Increasing Ethical Awareness of IT Students through Online Learning

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Abstract: - In this paper we demonstrate our methodology and architecture for teaching a computer ethics course within an e-learning environment. This work is an initial step towards an autonomous module, which aims to improve students’ ethical decision making. Despite the debate on whether such a topic can be taught and consequently influence the students’ ethical behavior, we argue that such training can create the necessary familiarity with ethical issues and develop awareness on cases that might include possible ethical issues. In addition, the proposed analysis path helps students handle and analyze such issues, thus improving their critical thinking and ethical decision making.

Key-Words: - computer ethics, e-learning

1 Introduction and motivation

E-learning technologies have been adopted by institutions, such as universities and schools, either as facilitators to traditional teaching methods or as autonomous training tools. Teaching material and methods have been accordingly developed for many academic disciplines, especially for computer science. Since students of computing schools and departments are the most familiar the relative technology, they are the most receptive ones to e-learning technology as well. However, not all topics are easy to be implemented within an e-learning environment and be taught in online mode. Computer ethics is a topic which, despite its importance for future professionals in the field, has not benefited from e-learning developments. Although some researchers argue whether computers can assist the teaching of such a topic at all, building on some relevant approaches we propose our framework and initial work towards implementing a course on computer ethics within an e-learning environment.

Advances in technology tend to be followed by corresponding ethical issues, as it is evident from relevant historical facts. Information technology is nowadays the most prominent technological development that affects almost every aspect of everyday life, and our dependence on information technology increases constantly. As a consequence, emerging ethical issues, that individuals or professionals face, require appropriate skills.

It is therefore obvious that the relationship between IT and ethical behavior needs to be reinforced, especially as far as professionals in the field are concerned [2], [3], [24], [25], [26], [27], [28]. However, this cannot be accomplished solely by the use of regulation and more restricted policies. “Law is neither the beginning nor the ending resolution when it comes to filling policy gaps and addressing ethical issues.” [1]. So when it comes to ethical dilemmas, specific training at course level is also necessary in order to improve ethical decision making, either as a horizontal training seminar or as a standalone semester course. This kind of training is essential, for all kinds of future professional, whether working in the IT field or not.

In the rest of this paper we present some key points of major ethical theories along with relevant approaches in teaching computer ethics (Section 2). Next, we outline our model and architecture of the course (Section 3) and conclude with some discussion and comments on future work (Section 4).

2 Background and relevant work

2.1 Ethical theories concepts

Several ethical theories have been developed as to how one should act in order to abide by ethical rules. However, every individual has a unique perspective towards ethics, which depends greatly upon factors such as culture, environment, and personal
development. Below we present a brief overview of major theories on ethical behavior.

- **The Golden Rule**: This rule is derived from ancient philosophers and it suggests simply that the best choice for a decision maker who faces an ethical dilemma is to treat others the way he or she wants to be treated.
- **Utilitarianism**: Utilitarianism is a consequence based theory developed by British philosophers Jeremy Bentham and John Stuart Mill. It states that one should consider only the consequence of the action and the number of people positively affected when making a decision.
- **Pluralism**: Pluralism theory is based on doing one’s duty, and thus decisions should be made regardless of any consequences but only with the sense of duty to do the right thing.

Researchers argue that IT evolution has created completely new ethical problems and thus expanded existing ethical questions [7]. In addition, they define some areas where considerable issues arise from IT evolution, despite the substantial benefits derived from it [8]. Forester and Morrison [8] define seven such categories:

- Computer Crime and Computer Security
- Software Theft and Intellectual Property Rights
- Computer Hacking and the Creation of Viruses
- Computer and Information Systems Failure
- Invasion of Privacy
- The Social Implications of Artificial Intelligence and Expert Systems
- Workplace Computerization

### 2.2 Ethical decision making methodologies

Ethical decision making problems are usually extremely complex to be solved by an algorithm providing a valid choice to the decision maker [9]. Several researchers are skeptical about tools that have been developed in order to assist decision making for such problems. To overcome this issue, several heuristics have been proposed as procedures for ethical cases analysis and decision support.

In the following some methods as analyzed by Maner [9] are mentioned, which could be used to support ethical decision making by providing a series of steps that help the individual react to emerging ethical problems.

- Worksheet for ethical decision making [9].
- Chris MacDonald (1995), states that it is important that people ask and answer this question when considering the nature of some form of action; am I comfortable with this decision? Parallel spaces methodology [10].

### 2.3 Similar work

Due to the particularity of the topic, we identify several approaches for teaching computer ethics [12], [13]. Except the differences in duration, which may vary from short seminars to semester courses [14], [15], courses differ on the overall approach of the subject as well.

Some approaches are more theoretical, based upon presentation of case studies and ethical theories [16], [17] since teaching ethics to students using real life case studies to illustrate the ethical issues is popular [18]. King [14] proposes the outline of such a course concerning the responsibilities of computer scientists and end-users of computers to society. Robbins, Wallace and Puka [18] have developed a web-based application guided by normative ethical theory and present users with case-studies.

Other approaches promote active participation of students in imaginary ethical decision making cases. Coldwell [19], [20] has created a virtual classroom for a course in computer ethics at Deakin University, using FirstClass1, an on-line conferencing package which uses the client-server paradigm but also has a web interface, while recently WebCT technology has been adopted. Mancherjee and Sodan [4] have developed ‘Ethos Tool’, an application designed to solve practical ethical dilemmas and teach ethics, based primarily on utilitarian theory. The application teaches users to develop a framework with procedural steps to address ethical problems rationally. Goldin, Ashley and Pinkus [21] have developed a Professional Ethics Tutoring Environment or (PETE) that enables students to practice methods of moral reasoning. PETE differs from other applications in that it is augmented by other students’ analysis of cases.

### 3 Proposed model and architecture

Since ethical behavior is strongly affected by personal background (Section 2) and this could not possibly be altered within the frame of a computer ethics course, our main objective is to provide a course which primarily targets on improving students’ awareness of ethical issues within IT and further develop their ethical decision making skills [22].

In order to maximize students’ participation, we utilize e-learning technologies to develop the course. We combine traditional teaching methods, such as lectures, with virtual team formation and remote collaboration towards ethical decision making in a
way that maximum student involvement is achieved [23].

To improve awareness we present a number of case studies that raise ethical issues along with a brief analysis. In addition, a heuristic is provided as a basis for case analysis and ethical decision making which is executed either individually or cooperatively. Additional heuristics are provided for case analysis and decision making, where teams collaborate to select the appropriate one for each case.

E-learning technology provides substantial benefits for such a course, since it increases active participation and develops the students’ critical thinking on ethical problems, thus reducing lecture time only to necessary topics.

3.1 Ethical decision making methodology

Heuristics (Section 2) offer a useful procedure for ethical decision problem handling. We provide the following methodology as an introductory ethical problem decision method:

- **Step 1:** Establish who are the people involved and their interests.
- **Step 2:** For each person or group identified in step 1, describe the ethical problem from their point of view.
- **Step 3:** Contrast the views of the ethical problem by considering each other’s point of view.
- **Step 4:** Describe the ethical problem in terms of a similar real life problem.
- **Step 5:** Construct an open situation where all parties are able to see each other’s actions.
- **Step 6:** Select one solution and justify the choice.

3.2 Architecture

Based on the above model we demonstrate our architecture for a computer ethics course within an online teaching environment (Fig. 1). The following components have been implemented:

- **User levels:** Class home with appropriate levels of entry (e.g. student, instructor, administrator).
- **Collaboration facilities:** Flexible virtual team formation, group debates about ethical positions, blackboard, role playing with hypothetical scenarios.
- **Communication facilities:** Communication between instructor and students or teams, blackboard post.

![Fig. 1.- Architecture](image-url)
Repositories: Repositories provide all the necessary information and methods for both students and instructor and for this reason they become the core components of such a module. In more detail, the following repositories have been developed:

- **Case studies:** contains a number of real case studies which raise ethical issues. Students are working on these cases following the instructor’s guidance.
- **Analyzed cases:** contains some examples of cases which have been analyzed in order to demonstrate the methodology (Section 3.1).
- **Ethical theories:** contains analysis of ethical theories and methodologies for ethical decision making.
- **Heuristics:** contains a number of heuristics for handling ethical issues. Students may follow different paths to make an ethical decision according to their familiarity with the subject.

Interfaces: Flexible and simple to use interfaces provide easy access to all the repositories and facilities.

Assessment facilities: Computer science students feel more comfortable with objective rather than subjective answers. Our target is to motivate them participate without being apprehensive about unfair grading. A knowledge-base with a number of follow up questions help students to clarify concepts of ethical theories and practices. In addition, the instructor can evaluate student or team performance using the appropriate assessment tools.

4 Conclusion

In this work, an outline of our architecture for teaching computer ethics online was presented. Although many experts are still skeptical on the subject, our experience is that computer ethics can be taught virtually. However, due to the nature of this discipline, we believe that the task must be undertaken in a systematic way in order to maximize student involvement. Moreover, the infrastructure itself must be user-friendly; otherwise the technology will distract the learners from the content being presented. Our proposal is well fitted within an e-learning platform with minor modifications, benefiting from student’s familiarity of this environment. Our future plans include full development of the repositories and interface optimization according to feedback from students.

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