhile, Kallman and Grillo (1992) argue that:

Ethics has to do with making a principle-based choice between competing alternatives. In the simplest ethical dilemmas, the choice is between right and wrong (Kallman and Grillo, 1996, p.3).

Ethics then, are often very subjective, and connected to our emotions and our basic sense of 'right' and 'wrong'. This means that it can be difficult to define ethics rigorously. This also applies to ethics in I.T.

Kallman and Grillo consider whether 'computer ethics' are different from 'regular ethics'; and argue that:

Most experts agree that there is actually no special category of computer ethics; rather, there are ethical situations in which computers are involved (Kallman and Grillo, 1996, p.4).

This would seem to be the most sensible way to approach the subject. However, it must be noted that there are a great variety of ethical issues that need to be considered in I.T., ranging from plagiarism, to ergonomics and the digital divide, through to netiquette and nanotechnology. These will all be considered in this article. Furthermore, the meaning of 'ethics' might be interpreted differently in these different circumstances.

3. Various ethical issues in I.T.

3.1 Introduction

Any analysis of information technology should begin with a definition of it. There are various definitions of I.T. The British Advisory Council for Applied Research and Development defines it quite succinctly as:

The scientific, technological and engineering disciplines and the management techniques used in information handling and processing; their applications; computers and their interaction with men and machines; and associated social, economic and cultural matters (British Advisory Council for Applied Research and Development, 1980).

Various writers have referred to the importance of adopting an ethical/moral approach to I.T. Mason says that:

Our moral imperative is clear. We must insure that information technology, and the information it handles, are used to enhance the dignity of mankind (Mason, 1986, p.10).

Professional computing bodies realise the importance of laying down good ethical foundations, and as Bowyer notes

...almost every professional organization dealing with the field of computing has published its own code of ethics (Bowyer, 2001, p.47).

This includes organisations such as the Association of Information Technology Professionals (AITP), the Association for Computing Machinery (ACM) and the Computer Society of the Institute of Electrical and Electronics Engineer (IEEE-CS). The ethical codes of different organisations have some differences, but they are all in broad agreement in regard to most of the important general issues. These include, for example, being honest in professional relationships and protecting the privacy and confidentiality of all information that is entrusted to the professional.

Ethical issues in I.T. differ from general ethical issues in a variety of ways. Parker, Swope and Baker note that ethical problems involving computers pose a special challenge, for a number of different reasons. Firstly, there is less personal contact. We sometimes associate the moral decisions that we make with our face-to-face contacts, including moral decisions on issues such as euthanasia and abortion. Such face-to-face contact is missing when using I.T. systems. This is why various 'codes of ethical practice' have been developed for email communication on some networks, for example, which can be referred to as 'netiquette'. Without such a code, and its penalties, some people would probably not address each other in an appropriate manner in these forums. Secondly, the speed of computers means that the likely repercussions of our actions might not be adequately considered, and this could lead to unfortunate consequences. An inappropriate email might be sent in a moment of rage, which the sender later regrets, but meanwhile irreversible decisions have been made on the basis of this! Thirdly, Parker, Swope and Baker point out that information in electronic form is more fragile than in paper form. Information in electronic form can easily be changed, it is vulnerable to unauthorised access and it can easily be reproduced. This raises questions in regard to issues such as intellectual property rights, plagiarism, piracy and privacy. Fourthly, there are issues around information itself. Information integrity, information confidentiality and information availability/non-availability can conflict with notions of information sharing. Fifthly, Parker, Swope and Baker point out that a lack of

widespread means of authorisation and authentication means that I.T. can be exposed to unethical practices.

Meanwhile, Kallman and Grillo (1996) outline various **rights** and **duties**, which can also be seen to be important areas to consider in relation to ethical issues in I.T. In regard to '**rights**', they refer to the 'right to know', such as the extent to which we have a right to know and have access to information about us in a database. Also, the 'right to privacy', and the extent to which we have a right to control the use of information that relates to us, such as our personal medical information. Finally, the 'right to property', and the extent to which we have a right to protect our computer resources from misuse and abuse, such as viruses. Under '**duties**' they refer to 'confidentiality' and the need for a professional to protect information from unauthorised access and use and 'impartiality', whereby a professional should aim to be fair and impartial. An example of 'impartiality' is where a software company makes new releases available to all customers, on the same basis. The extent to which such 'rights' and 'duties' are enforceable in practice is clearly debatable, but they provide some useful guidelines for those concerned with ethical issues in I.T.

There are also differences between wider ethical I.T. issues related to the well-being and dignity of humankind and people, and organisations behaving morally in their own use of I.T. The former includes issues such as transhumanism, nanotechnology, genetic engineering and the patenting of life-forms, and the latter includes issues such as plagiarism, netiquette and computer crime.

Kallman and Grillo consider computer ethics and individual responsibility, arguing that:

An individual who uses a computer, whether on the job or for personal use, has the responsibility to use it ethically (Kallman and Grillo, 1996, p.25).

They say that individuals should take responsibility in a number of key areas, such as protecting passwords and not leaving confidential information unattended on the screen. Clearly, there are differences between how individuals could and should behave ethically in I.T. matters, compared with how organisations could and should behave. Furthermore, different legislation applies. Legislation for copyright for individual creators of works is different from copyright legislation for organisations, for example.

The wider ethical issues in relation to I.T. consider the implications of I.T. for society in general. If those designing complex I.T. systems (such as nanotechnology) do not pay sufficient heed to

certain ethical/moral issues, then this could have very serious consequences for society and, indeed, for human kind in general. This is considered, in particular, in the nanotechnology section of this article. Bill Joy suggests that if we do not heed to moral principles then nanotechnology could begin to destroy humankind.

3.2 Types of ethical issues in I.T.

There are a great variety of ethical issues in I.T. that need to be considered, and some of the different types will be considered in this section.

3.2.1 Ethical dilemmas

There are various ethical dilemmas in relation to I.T. that need to be addressed. What are and are not ethical issues in I.T.? In regard to hackers, for example, are they testing the system or performing an immoral action? Will genetic engineering improve the quality of peoples' lives or start to destroy it? How do we recognise when an ethical dilemma exists? There are, indeed, many grey ethical areas.

3.2.2 Plagiarism

Plagiarism is where the work of others is copied, but the author presents it as his or her own work. This is a highly unethical practice, but happens quite frequently, and with all the information that is now available on the Internet it is much easier to do and is happening more often. As Bowyer states:

Plagiarism is the taking of the ideas, writings, drawings, words, or other similar intellectual property created by others and presenting it as your own. It is generally not a legal issue, like copyright infringement, but it is an ethical one. For example, you can reuse writings in the public domain without worrying about the legal problem of infringing a copyright, but presenting them as your own without proper credit to their true origin is an act of plagiarism. And plagiarism is unethical (Bowyer, 2001, p.267).

Bowyer also refers to 'self-plagiarism', whereby the author reuses his/her own words from a previous publication in a newer publication without referencing the older publication. There are software packages that operate to detect plagiarism from the Internet, but it would be highly beneficial if more work was undertaken in this area.

3.2.3 Piracy

Piracy, the illegal copying of software, is a very serious problem, and it is estimated that approximately 50% of all programs on PCs are pirated copies. Programmers spend hours and hours designing programs, using elaborate code, and surely need to be protected. Although some might argue that some pirating at least should be permitted as it can help to lead to a more computer literate population. But, for corporations, in particular, this is a very serious issue, and can significantly damage profit margins.

3.2.4 Hacking

Hackers break into, or 'hack' into a system. Hacking can be undertaken for a variety of reasons, such as the wish to damage a system or the wish to understand how a system works, so that money can be made out of it. Alternatively, there might be a desire to alert people to the fact that a system is insecure and needs improving. Due to this some argue that there are 'hacker ethics'. Mikkeee (und.) says that:

The ethics behind hacking and the actions taken by hackers constitute a philosophical manifesto that transcends our understanding of the art (Mikkeee, und. p.1).

Hacking can present a moral dilemma. This is because 'reformed hackers' sometimes offer their expertise to help organisations protect themselves against other hackers. Hackers cannot just wander into a system, as they could into an unlocked door. Instead, it requires a lot of skill. With this skill hackers can demonstrate that a system is insecure and needs improving. In this way, it could be argued that hackers play a valuable role. However, many such as Mikkeee, argue that hacking might lead to some improvements, but that it causes such a lot of disruption that it is not worth it in the long-run. Mikkeee suggests that there should be a National Data Protection Commission to monitor information, propose legislation and monitor abuse.

3.2.5 Computer crime

Many different computer crimes are committed, which clearly poses ethical questions for society. Various illegal acts are performed on computers, such as fraud and embezzlement. This includes, for example, using imaging and desktop publishing to create, copy or alter official documents and graphic images. There are also various

ethical dilemmas, such as whether copying such files is as bad as stealing something.

3.2.6 Viruses

Clearly writing and spreading virus programs are unethical acts, they have very serious consequences, and cause systems to crash and organisations to cease operating for certain periods. One of the most concerning consequences of such actions is when viruses interrupt the smooth functioning of an organisation such as a hospital, which could in extreme cases even cause people to die. Logic bombs are also sometimes planted.

There is obviously a lot of anti-virus software on the market now though that helps to deal with this ever-growing problem.

3.2.7 Ergonomics/health issues

There are many ergonomic/health issues related to I.T. Responsible/ethically-minded employers will, hopefully, give due consideration to this, as indeed should all employers. This includes issues such as the importance of taking adequate breaks from using the computer and ensuring that the screens comply with the regulations. Also, ensuring that the positioning of the chair and the computer is appropriate for the user and providing foot rests, when required. Some organisations will give special advice to their employees on these matters. When I worked at Clifford Chance, an international law company, for example, they had specialised staff who would come round to each employee individually, and discuss their ergonomic needs, if the employee requested this. Having enough light and having plants in the room can also be important factors. As Kallman and Grillo say:

Ergonomics is concerned with the physical work environment. The question is, how far should an organization go to be "ergonomically sound"? For example, what is required to provide data entry clerks with a healthful work area? How can a firm create an environment that results in minimal eyestrain, guards against back problems, prevents repetitive-motion syndrome, and protects against exposure to possibly harmful CRT (cathode-ray tube) emissions? (Kallman and Grillo, 1996, p.27).

Without such ethical/moral awareness and taking the necessary action, many workers will suffer health problems directly from I.T., such as back problems, eyestrain and eye infections and repetitive strain injury (RSI).

3.2.8 Job displacement/work pressures imposed on computer professionals

Computers are changing the face of the work scene. For some people, their jobs are becoming redundant or they have to play quite different roles, and others are suffering increasing levels of stress from work pressures. Others are, obviously, reaping the benefits of having more rewarding jobs, and there is certainly more emphasis on knowledge, information and I.T. skills than ever before. However, this all clearly poses various ethical issues. Should those that lose their jobs be compensated? How can the pressure be eased on those that are suffering stress? Is it acceptable for computer programmers to be made redundant 'on the spot' etc? There are many ethical issues that need to be addressed here.

3.2.9 Digital divide

The digital divide poses a serious problem today. A new breed of 'haves' and 'have nots' are being created, between those that have access and can use a computer and the Internet, and those that do not have such access. There are clearly serious ethical implications here. Those that do not have such access may well be discriminated against, feel 'socially excluded' and miss out on many life opportunities. As Lynch says:

One of the major issues in electronic networks is the question of access: who will have access to the networks, and what kind of information will be accessible. These questions are important because networks offer tremendous economic, political, and even social advantages to people who have access to them. As the networks become a larger presence in society, conflicts may arise between information "haves" and "have-nots". Conceivably, network communication could create greater equality by offering common access to all resources for all citizens. Already, in a few places scattered around the country, experiments with "freenets", network connections established through local libraries or other municipal or local organizations specifically for people who otherwise would have no way to use the networks, have shown that those people will, for instance, participate more in local government issues. They therefore have a greater voice in whatever happens with a local government. Conversely, if access is not evenly distributed, it threatens to perpetuate or deepen existing divides between the poor, who cannot afford expensive computer systems, and the better-off (Lynch, 2000, p.9).

This is all very concerning. However, there will always be inequalities in some shape of form, whilst we live in global capitalism, I would suggest. There will be both absolute and relative

poverty; absolute poverty being the state of poverty that people are in where they lack the basic means for survival, such as food and shelter, and relative poverty being where some members of a society are poor relative to other members. Clearly, the digital divide is an example of relative poverty.

3.2.10 Gender

There are also ethical issues in regard to gender and computers, given the fact that females are often discriminated against in various ways in this new I.T. age. As I emphasised in my article *Females, computer and libraries*:

The computing world is very male-dominated...For various reasons, such as early socialisation, the male-dominated computer environment, and an apparent lack of confidence, females tend to focus on the softer subjects. They either do not study and move into areas such as computing, mathematics and engineering at all, or if they do many subsequently become discouraged and disillusioned and leave. Males dominate the computing world and even more disturbingly the numbers of women going into IT are falling (Rikowski, 2003, p.6).

Furthermore, Butcher notes the fact that:

Only around 5% of young women consider the IT industry for a career; with most perceiving it as nerdy, even though girls who pick IT often excel (Butcher, 2003, p.6).

Also, the number of females in computing academia is low. Wade, reporting in *The Guardian*, says that:

Computing degrees are notoriously male-dominated; nationally there is an average of only 21% of women registered on them (Wade, 2001, p.15).

Margolis and Fisher consider early socialisation both at home and school, emphasising that:

Childhood behaviours, however conditioned by gender socialization and genetics, tend to set computing on the male side of the gender divide (Margolis and Fisher, 2002, p.32).

Margolis and Fisher undertook some detailed research into women and computing. They conducted over 230 interviews with over 100 male and female computer science students, during a four-year period (from 1995-1999) at Carnegie Mellon University. In this research they consider the fact that women's confidence in computing is often undermined. They refer to one participant, Carmela, for example, who started programming when she was

about 5 years old. Carmela found that comments made by her male classmates overwhelmed her and undermined her confidence. She said:

Then I got here and just felt so incredibly overwhelmed by the other people in the program (mostly guys, yes) that I began to lose interest in coding because really, whenever I sat down to program there would be tons of people around going, "My God, this is so easy. Why have you been working on it for two days, when I finished in five hours?" (p.79).

Furthermore, when females do work closely with computers, it is often in the lower-level of work. As Wilding said:

Why are women a tiny percentage of computer programmers, software designers, systems analysts, and hackers, while they are the majority of teletypers, chip-assemblers, and installers, and low skilled tele-operators that keep the global data and infobanks operating? (Wilding, und., p.2).

Also, computer screens and layouts are frequently designed and programmed by men, and they might not be ideally suited to women, which could affect the quality of the work that women produce.

All this clearly has serious repercussions for society. Certain aspects of the digital divide will not only apply to the 'haves' and the 'have nots', but also to males and females. Furthermore, men tend to obtain the better quality I.T. jobs, earn more money, and make far more of the important decisions in relation to I.T. Basically, men are driving the I.T. age forward, whereas females are playing more passive roles, confined to working with the systems that men have already created, but which might not be ideally suited to them. These are all ethical issues that people should be made more aware of, and efforts need to be made to try to remedy the situation.

3.2.11 Nanotechnology

Nanotechnology presents a new set of ethical dilemmas. Colvin says:

For the past decade, nanotechnologists have basked in the glow of positive public opinion. We've wowed the public with our ability to manipulate matter at the atomic level and with grand visions of how we might use this ability. All this 'good news' has created a growing perception among business and government leaders that nanotechnology is a powerful platform for twenty-first technologies (Colvin, 2002, p.1).

Nanotechnology could help humankind and help to provide adequate food and shelter. On the other hand, it could be very

dangerous. There are also various environmental issues to consider, such as the effect that nanomaterials have on living systems. There is a relatively low investment in environmental nanotechnology, which must surely give us cause for concern.

Bill Joy considers nanotechnology issues in some depth. Joy has worked with computer networking for over 25 years and has written computer programs such as the Unix utilities and the Vi text editor on Unix. He says in regard to ethics:

I believe we all wish our course could be determined by our collective values, ethics and morals (Joy, 2000, p.256).

However, he speaks about nanotechnology saying that:

...it is far easier to create destructive uses for nanotechnology than constructive ones (Joy, 2000, p.246).

Furthermore:

...we have the possibility not just of weapons of mass destruction but of knowledge-enabled mass destruction (KMD), this destructiveness hugely amplified by the power of self-replication. I think it is no exaggeration to say that we are on the cusp of the further perfection of extreme evil, an evil whose possibility will spread well beyond that which weapons of mass destruction bequeathed to the nation-states, on to a surprising and terrible empowerment of extreme individuals (Joy, 2000, p.9).

He concludes by saying that:

I have always believed that making software more reliable, given its many users, will make the world a safer and better place; if I were to come to believe the opposite, then I would be morally obliged to stop this work. I can now imagine such a day may come (Joy, 2000, p.262).

Thus, these are all very serious ethical issues that need to be confronted sooner rather than later. If it appears to be the case that advanced aspects of I.T. are seriously threatening our way of life, then something surely needs to be done about it as soon as possible.

3.2.12 Expert systems

Expert systems are a body of information in a specific field that is held in an electronic format, such as a 'doctor expert system', that houses detailed medical information on a database. Various questions can be posed in regard to expert systems, such as what is the basis of ownership? Is it the different elements that comprise

the total system or the total package? These issues are related to intellectual property rights and the moral aspects in regard to this. Belohlav, Drehemer and Raho (und.) report on a survey of information system professionals that was undertaken, which examined the perceptions of these professionals on the development and use of expert systems business organisations. The population that was examined was the membership of the Data Processing Management Association (DPMA), and 499 usable questionnaires were returned. The DPMA is the largest general computing association in the United States. The survey examined how knowledge of an expert system was developed. Respondents said that individual experts in an organisation should be informed about their participation, but that they should not necessarily be forced to participate in creating an existing system. Furthermore, they said that they were not the owners of the end product. Thus, the respondents had clear opinions about their moral rights in relation to the use of their intellectual property for expert systems, although also:

The results indicate that no uniform ethical perspective dominates the perceptions of the respondents in assessing expert system applications (Belohlav, Drehmer and Raho, und., p.1).

This, perhaps, helps to illustrate the complexity of ethical issues here.

There are also wider ethical issues in regard to expert systems that need to be explored. In regard to a 'doctor expert system', for example, such a system can provide accurate information, but the face-to-face contact is missing. Such face-to-face contact might prove to be essential in order to ensure that the right diagnosis is made, and it is possible that some individuals could even die as a result of a wrong diagnosis given through this lack of face-to-face contact. In other ways expert systems could help to save lives. The patient might, for example, be given a speedier response. All these ethical issues need to be considered further.

3.2.13 Genetic engineering and the patenting of life-forms

Many ethical issues are raised in regard to genetic engineering and the patenting of life-forms. Is such behaviour morally acceptable? Such debates can sit alongside debates on subjects such as euthanasia and abortion.

3.2.14 Netiquette

There are also ethical/moral codes that should be adhered to, in the use of networks and email correspondence. As already indicated, the setting up of such codes has become necessary as people have not always addressed each other in an appropriate manner through this means of communication, and in this way they have behaved unethically. As pointed out by Margaret Lynch (1994) guidelines for 'on-line civil behaviour' include, for example, not wasting peoples' time and not taking up network storage with large files. Furthermore, not looking at other peoples' files or using other systems without permission and not using capital letters, as this denotes shouting (unless one does actually want to shout at someone through email!). Also, people that become too obnoxious can be banned or ignored. A 'kill file' can be set-up which will automatically erases messages from that person.

3.2.15 Intellectual property rights: the moral rights

There are moral rights embedded within much intellectual property rights legislation, agreements and directives, for the benefit of creators of works and copyright holders. Furthermore, there are penalties for those that violate such legislation, (such as violating copyright legislation), although this can sometimes be difficult to enforce in practice. The legislation, though, is often complex and difficult to understand, which means that some creators of works do not obtain the moral rights that they are entitled to. However, sometimes, moral rights are actually excluded from agreements. This applies to the World Trade Organisation's Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS) (1995), in relation to copyright. As the WTO says:

...Members do not have rights or obligations under the TRIPS Agreement in respect of the rights conferred under Article 6Bis of that Convention, i.e. the moral rights (the right to claim authorship and to object to any derogatory action in relation to a work, which would be prejudicial to the author's honour or reputation), or of the rights derived there from (WTO, und., p.4).

The Berne Convention is over 100 years old, and deals with copyright issues in great depth. All of the Berne Convention has been incorporated into TRIPS, apart from the moral rights. This should surely give us cause for concern.

3.2.16 Issues of data collection, storage and access

There are many moral issues that need to be considered in regard to the collection, storage and access of data in electronic form. Under what circumstances, for example, should one seek permission from or inform those whose records are on file? Furthermore, how accurate is the data and who has access to it?

3.2.17 Speed of computers

The pure speed at which computers operate can cause ethical problems in themselves. It can allow people to perform unethical issues quickly, or perform operations that it was difficult or impossible to perform before, such as browsing through files that one is not authorised to. It can also mean that people do not give enough consideration before performing various actions.

3.2.18 Vendor-client issues

Ethical issues also arise in regard to vendor-client relationships, the vendor being the computer supplier and the client being the person that is buying the computer system, whether this be the hardware or software or both. If the user continually changes the system specification, for example, to what extent should the vendor be prepared to adjust the system specification accordingly? Other unethical acts include, for example, consultants selling the program to the second client, after being paid to develop the program for the first client only. Also, the vendor might provide hardware maintenance according to a written contract and for hardware to be repaired in a 'timely manner', but the client might not believe that the repairs have been timely. Drawing up more precise contracts might help here, but in some instances the outcome can probably only depend on peoples' individual moral consciences.

3.2.19 Conclusions

Thus, there is a vast range of ethical issues in I.T., and some of these have been discussed in this article. These can be broken down into a number of sub-headings, including computer crime, social implications, advanced I.T. issues, netiquette and intellectual property rights. Some of these can be solved quite easily, whilst others seem to be almost impossible to solve. Kallman and Grillo say that in order to create an ethical computing environment we

need to establish rules of conduct. Referring to ethical issues in I.T. in general, they say:

Because computers permeate our work and personal lives, all of us have an obligation to see that they are used responsibly. The factors that characterize ethical dilemmas in a computer environment include the speed of a computer, vulnerability of computer data to unauthorized change, and the fact that protecting information often decreases its accessibility. Because of the effort effect, harmless situations may turn into harmful ones without our realizing it (Kallman and Grillo, 1996, p.31).

There is much food for thought and a lot of work that needs to be done, if we are to meaningfully address some of these issues. Not addressing some of these issues (such as computer viruses) is not an option anyway, if we want to continue to live in an I.T. age (which seems inevitable anyway) – we cannot have viruses causing our I.T. systems to continually crash.

4. How to teach ethical issues in I.T. – different teaching methods

4.1 Introduction

Clearly, teaching ethical issues in I.T. is important, and there are many different ways in which these issues can be taught. This section will consider some of these methods. Doris Lidtke says:

Teaching social and ethical issues in computing seems to have become a requirement in computer science curricula within the past few years...only a few within the profession have been concerned with the issues of computing and values, and only within the past few years has there been some consensus about the need for every undergraduate student to acquire some understanding of the professional and ethical standards of the field (Lidtke, und., p.1).

Furthermore, Computer Learning Month 1990 Contests said that:

Ensuring our children develop positive values and a sense of ethical and responsible use of technology is our responsibility as adults (Computer Learning Month Contests, 1990).

Following on from this, they ran a Computer Learning Month 1990 Contest, to examine this further, and some of the teaching methods that they used are considered below.

4.2 Different teaching methods for teaching ethical issues in I.T.

4.2.1.1 Lectures and seminars

Lectures and seminars are obviously the standard traditional teaching methods in universities, and they are, indeed, valuable teaching methods. The importance of them should not be undermined, simply because they are traditional methods that are being used in a non-traditional subject area.

4.2.1.2 Online collaborative tools

There are various online collaborative tools on the market, such as Blackboard. They are useful because they provide opportunities for groups to debate issues online. This is particularly important in a subject such as ethical issues in I.T., on topics such as plagiarism and the digital divide, as well as a means for storing information and documents, such as discussion documents on 'work in progress' obtaining lecture notes.

4.2.1.3 Worksheets

This is another traditional method. Students can be asked to complete questions on worksheets. Students can also be broken up into groups, and the questions on the worksheet can then be discussed further, followed by feedback sessions.

4.2.1.4 Storybooks

Storybooks can be a very good teaching method for primary school children. Suzy Bagley of Kaley Elementary School in Orlando, Florida, for example, (see Computer Learning Month 1990 Contests) ties the teaching of computer ethics to themes of pirates and Captain Hook. This can help to make the message real.

4.2.5 Role playing

Role playing can be very useful as it helps to make situations seem real. Students can act out court procedures regarding some ethical issues in I.T., for example, such as the pirating of software. Participants can play different roles, such as judge, prosecutor and defender and act out the court scene.

4.2.6.1 Classroom discussions

Classroom discussions can be invaluable, if structured properly. As those writing up the Computer Learning Month 1990 Contests said:

Class discussions are important in most strategies for teaching children computer ethics, as students have the opportunity to discover and better understand all sides of ethical issues and develop their own values (Computer Learning Month Contests, 1990, p.2).

Specific topics could be debated, such as the digital divide, gender and I.T. issues and hacking.

4.2.6.2 Brainstorming sessions

Brainstorming is another very popular, tried and trusted teaching method. Students can be given a question or a theme, which can then be discussed in groups and then fed back to the whole group. Sometimes, the main ideas can be written up on flipchart paper in various ways, such as by using a simple point system, mind maps and/or diagrams. Students could discuss, for example whether it is ever acceptable to hack into a system.

4.2.6.3 Use real-life examples

Using real examples is wonderful if there is the opportunity to do this. This could include, for example, examining an anti-virus package; isolating a virus and examining how and what damage it can create; observing real work situations where I.T. staff are suffering stress; examining the ergonomic environment of staff working with I.T. and considering some real examples of plagiarism.

4.2.6.4 News stories

Students can research and discuss news stories on computer crime. David Heath, Friends School of Baltimore, Maryland (see Computer Learning Month 1990 Contests) suggested that students list the pros and cons of pirating software, discuss which facts they would be comfortable with other organisations having about them and whether information should be available for sale to others.

4.2.6.5 Developing billboards/posters

Billboards and posters can be used to communicate ethical messages and standards to other students. Jeanine DeLay from Greenhills School in Ann Arbor, Michigan, used this method effectively (see Computer Learning Month 1990 Contests).

4.2.6.6 Conduct surveys

Students can conduct surveys to establish, for example, other students' attitudes about computer ethic issues. Jeanine DeLay also used this method (see Computer Learning Month 1990 Contests). Larger surveys could also be undertaken, and questions could be asked to the wider population. This could be undertaken as part of a research methods course, for example, and/or as part of a dissertation.

4.2.6.7 Speakers

Guest speakers can be invited along, to speak about various ethical issues in I.T. These could include writers, I.T. experts and academics. This could be followed by a discussion.

4.2.6.8 Discuss consequences of computer crimes

Students could, for example, review software licence agreements and discuss this. This can help students to understand the law and variations in policies across companies. Margaret Synder from All Saints Catholic, Pottsville, Pennsylvania undertook this method (see Computer Learning Months 1990 Contests).

4.2.6.9 Musicals

Computer ethics could be explored through a musical. Indeed, the musical that is currently showing in the West End, 'We will rock you' which is written by Ben Elton, and features the music of the group Queen, considers the ethical issues in relation to music being downloaded from the Internet. In this futuristic world, there is no place for musical composers and musical instruments. Only music that is downloaded from the Internet is acceptable. The musical focuses on the 'deviants' who would not comply with this, and tried to create their own music. These are serious issues here that need to be considered further. Will the downloading of music from the Internet stifle musical creativity and what are the likely consequences of this for humankind?

Louise Kann, (see Computer Learning Month 1990 Contest), looked at computer ethics through a short musical. Characters in the musical included 'Computerbug', a character that added bugs to software programs and 'Bender' who bends and takes discs from the disk drive when the 'busy' light is on.

4.2.6.10 Inputting information on to a database

Students could input their personal details into a database as an experiment. The teacher could then make changes to the information and have a discussion around how students feel about

having their personal information tampered with in this way. Robbi Ray used this method (see Computer Learning Month 1990 Contest).

4.2.6.11 Book, journal articles and newspapers and I.T. information sources, such as ejournals, the Internet, websites and weblogs

Books, journal articles and newspapers as well as the various I.T. information sources all provide rich sources of information, which can be used to find out more details about some of the various ethical issues in I.T.

4.2.6.12 Conclusion

There are many different ways in which ethical issues in I.T. can be taught, and some of these methods have been explored in this article. However, consideration also needs to be given in regard to which are the best methods to use, both in an ideal situation, and in reality. By this I mean that one of the best methods to use in an ideal situation would probably be the use of real-life examples. However, this might be difficult to achieve in practice – there might be a lack of resources and/or it might not be feasible to arrange. Making the necessary arrangements for students to observe a real work situation of I.T. staff working in a stressful environment, for example, might actually be quite difficult to achieve. Furthermore, some methods will be more appropriate for one particular group of students, whilst other methods will be more appropriate for another group. The musical method, for example, might be ideal for drama and music students, but quite inappropriate for students studying chemistry. Other examples are more likely to appeal to all students and to be feasible. This would include the more traditional teaching methods, such as lectures, seminars and classroom discussions. Other methods can be used in longer-term projects, such as conducting a detailed survey as part of a research qualification.

5. When to teach ethical issues in I.T.

When should people first be introduced and made aware of ethical issues in I.T? Given the importance of I.T. today, it should probably be introduced in the primary school. Obviously, the type of subject areas to include would have to be considered carefully, to ensure that they would be suitable and that most children would be able to understand it. It could include information about piracy and

plagiarism, for example, as these are topics that children are likely to come into contact with early on and to be affected by. At the other end of the age spectrum, we can ask whether elderly people should be made aware of and taught these issues? Some elderly people are not very familiar with computers at all, but should this be allowed to hold back those that are forward-looking and enthusiastic, and use computers, and might benefit from being made more aware about these ethical I.T. issues? If such courses are run for the elderly it then has to be decided when and where such courses are to be held.

In regard to university, there are various issues to consider here. Clearly, a variety of ethical issues in I.T. need to be taught at university. But when should they be taught? Whilst some ethical issues in I.T. need to be taught on all courses, others are more specialist. Issues around plagiarism need to be taught on all courses, and should be emphasised and reinforced at various points on the course, I would suggest, such as at the beginning, in the middle and at the end of a course. Other topics should be taught as part of a unit on a course - whether that is an undergraduate or a postgraduate course. Job displacement could form part of an Industrial Relations unit, for example. Whereas other subjects could be units in their own rights. In general, subjects such as nanotechnology and expert systems could be taught on specialist I.T. courses and subjects such as the digital divide, ergonomics and job displacement could be taught on social science courses (either as a part of a unit or as units in their own rights). Decisions also have to be made in regard to *when* to teach these ethical issues in I.T. – whether towards the beginning, middle or end of a course/unit; what time of the day, such as morning, afternoon or evening; and the length of the teaching, such as one hour, or two hours, within a session.

Some ethical I.T. issues need to be taught in the work-place. Topics here could include, for example, hacking, ergonomics and viruses. Ethical issues in I.T. can also be taught in various other institutions, such as colleges and community centres. It could also be undertaken through e-learning and various online facilities, such as through websites, email lists and online collaborative tools.

Several issues need to be considered for all courses. These include: what subjects to cover; when to have sessions; how long the sessions should be; what level to teach at; whether to teach in-house and/or have external I.T. trainers and what documentation to provide.

In the future, the teaching of ethics in I.T. is likely to become even more important.

6. Conclusions

The I.T. age has presented us with a new set of ethical dilemmas. As Lynch says:

New computer technologies for gathering, storing, manipulating, and communicating data are revolutionizing the use and spread of information. Along the way, they are also creating ethical dilemmas. The speed and efficiency of electronic information systems, which include local and global networks, databases, and programs for processing information, force people to confront entirely new rights and responsibilities in their use of information and to reconsider standards of conduct shaped before the advent of computers (Lynch, 2000, p.1).

This article has examined some of the different ethical issues in I.T. and how they can be taught effectively. The various ethical issues can be broken down into various sub-categories, such as social issues, computer crime, intellectual property rights and advanced I.T. issues. When teaching ethical issues in I.T. a number of factors need to be considered. These include: which ethical issues in I.T. to teach and how to teach these issues – which teaching methods to use. Also, what level to teach at; how much time to allocate to these teaching/training sessions; what types of material to use; whether and to what extent real-life situations should be explored; when it should be taught and where it should be taught, such as primary school, college, university and the work place.

These ethical I.T. issues are not going to disappear, so they need to be explored and tackled, although some of them might, in essence, be irresolvable, especially whilst we live in capitalism. The main aim of computer companies, for example, is to make a profit, and this might, and indeed often does, conflict with the needs of the clients that have bought the software and hardware and expect a good level of support. Continually upgrading products is often not in the customers' interest, even though computer companies will try to persuade its customers that it is. Such companies are in the business of creating wants and needs for people – sometimes creating wants and needs that they never knew they had! As Dodson, writing in *The Guardian*, said:

Around once every two years most major UK companies upgrade their office software. Perfectly good programmes are thrown out, to be replaced with newer versions, all in the hope that faster, more reliable software will speed up the time it takes to do office tasks. But like the myth of the paperless office, will this promise ever be realised? Or are

software upgrades more trouble than they are worth? ... Ultimately, the real fear is that software packages lead to de-skilling (Dodson, 2000, p.5).

Richard Reeves also makes the point that:

Capitalism stands accused of many crimes, but its capacity to keep creating demand, which people have to be employed to meet, seems limitless (Reeves, 2001, p.11).

So, this conflict might mean that companies do not, in reality, give enough consideration to the ethical issues in I.T., as the drive to create new products and upgrade products, thereby raising the profit margin, takes precedence over moral considerations. Some of the ethical issues in I.T. are being tackled more effectively though (although there is obviously always room for improvement). Great efforts are being made in regard to finding ways to deal with viruses, for example, and more and more attention is now being given to ergonomic and health issues.

Also, though, whilst it is useful to be aware of the ethical dilemmas/problems, time can undoubtedly be wasted if too much attention is given to trying to solve some of them. One example here is the digital divide. Whilst we live in global capitalism, there will always be inequalities, I would suggest. So, now that we live in an I.T. age, there will always be some people that have greater accessibility to computers than others. We can attempt to make this somewhat fairer, by having more computers available in public libraries, for example, and enabling the public to search on the Internet for free, but the problem cannot be solved in a total way. In order to solve the problem on a lasting basis, we need to look beyond capitalism.

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