Blackboard: A Web-Based Resource In the Teaching of A Multi-disciplinary/Multi-Institutional Computer Ethics Course

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Abstract

This paper will focus on the use of a commercially available collaborative learning management tool (CLMT), Blackboard and how it has been used to enhance the teaching of professional issues in a large cohort given at the University of Limerick in Ireland and a small writing-based senior ethics course given at Sacred Heart University. This study details the various facilities offered by Blackboard, some of the ways in which the tools were used to enhance learning and critical thinking and some reflections on the strengths and weaknesses of the tool. A prospective design and implementation of an international collaboration between the two classes will be explained along with the objectives and outcome assessment methods.

1. Introduction

The Blackboard system comprises an integrated set of tools: publishing tools that allow the course instructor to publish teaching materials, communication tools such as discussion boards, chat rooms and whiteboards to allow for asynchronous or synchronous student/student & instructor/student communication and statistical tools to gather data on student activity in the different functional areas of the Collaborative Learning Management Tool (CLMT).

Professional Issues in Software Engineering (PISE) is a final year undergraduate module for computer science students that focuses on the legal, ethical and social aspects of computing. Although the module has been taught for a number of years at the University of Limerick, increased student numbers have added to the problem of how to teach and assess such a large group. During the current academic year Blackboard, has been used to enable the large cohort (130 students) to be taught and assessed using a group based approach.

For the last three years, the course entitled Computer Ethics: Society and Technology has been developed and team-taught by a computer scientist and a sociologist. The marriage of these two fields is enhanced by the belief that technology does not exist in a vacuum but is developed for and driven by social forces. This course was designed as a writing course in the belief that ICT students' ability to communicate is critical to their professional success. Blackboard has been and continues to be used to enable the group of twenty-five to engage in a weekly threaded discussion of ethics articles and issues, to create directed reading questions for in-class presentations and for the posting of paper topics and assessment rubrics that are used in the evaluation of written work.

In both settings, Blackboard facilitates collaborative learning and critical thinking skills that are so important in the world of Computing and Information Technology (ICT). Group work and peer dialogues enable students to explore and evaluate the ethical issues that surround them as ICT professionals. We will first examine the use of blackboard in the individual courses, discuss the pluses and minuses of the tool and present our use of Blackboard in our international collaboration.

2. Professional issues in software engineering

Professional Issues in Software Engineering (PISE) is a full semester (13 week) final year Computer Science module that is concerned with the ethical, legal and social issues surrounding the design, implementation and

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use of computer and information systems. The main aim of this module is "...to encourage students to develop the ethical foundations of good professional practice in computing." (http://www.csis.ul.ie/). A major theme is the relationship between ethics and the legal and social consequences of being a computer professional.

The module starts with a series of core lectures where students are introduced to the main concepts in this area. These focus on an introduction to ethical theories (ethical relativism, utilitarianism, deontological theories) the dialectical process, legal issues and social consequences (gender & access issues). Students then undertake a group-based presentation and produce a written report based on a moral dilemma scenario. Increasing class sizes (in this study there was a student cohort 130) have raised significant management and pedagogical issues. For example how does the tutor ensure that students are working towards developing the concepts of personal and professional codes of ethical conduct (the dialectical process) and developing moral reasoning? How can students be assessed fairly using group work? How can weaker students be identified early enough to enable appropriate intervention?

In previous years with smaller cohorts, it was relatively easy to monitor individual progress even though students worked in groups. Larger cohorts have meant more groups and this approach to learning and assessment has become significantly more difficult to maintain. However it has been a major tenet of this module to continue with the group-based approach to teaching and learning.

3. Computer ethics: society and technology

Computer Ethics: Society and Technology (CEST) is a full semester course (13 weeks) for senior computer science/information technology majors. Its objective is to address a number of issues that arise at the intersection of computers, technology and society and examines how the digital revolution has affected our personal and professional ethics. It is divided into three main areas: Perspectives, Issues Regarding Access and Control and Impact on Human Life. In Perspectives students learn about the ethical process: how to construct an ethical argument working from observations through assumptions and value judgments. They study theories of philosophical ethics: virtue ethics, utilitarianism and deontological ethics and use these to support their proposals. Finally, they examine the convergence of ethical and social analysis and try to come to some consensus about the role of technology in society and the place of computer ethics. In the section of the course devoted to access and control, students study the impact of the Internet on issues of privacy, computer crime, and hate web sites. They examine the question of property rights from intellectual property to open source and domain names. In the section on Impact on Human Life, students examine biometrics, identity and community (both virtual and real), workplace issues of reorganization, spying on employees, and whistle blowing. They examine the professional issues of errors, reliability and accountability in software/hardware development and discuss whether we are shaping computer technology for the betterment of society. Throughout the course, the professors foster the concept that to be an ethical computer professional, one must first be an ethical person. We follow the Aristotelian idea of flourishing personally and as a member of the professional community.

CEST is designed as a writing and oral communication course. Students are assessed on their writing and oral skills as well as the depth of their critical thinking and ethical arguments. They are required to write 5 1-2 page papers on given topics using the ethical theories to support their points of view. In addition, there are 2 longer papers and one group presentation/paper based on a work of science fiction. Twenty percent of the student's grade is based on participation online through Blackboard. This includes postings to a weekly threaded discussion board as well as a posting of directed reading questions about one of the articles we read in class. Based on these questions, that student will lead a discussion of the article. All written work is assessed through a developed rubric that is attached to submitted papers.

4. The Blackboard system

The Blackboard system is an integrated set of web-based tools designed for the creation and management of a learning environment. These tools include course development and management tools; statistical tools; content management tools; communication and collaboration tools; assessment tools; personal information management tools; academic web resources; and system management tools. Using these tools the following facilities are available: publication of learning materials (including links to module-related websites); publication of announcements; provision of a range of collaborative tools including discussion boards and chat rooms; communication tools including email. All files are stored on the Blackboard server (unless a server set of applications has been purchased by an institution). By using this 'shell' approach an instructor can build up a course site for any module with different types of learning materials and can use a range of communication tools to assist with the management and assessment of the module. Students can share files and use communication tools to contact other students and the lecturer either synchronously or asynchronously.

5. Collaborative learning

Researchers have already identified the positive effects of social interaction during learning [1,2]. Furthermore, ccollaboration with other students has been shown to stimulate activity, make learning more realistic and to stimulate motivation. [3]

Research has also shown that moral dilemmas in computer ethics encourage group discussion, that teamwork encourages social facilitation, better learning and higher cognitive skills [4,5] and that groups can produce better solutions to moral and ethical problems than individuals [6]. Because moral judgments are a social construct, it could also be argued that the development of a personal ethical code is best achieved in a group situation.

At the same time there is a major problem with the use of group-based approaches when it comes to assessment. This is primarily due to the possibility of some individuals gaining more (in terms of grades) than they have put into the process, a term that has been called 'free-riding' [7]. There is also the potential for the group to be dominated by the stronger students, leaving the weaker students behind. Although research also suggests that larger groups can increase the advantages to members [3], this can also increase the occurrence of free-riding due to the difficulty of monitoring these larger groups.

In order to overcome the problems of managing larger cohorts and to ensure that the advantages of group learning were continued, it was decided to investigate the potential for using collaborative instructional tools in PISE and CEST. Recent research supports this approach and also seems to indicate that a collaborative approach to learning supported by instructional technology could potentially lead to deeper understanding and new knowledge creation [8].

A further consideration in selecting a tool for use in PISE was whether to use synchronous or asynchronous tools. Research has shown that asynchronous tools can provide student groups with more options to think and reflect on information, to organise and keep track of discussions and to take part in group discussions compared to synchronous tools [3]. However some students on the module (particularly more mature students with other commitments such as childcare) required facilities that would allow for synchronous communication in 'virtual' tutorials.

In CEST, an asynchronous tool was required to implement a threaded discussion board that had previously been implemented by a listserv. In addition, students preferred the freedom that this tool provided in terms of accessing paper topics, their peers and the instructors as well as submitting papers in the digital drop box at their convenience.

In both institutions, after investigating a range of existing tools, it was decided to focus on Blackboard (www.blackboard.com) as this system provided an integrated set of tools suitable for a variety of different uses including synchronous and asynchronous communication.

5.1 Collaborative tools on Blackboard

In PISE, the main collaborative work was carried out by students working in groups using facilities provided from the Group Pages (Figure 1). The Discussion Board provided asynchronous communication while the Virtual Chat provided the synchronous communication facility. Students could swap files and send emails to other group members using the File Exchange and Send Email tools. Only members of a particular group and the module tutor could access that group's page and tools.

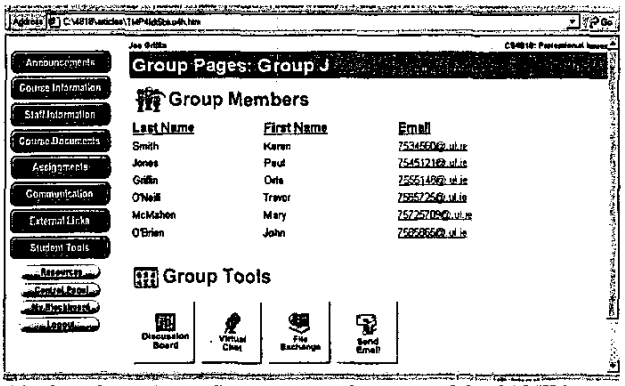

Figure 1- Group Pages (identities have been changed). Access to other parts of the CLMT is via the buttons on the left.

In CEST, the syllabus is accessed through Course Information. All paper topics and the rubric are accessed through the Course Document site where they are grouped into folders. The two Discussion Boards,

one for threaded discussion and one for directed reading questions are in the Discussion Board section. This course did not use Virtual Chat but students did submit papers to the Digital Drop Box and contact each other and the instructors via the email facility. In addition, the announcements, provided on the course homepage allowed the professor to alert the student to anything of immediate interest.

5.2 Course Statistics

In PISE, the Blackboard CLMT was used over a thirteen-week period by a student cohort of 130 and two tutors. Statistics were gathered using the Course Statistics tool. There were approximately 33700 hits in total over the entire period. These can be categorized as follows:

- Organizing students into groups, allocation of topics, tutorial slots and presentation slots
- Accessing learning materials and external links
- Communicating between students and between lecturer and students
- Collaborating using self-regulated discussion groups

Functional area	Number of Hits	%
Content	15904	47.1
Communication	10229	30.34
Groups	7340	21.65
Student tools	239	0.8
Total	33712	

Figure 2- Functional use of Blackboard (includes 4.5% for use by tutors)

Figure 2 gives a breakdown of the level of usage of different parts of the CLMT. The Content section was the most-used function. This function includes accessing the main page, course information, staff information, course documents, assignments and external links. Course information was management oriented, e.g. syllabus, tutorial times, lecture slots and other such notices. Course documents included lecture slides, handouts etc. Assignment information, including guidelines on ethical analysis of the scenario, was accessed using the Assignments function. The External Links function was used to display a pre-defined set of web resources selected by the module tutor. With the increasing size of the Internet and the growth in the number and range of resources available, having a pre-defined set of links helped to guide students to some of the more useful websites.

The Communication section was the function most used. Communication includes sending email to tutors and other students, postings to the main discussion board, virtual chat for the entire cohort (disabled for most of the module; individual groups had access to their own virtual chat tool) access to the student roster and to the group pages. The main discussion board was primarily used to manage the module. Initially students were required to organize themselves into groups, select topics for presentations and reports, select presentation slots and select tutorial slots. Groups coalesced around individuals who had selected a topic from a pre-defined list and who advertised their requirements for extra group members as needed. Use of this part of the system decreased, as these management issues were resolved.

The Group function became more used as the module progressed with peaks occurring before groups had to submit reports or do a presentation. (Usage of the Group Pages is detailed in Figure 3 below.)

The Student Tools function was least used, as there were relatively few features here that were needed to successfully complete this module. Student Tools includes checking grades, editing homepages, student calendar, electric blackboard and a file exchange facility (also available on the Group pages).

Tool	Hits	%
Group discussion board	6844	93.2
Send Group Email	121	1.64
Send File to Group	107	1.45
Group Virtual Chat	268	3.65

Figure 3- Details of usage of Group Pages tools

Figure 3 shows that although all tools in the Group Pages area were used, the group discussion boards were by far the most popular. How these were used is now discussed. It had originally been expected that a significant number of discussion threads would develop in the group discussion boards while students worked on the moral dilemma scenario but this did not in fact happen. Approximately 52% of postings did not develop into threaded discussions. This is consistent with other recent research on the use of asynchronous communication tools in higher education [9]. A possible reason for this, cited by students in this study, was the ease of face-to-face communication. However, face-to-face communication is difficult to formally assess and there is some doubt as to its educational value. One option, which might overcome this, is to use larger groups of students or to involve students from other institutions who are carrying out similar assessment tasks in similar modules.

As neither of these was feasible within the study at that time, it was decided to give students the option to submit for assessment that part of their group discussion board that related to the moral dilemma scenario, instead of the usual written report. For the written report, individual contribution already had to be indicated clearly. For the threaded discussions, postings could be ascribed to individuals thus enabling the measurement of individual contribution.

As a result of this change 30% of student groups elected to submit the moral dilemma scenario report in the form of threaded discussions. This then resulted in an increase in the number of threaded discussions by these groups but at the same time it became apparent that some students did not use threaded discussions appropriately.

Some postings that should have been in reply to earlier postings were submitted under new headings; others, which introduced new topics, were wrongly submitted as part of ongoing threaded discussions. It was not clear if this demonstrated a lack of ability in the dialectical process, but feedback from the students indicated that correct usage of asynchronous tools such as these need to be formally taught.

In CEST, the Communication area and main content areas received the most traffic (Figure 4).

Area Name	Hits	Percent
Communication Areas	16311	65.67%
Main Content Areas	8346	33.60%
Group Areas	72	0.28%
Student Areas	107	0.43%
Total	24836	100%

Figure 4- Traffic Patterns

Within the Communications area, students spent most of their time on the discussion board. This was due in part to the fact that 20% of their course grade depended on their visibility in this area. What was interesting as the course progressed, however, was that students were posting interesting ethics articles and personal dilemmas even when it wasn't their week. They contributed articles and personal dilemmas that usually focused on our classroom discussions, extending the classroom into virtual space when time ran out in class (Figure 5).

Of the communication area:

Area Name	Hits	Percent
Communication	164	1.02%
Send E-mail	40	0.25%
Roster	124	0.77%
Discussion Board	15509	97.14%
Virtual Classroom	16	0.10%
Enter Virtual Classroom	3	0.01%
Virtual Classroom	108	0.67%
Total	15964	100%

Figure 5- Discussion Board Usage

Students took advantage of the asynchronous facility as we can see in the following statistics. Usage was spread throughout week, but the heaviest usage occurred on Sunday through Tuesday (Figure 6). The class met on Wednesday evening.

Day of The Week	Hits	Percent
Sunday	1981	12.40%
Monday	3092	19.36%
Tuesday	4229	26.49%
Wednesday	3640	22.80%
Thursday	1217	7.62%
Friday	1189	7.44%
Saturday	616	3.85%
Total	15964	100%

Figure 6- Weekly Distribution

5.3 Some specific advantages

Some specific advantages of using the Blackboard CLMT have been identified

- Class management. The onus of forming groups, selecting topics and identifying slots for tutorials and presentations has been significantly eased. Posting of paper topics and reading questions were timely as were threaded discussions.
- Communication between instructor and student has been greatly enhanced with the use of the discussion board and course announcements
- Inter- and intra-group collaboration took place and the system enabled these to be observed by the instructor, who could join in discussions as required
- The virtual chat tool has enabled virtual tutorials to take place thus facilitating involvement for students who had difficulty always attending on campus.

5.4 Problems

- A major problem area has been the slow, and sometimes broken, Internet connections, which created frustration for some students. This was less of a problem at Sacred Heart University.
- In PISE, the volume of usage was much greater than was anticipated and due the number of levels in the system (e.g. to get to a group's discussion board requires the traversal of five levels) considerable time was needed to be spent to ensure that the instructor answered all communications in a timely manner. A flagging or notification system would improve this.

1. In PISE, encouraging students to use the system in an appropriate way and in a way that would enhance their

learning experience was also problematic. Early analysis of usage patterns indicated that the majority of postings elicited no replies and did not grow into threaded discussions. In CEST, the biggest problem was to convince the students that this was a serious way of contributing to the course.

6. Future Collaboration

At the time of this writing, collaboration among students at Sacred Heart University and the University of Limerick is being established. We have also included students at DeMontfort University in the UK in our study. We intend to design virtual groups comprised of two students from each institution. They will engage in a threaded discussion based on an ethical scenario. The group will be responsible for a group report that will be evaluated on-site by each of the three instructors for their particular course. All students will be given the Moral Judgment Test [11] pre and post-course to measure more accurately the contribution of Blackboard to the development of moral reasoning. The instructors will compare these virtual groups to those working on the same scenarios in face-to-face collaborations.

7. Conclusion

Blackboard has contributed to the management and teaching of both a large cohort of students at the University of Limerick and a small senior writing course at Sacred Heart University. There have been some problems but also some clear advantages for instructors and students. Overall, the use of the Blackboard CLMT has been successful. Students have seemed to be more engaged in the module and average grades for this academic year (albeit a crude indicator) are higher than for previous years. Future research will use specific tools (e.g. the Defining Issues Test [10] or the Moral Judgment Test [11]) to more accurately measure the contribution of this CLMT to the development of moral reasoning.

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