‘Social, Legal and Professional Issues of Computing’: Course contents and ethical awareness

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Abstract
We are constantly reminded of the security vulnerability of information systems through reports in the media, security alerts and the latest in security “fixes” from Internet Service Providers, and admonishments from employers to be constantly vigilant against virus attacks and unauthorized intrusions. Whilst these reactive approaches are necessary to address the problem confronting computer security today, we argue for a more pro-active approach directly aimed at tomorrow’s professionals. This paper outlines the approach taken in the UK promoted by the British Computer Society to raise awareness of these issues with Computing Science undergraduates. In particular we discuss the content and structure of an UK university’s course at a school of Computing Science, addressing these issues. A survey investigating the development of the students’ ethical awareness on selected scenarios will also be discussed.

Key words
Security, ethics, professional issues, human factors, information security education, ethical scenarios.

1. Introduction

The name of this conference include the words: “security education” and almost all of the topics in the call for papers include the terms: training, education and security awareness, teaching cyber ethics, and so forth - showing a high level of interest, and concern in security training and awareness. Part of security training is to highlight the “people” issue. Schneier [2000] talks about the weakest link as people in the security chain and that they need to be educated. Social problems can’t be solved with technical solutions. The media is awash with articles on non-compliance with ICT laws [ITWEB, 2003, 2004,] or ethical dilemmas [ComputerWeekly.com, 2002] or human failings [Computer Weekly, 2004] or e-crime [Computing, 2004]. The need for computer science departments to address these issues was debated in the Communications of the ACM with specific reference to the ‘tenth strand’ which include social and professional issues.

The aim of this paper is to discuss a UK university’s course in Social, Legal and Professional issues of Computing and to assess its impact on the undergraduates as they learn to become computing professionals. The course was offered for the first time in 1998 to a small group of students, and developed to its current structure in 2000. The content is updated, as in any academic discipline, and particularly so in Computing to keep up with regular advances in the field.
This paper will firstly look at the content of the course, secondly at the reasons behind the format of the course and finally we report on a survey which tested the students’ ethical awareness and the possible effect of the course on students. In our conclusion we highlight the importance of these topics to be included in the computing science curriculum from the viewpoints of teachers as well as students.

2. Content of course

The course – Social, Legal and Professional Issues of Computing - runs each semester, is compulsory for all second year Single Honours degree students, and offered as an option to other second years taking a Joint Honours degree. The student cohort are from different programmes: Business Information Systems, Computers and Multi-Media, and Computer Communications (networks). The University, located in North London, attracts a culturally diverse and international student population, and the School of Computing Science provides distance learning to a number of overseas universities. As well as being taught in London, the course discussed in this paper also currently runs in Hong Kong and China.

The aim of the course is to provide the students with tools to enable them to build information systems to appropriate ethical, legal and professional standards. It runs over 12 weeks and a different topic is covered each week. It begins with an introduction to computer ethics and theoretical frameworks, and continues with topics such as: hacking, computer crime, intellectual property rights, the Internet and content regulation, privacy, and codes of conduct, amongst others.

The learning outcomes are given as: understanding the general issues of ethics, develop ethical thinking skills, understand and analyse an ethical problem, construct and present a rational argument, awareness of discussions and literature on ethical issues within the field of information systems, awareness of professional responsibility in the field, and the impact of information systems on society.

The students receive one lecture and one seminar each week, and are assessed on a group presentation, individual essay, and exam. The seminars are structured specifically to encourage discussion on the issues presented, thereby allowing different viewpoints to be explored and rationally analysed. Students are supported by material written specifically for the module, drawn from current debates in the field, and delivered in on-line format – in keeping with the technological bias of the students, and utilising various learning approaches (such as on-line activities). The students have a few core textbooks prescribed to them. Supporting texts are also recommended to students to broaden their knowledge, and offer a more global perspective. The libraries at all home (London) campuses are well stocked with relevant text books.

Students have a module handbook which gives the aim and outline of the course, textbook references and a summary of each topic that is covered during the semester. Also included are: explanations of the assessments, guidance on assessment criteria, short articles for discussion in seminars, a past exam paper, and the British Computer Society Code of Conduct.
3. Rationale for the course

In its original pilot form the course addressed the issues of the day - i.e. those issues arising in 1998, a time when the Internet was becoming more widely used (as the World Wide Web). In particular issues of content and regulation, legislation, viruses and other malicious attacks, including unauthorised access are included in the course.

The course developed in line with the promotion by the British Computer Society to include Social, Legal and Professional issues of computing in the Computing Science (CS) curriculum. In the UK the British Computer Society offers accreditation to those CS degrees that comply with certain criteria. Inclusion of social, legal and professional issues is a compulsory requirement of gaining accreditation – not necessarily as a separately taught component, these issues can be included in other courses (programming, HCI, multi-media etc.). However, universities must show how these issues are being addressed, and demonstrate that students have knowledge of the issues. There are advantages to providing a course specifically dedicated to these issues (e.g. quantifiable indicators of student learning), and advantages to integrating the discussions in the normal Computing Science modules (e.g. discussing the issues in the context of application areas). In the University under discussion, the practicalities of reaching all students, over three campuses (in London) and overseas, and given the numbers of students involved (500+ each semester), it was considered that a dedicated module was the most appropriate method.

4. Assessment of student awareness of ethical issues

During the second semester of 2003/2004 a survey was undertaken to assess the ethical awareness of students that were busy with this specific course. The survey was based on an adaptation of a questionnaire developed and used by Methakunavudhi [1995], Yngström [1998] and Drevin and others [2000]. The scenario method was used to present ten cases to students. Students were asked to judge the actions in each scenario as ethical or unethical. Separate questions were asked to establish their general interest and knowledge about the field in question. Aspects included in the scenarios form part of the ACM Code of Ethics [ACM 1992]: e.g. security, privacy, use of services, different environments, intellectual and physical objects. The actions in every scenario presented to the students were unethical.

23 questionnaires were completed and used in this survey. The following will be reported on:

- Total or overall awareness. This indicates the percentage of students that rated the actions in a specific scenario as ethical.
- Attitudes of the different fields of study (i.e. Business Information Systems (BIS), and Computer Communications (CCM)
- Knowledge of IT related laws
- Gender
- Age groups
- Diverse first languages (suggesting cultural differences)
4.1 RESULTS

4.1.1 Total or overall awareness
This first analysis shows total awareness which indicates the percentage of all students that rated the actions in each scenario (1-10) as ethical. E.g. Scenario 1 was rated ethical by almost 26% of the respondents or almost 74% of the students rated scenario 1’s actions as unethical. The lower the percentage of the ethical rating, the better their ethical outlook is – meaning the students could identify the actions as unethical.

The students’ overall ethical awareness according to their responses to the scenarios is shown in figure 1. On average, almost 63% of the students judged the scenarios as unethical – meaning that they could identify the actions in the scenario as unethical (which is correct). The highest response was to Scenarios 2 and 5 – each of these was rated as ethical by over 65% of the students. Scenario 2 was concerned with project development, and included aspects of efficiency and quality, and meeting requirements. Scenario 5 dealt with honesty and reliability of people, evaluation of systems and attitudes to responsibility. Scenario 7 was rated as unethical by almost 83% of the respondents. It involved the privacy of other and respect of confidentiality. This could imply that the students consider privacy as an important issue not to be compromised.

Figure 1 shows the overall rating for each scenario for all of the students. The 10 scenarios that had to be rated are indicated by numbers 1 to 10. Each scenario describes a different ethical situation and the students had to rate the actions in the scenario as ethical or unethical. (The actions in the scenarios were all unethical).

![Figure 1](image)

Total evaluation: % that see a scenario as ethical

4.1.2 Assessment of students on different programmes of study
The survey was done with 2 groups of students and also at different stages of the module. There were 14 BIS (Business students) and 9 CCM (Communications students). Their average ethical awareness view (taken from all 10 scenarios) was as follows:

- 40 % of BIS students on average judged the scenarios’ actions as ethical (60% unethical)
- 33 % of CCM students on average judged the scenarios’ actions as ethical (67% unethical)
The biggest difference in opinion was in scenario 6 which involved access to data – access can be obtained only through authentication and in this scenario the authentication was not done properly. The case where the two groups had almost the same rating was scenario 8 which referred to the confidentiality of health data.

It seems that the CCM students were slightly more aware of ethical implications in the scenarios. They rated more scenarios’ actions as unethical meaning that they acknowledged the actions in the scenarios were not ethical.

**Fields of study: % that see scenario as ethical**

![Fields of study: % that see scenario as ethical](image)

**Figure 2**

### 4.1.3 Knowledge of IT related laws

It was expected that students with knowledge about IT related laws will ethically be more sensitive. The students with more knowledge of IT laws were more informed about IT related matters due to a broader education or reading interest and the author’s feeling was that they should be more informed about what is right and what is wrong.

The following questions were asked in the questionnaire:

- Should an IT student know about IT laws?
- Where should they get knowledge about these laws?
- Do you have any knowledge about IT related laws and if so, state them.

The last question was answered yes by 15 students and no by 8 students. The author was interested to see if there was any correlation between the students’ knowledge of the law and their ethical outlook. 15 students stated that they knew something about IT related laws, and were able to name a few. 8 students said they knew nothing about IT related laws.

The result was not as expected. On average 72% of the students with no legal knowledge rated the cases overall as unethical while 57% of the students with knowledge regarding IT laws rated the cases overall as unethical – a big difference! More students with no knowledge regarding IT laws rated the actions in the scenarios as unethical (which is right) than the more informed students that rated fewer cases as unethical.
All of the students were of opinion that IT students should have knowledge about IT related laws. Most of them felt that they should get the information as part of their training and a few felt that they could also find information from the Internet, and other reading. Those who knew about the laws reported that they had, in the most part, obtained the information from their lectures. A few had read about it from the Internet or in books.

Figure 3 shows the different opinions according to the two groups: those who knew the IT laws, and those who did not have any knowledge.

### Knowledge of IT Laws: % that see scenario as ethical

<table>
<thead>
<tr>
<th>Scenario</th>
<th>% don't know laws</th>
<th>% know laws</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>2</td>
<td>40</td>
<td>60</td>
</tr>
<tr>
<td>3</td>
<td>30</td>
<td>70</td>
</tr>
<tr>
<td>4</td>
<td>20</td>
<td>80</td>
</tr>
<tr>
<td>5</td>
<td>10</td>
<td>90</td>
</tr>
</tbody>
</table>

Figure 3

4.1.4 Gender

The distribution between male and female is shown in figure 4. The overall ethical rating is indicated in figure 5. 40% of male students on average rated the actions of the scenarios as ethical while 31% of the female students on average rated the scenarios’ actions as ethical. The higher percentage of males that rated the actions in the scenarios as ethical indicates a lower awareness of ethical implications. (Fewer scenarios were rated as unethical).

The biggest difference in opinion is scenario 9 where the use of office computer equipment for personal use, for personal benefit was illustrated. The aspects of honesty and obtaining authorization to use computer resources were tested. All female students felt it was unethical to make use of office equipment for personal benefit and only 63% of
male students felt this was unethical. Scenario 8 was judged almost the same than scenario 9. In scenario 8 - where privacy and health records were the issues - 100% of the female students felt it was unethical not to respect the privacy and confidentiality of data and only 68% of male students judged the case as unethical. The scenario where all the students felt almost the same was number 3 where the privacy of an employee was violated by the employer by reading their email as to monitor what they are working on.

Overall, the results indicate that more of the female respondents recognized actions as unethical in the scenarios than the male respondents. Figure 6 shows the statistics discussed above.

<table>
<thead>
<tr>
<th>Scenarios</th>
<th>% that see scenario as ethical</th>
</tr>
</thead>
<tbody>
<tr>
<td>1, 2, 3, 4, 5</td>
<td>Female 80%</td>
</tr>
<tr>
<td>6, 7, 8, 9, 10</td>
<td>Female 10%</td>
</tr>
</tbody>
</table>

**Figure 6**

4.1.5 Differences of age
It was expected that students would show a higher degree of ethical responsibility with maturity. Kohlberg's stages of moral development states that people progress in their moral reasoning through stages and that moral development can be promoted through formal education. [Barger, 2000]. In this investigation the students' ages were asked in the questionnaire and grouped as shown in table 1. The average percentage per age group that rated the actions in the scenarios as ethical were as follows:

<table>
<thead>
<tr>
<th>Age group</th>
<th>Assessment of ethical content (average)</th>
</tr>
</thead>
<tbody>
<tr>
<td>21, 22</td>
<td>32%</td>
</tr>
<tr>
<td>23, 24</td>
<td>41%</td>
</tr>
<tr>
<td>over 24</td>
<td>37%</td>
</tr>
</tbody>
</table>

**Table 1**

The youngest group has the best rating (the lowest percentage in the table indicates that this group has the most students that assessed the cases as unethical) followed by the seniors and then the middle group.

The scenario that showed the biggest difference in opinion was number 4 which tested aspects of privacy in respect to confidentiality in a medical and teaching environment.
The scenario that was rated almost the same by every age group was number 3 where the privacy of an employee was violated by the employer by reading their email. It seems that, according to these students, when it comes to one’s own privacy it is essential to be protected!

The outcome was not fully as expected. Figure 7 shows the ratings of each scenario by age group.

**AGE: % that see scenarios as ethical**

![Graph showing ratings of scenarios by age group](image)

**Figure 7**

4.1.6 Different stages in module’s progress
As we indicated in Section 4.2 the survey was conducted with the different programme groups at different stages during the module. One group did the questionnaire early in the semester and the other group at the end of the semester. It was expected that the students would gain knowledge and at the same time would become more aware of ethical implications. The survey indicated overall ethical awareness in the two groups as follows:

Early group: 33% of the students on average rated the actions in the cases as ethical
Late group: 40% of the students on average rated the actions in the cases as ethical

It would appear from the figures that the time lapse with these two groups did not influence their ethical judgment; it seems that the group tested at the beginning of the course was more aware of unethical behavior than the later group. The greatest difference in opinion was shown in scenario 6 where access to data was an issue (i.e. access can be obtained only through authentication which was not given). Scenario 8 was judged almost the same by the two groups - where the confidentiality of health data was discussed in the case (i.e. issues of privacy and confidentiality).

Figure 8 shows the ratings of the two groups for each scenario.
4.1.7 Different first languages
There was a question on the questionnaire regarding the students’ mother tongue or first language. This question was asked to see whether a difference in background or culture showed any influence on the ethical outlook of the students.

The number and distribution of languages that were reported are as follows:

- **African**: 3
- **Arabic**: 1
- **European**: 8
- **Eastern**: 11

The overall rating for each language group is as follows:

- **European**: 31% of the students on average rated the cases’ actions as ethical
- **African**: 37% of the students on average rated the cases’ actions as ethical
- **Arabic**: 40% of the students on average rated the cases’ actions as ethical
- **Eastern**: 92% of the students on average rated the cases’ actions as ethical

The above figures indicate that there is a huge difference in opinion between the students with an Eastern background and the groups with an European background of what is...
ethical and what is not ethical. It could be as a result of the difference in understanding of English (language of the questionnaire) or the different underlying cultures where not all the concepts that are used mean the same or have the same importance.

The rating of each scenario for the different language groups is shown in figure 9.

![Language groups: % that see scenarios as ethical](image)

Figure 9

5. Summary

The analysis of the data from this questionnaire shows that many students do have a perception of what is ethical and unethical behavior. On average, almost 63% of the students said that the actions in the scenarios overall were unethical – but there is room for changes in perceptions through awareness programs and education efforts. Rogerson [ComputerWeekly.com, 2003] conducted a survey amongst members of IMIS (The Institute for the Management of Information Systems) on ethical issues. He found that 75% of IT employees would not work on a project they considered to be unethical. These figures are better than the percentages demonstrated in our survey of the students. There is, however, speculation that younger people have not so much concern with ethical issues when they struggle to get on the career ladder. We could also speculate that the hypothetical scenarios we offered – i.e. relevant to the working world – are not within the students’ current experience, and therefore are perceived as exactly what they are – “hypothetical”. It may be that when the situations described are deemed more relevant to their world experience, the responses may show a higher percentage when unethical behavior is tested.

The most interesting outcome of the survey reported in this paper was the ethical perception of different language groups. There were, however, also results not consistent with expectations. The increase in ethical awareness of the students through the course did not appear to be a factor, neither did the age of the students. The prior knowledge about IT related laws also seemed not to relate to their ethical judgment.
6. Conclusion

It must be acknowledged that the results given above cannot be generalized, due to the small number of students involved in the survey. There were difficulties in achieving a maximum “hit” in the later stages of the course – as most university lecturers will know, in the later stages of the semester student attendance drops for various reasons (academic load of coursework, tiredness, familiarity with the system means students are better able to make judgments on how best to manage their time). However, we believe the results are interesting, and further surveys of larger student groups should be pursued.

It is hoped that the students will develop their ethical awareness with time through work experience, interaction with other people and training programmes. We, as educators, should not stop working and educating on these important matters – particularly in Computing Science, given the impact of computers on all aspects of life today. It is too soon to say whether specialized courses, such as the one discussed above, will make any difference to tomorrow’s professionals. But verbal feedback from many of the students after the course (sometimes a year later) indicates an influence – comments along the lines of “it was a great course”, and “I learnt about issues I hadn’t thought of before” are common, as well as students opting to continue work on some of the issues in their third year projects. According to Martin [1997] the real issue for computer educators is not to define computer science precisely, but to teach the students about the profession of computing.

7. Bibliography


