In this issue:

Informed Discussion in Information Technology Survey Courses

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Abstract: Structured debates have been suggested as a way to help students understand the basic ethical, social, and legal issues inherent in information technology. In this paper, we present evidence that a form of less structured debates we call informed discussions provide equal benefits. As with debates, informed discussions allow for a high-level of participation, demand that students conduct significant research, and provide an interactive environment. However, informed discussion is more engaging for certain populations. Our work is based on debates and informed discussions conducted in three courses. Two of these courses are at the undergraduate level and one is a Masters level course; all provide a survey of some area of information technology.

Keywords: ethics, electronic commerce, e-Commerce, e-business, debates, structured debates

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Informed Discussion in Information Technology Survey Courses

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Abstract

Structured debates have been suggested as a way to help students understand the basic ethical, social, and legal issues inherent in information technology. In this paper, we present evidence that a form of less structured debates we call informed discussions provide equal benefits. As with debates, informed discussions allow for a high-level of participation, demand that students conduct significant research, and provide an interactive environment. However, informed discussion is more engaging for certain populations. Our work is based on debates and informed discussions conducted in three courses. Two of these courses are at the undergraduate level and one is a Masters level course; all provide a survey of some area of information technology.

Keywords: Ethics, electronic commerce, e-commerce, e-business

1. INTRODUCTION

Helping students understand the basic ethical, social, and legal issues inherent in information technology has become one of the most urgent tasks educators face. One proven method for educating students about these issues is to integrate these topics into existing courses (Cohen and Cornwell 1989), and one of the most active and comprehensive ways to do this from the students' perspective is independent research shared during an in-class debate (Settle and Berthiaume 2002). In-class debates allow for a high-level of participation, demand that students conduct significant research, and provide an interactive environment for the examination of ethical, social, and legal issues.

The goal of such debates is to engage students in critical thinking about controversial topics with a significant technological component. As such, the format of the debate is somewhat irrelevant, and no formal debating style or methodology needs to be followed. Nevertheless, in our original work, we adopted a particular structure for the debates. We felt that this would provide stu-

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dents with guidance, ultimately improving the debate experience. While this proved true in the Masters level course, the results were less clear-cut in the undergraduate courses. Students seemed to be partially hampered by the structure imposed during the debates, and the most involved discussion occurred during the question and answer periods where less formal rules were enforced. Our experiences with less structured debates in undergraduate courses support this view, indicating that undergraduates engage more fully in informal discussions. However, since part of the exercise is to educate students on topics they are unfamiliar with, students must conduct independent research prior to the discussions. For this reason, we believe that informal debates based on significant prior research, called informed discussions, are the optimal way to teach students about controversial, technical topics in information technology.

In this paper, we present results supporting the effectiveness of informed discussion for undergraduates. We contrast more structured debates conducted in undergraduate and Masters level e-commerce survey courses with informed discussions conducted in a freshman-level information technology survey course. All of the courses selected provide a survey of some aspect of information technology, and thus offer the best context for the introduction of a broad spectrum of ethical, social, and legal issues related to technology. Debates proved highly effective in the graduate level course, while informed discussions allowed undergraduates to respond to the material in a more relaxed fashion, eliciting from them a more spontaneous and involved response. Interestingly, both discussion formats shared some benefits in terms of student engagement, impacting the course evaluations in positive ways. In the remainder of the paper, we provide background on each of the courses, outline both the structured debate format and the rules used in the informed discussions, present the results for each of the various formats, and discuss the impact of informed discussion on course evaluations.

2. THE COURSES

Our original motivation in choosing both undergraduate and graduate courses in which to conduct informed discussions was the typically higher maturity level demonstrated by graduate students. As public speaking is a stressful situation for many people, we expected that graduate students and undergraduates would perform differently. The courses discussed in this paper are two undergraduate courses, ECT 250: Survey of e-commerce technology and CSC 200: Survey of computer technology, and a Masters-level graduate course, DS 425: Distributed Systems Fundamentals. The details for each course are provided in the following sections. It should be noted that all courses operate within a quarter system. In the quarter system at DePaul University, each course has 10 weeks of regular instruction followed by a one-week final exam period. The 5th or 6th week is the standard time for a midterm exam. Classes meet 3 hours a week, either twice a week for 1 ½ hours, standard for undergraduate courses, or once a week for 3 hours, standard for graduate courses.

Undergraduate Courses
ECT 250: Survey of e-commerce technology is a course required in several of the current undergraduate degrees at CTI, including the bachelors degrees in E-commerce Technology, Information Systems, and Network Technologies and the combined BS/MS in Telecommunications (DePaul CTI 2003). The purpose of ECT 250 within the undergraduate curriculum is twofold. First, it provides students with a general survey of the topics important to the study of e-commerce technology. This provides CTI students with a survey of the topics they will encounter in their degree program, and it exposes non-majors to an area that is increasingly important both to their personal and professional lives. The topics of the course range from a history of the Internet to legal issues surrounding e-commerce. The survey topics are supported by the textbook for the course (Laudon and Traver, 2002). The second purpose of the course is to prepare students for the client-side Web application development course that follows it within each of the three undergraduate degrees mentioned earlier. This preparation entails learning how to create Web pages using FrontPage 2000 and how to publish Web pages on a Unix system. The goal in giving some topics more coverage is to expose students to a deeper knowledge of topics than a survey

can provide. A course that takes both a breath-first and depth-first approach simultaneously is unusual (Reed 2001, Settle 2001).

The function of CSC 200: Survey of Computing Technology in the curriculum at CTI is changing for the Fall 2004, and more information about those changes is provided in the conclusions and future work section. For the purposes of this paper, we will discus the role the course played during the quarters in which CSC 200 data was gathered, namely Fall 2001 – Winter 2003. During those quarters, CSC 200 served as an equivalent introductory course as ECT 250, but in the bachelors degree in Computer Science. The course surveys topics students will encounter in a computer science program, including the basics of computer hardware and software, networking concepts and the Internet, the creation of simple Web pages, fundamental security issues, an introduction to database management systems, a survey of programming languages, and an overview of careers in computer science. The textbook for the course provides references for all topics but Web page development (Capron 2001). The course follows more of a standard survey approach, as it is not part of a sequence of courses like ECT 250.

Since the topics in the survey portion of both of the undergraduate courses include current trends in information technology, including international, legal, and ethical issues surrounding the Internet, the courses are a natural setting for the debate scenario described above. ECT 250, and CSC 200 in its original form, serve as an orientation for the remainder of students' undergraduate experience, and it is crucial to impress upon them both the fluctuating nature of information technology and the importance of remaining engaged in public debate over the ethical, social, and legal impact of changes in technology.

Graduate Course
DS 425: Distributed Systems Fundamentals is a course required in the E-commerce Technology Masters program at CTI (DePaul CTI 2003). The purpose of the course is to introduce the foundational and technological issues in building distributed systems. It examines current architectures, protocols, and tools. In particular, the course covers network protocols, network programming with Java, HTTP, operating systems and threads, remote procedure calls and remote method invocation and security in a distributed environment. No single topic is covered in great depth, so that the course serves as a survey of the area. The textbook used for the course provides material on all of the required topics (Coulouris, Dollimore, and Kindberg, 2001).

Although DS 425 is more technical than either ECT 250 or CSC 200, it serves a similar purpose by providing Masters students with a framework for understanding the material that will follow in the advanced phase of their degrees. With their newly acquired understanding of fundamental e-commerce technology, students in DS 425 are encouraged to dissect and critique current events and trends in the field, a task they will soon be expected to do as e-commerce experts in their work environment.

3. USING INFORMED DISCUSSION

As mentioned earlier, our original approach to informed discussion into our courses involved a structured debate. However, less structured informed discussions are also beneficial and seem to encourage the less confident undergraduates to participate more fully in the process. There are several ways that informed discussions can be handled. In this section of the paper, we first describe the more structured debate format and our results using structured debate in our courses and then explain the various approaches to less structured discussions taken in our classes and our experiences with each approach.

Debates
Since the background material needed for the debates was covered throughout the 10 weeks of class, the debate was not introduced until halfway through the quarter. There were two roles for each debate topic: pro and con. The pro participant was required to present the case supporting one side of the debate issue, and the con participant was responsible for presenting the opposing viewpoint. Suggested positions were given for each topic to provide some structure to the students. The debate topics and one set of suggested positions are given in the table below. These topics were chosen

for their relevance to current issues and because any discussion of their ethical, social, and legal impact requires the understanding of technical material core to the survey courses. Note that not all topics were offered every quarter in every class. The topics offered during any given quarter in a class depended on the relevance of the topic to the course and the type of stories prevalent in the media at the time.

Offensive Web content: Controlling content viewing
– **Pro**: Offensive Web content must be controlled and monitored in order to protect portions of the population (e.g. minors)   – **Con**: Web content is protected under free speech and should not or cannot be controlled.
Copyrighting digital media: The Napster case and enforcement of copyrights on theWeb
The U.S. government versus Microsoft Corporation: Was the settlement appropriate?
Legal issues in e-commerce: The enforcement of digital signatures and electronic transactions and privacy protection
Sklyarov case and code breaking in general: Should we allow public discussion on how to break encryption code?
U.S. bill draft: Government imposed software security measures
The French government versus Yahoo! : Do governments have the right to enforce local laws on the Internet?
Virtual child pornography: Should virtual child pornography be banned or is it protected by freedom of speech?
Internet taxation: Should federal or state governments collect taxes for Web purchases?
American Disability Act and Southwest Airlines: Should Web sites be forced to be readable by the visually impaired?
KaZaA, Morpheus, and the Bermann bill: Should owners of copyrights be allowed to actively attack machines owned by people who are violating those copyrights?
The Verizon case and the Digital Millennium Copyright Act: Should ISP be forced to disclose the identity of owners of machines involved with illegal file swapping?

Students who participated in the debates picked a topic and a position for that topic. In order to prepare for the debate they were asked to research their topic and provide a document summarizing their research. This document was required to contain the following items: 1. A statement giving the context for the topic. This should include any background information necessary to understand the arguments provided by either side. One to two pages were the suggested length for this portion of the document. 2. A summary of the position taken by the student. Again, one to two pages were the suggested length. 3. A list of sources for information supporting the position taken in part two. These sources could include books, newspaper and magazine articles, Web sites, etc. The title and reference of the source were required in addition to one or more short quotes (each a maximum of 3-4 lines) from the source.

The debates themselves took place during regularly scheduled class sessions. Each topic was allocated 30 minutes of time. The exact speaking order and allotted times were as follows: 1. *Pro's opening statement* (*5 min*): Pro states the context, his/her position and provides supporting evidence. 2. *Con's cross-examination* (*3 min*): Con's rebuttal of pro's position statement in which pro's points are addressed in turn. 3. *Con's position statement* (*4 min*): Con states his/her position and states supporting evidence. 4. *Pro's cross-examination* (*3 min*): Pro answers con's position statement, addressing con's points in turn. 5. *Audience questions/comments* (*8 min*): The audience and/or assigned interrogators ask questions. 6. *Pro's closing statements* (*2 min*): Pro recaps his/her points. 7. *Con's closing statements* (*2 min*): Con recaps his/her points.

The debates were optional. Students who did not wish to participate could complete other work to receive credit, an option provided so that students whose native language is not English and students uncomfortable with public speaking would not be forced to participate. Students who participated in the debates were allowed to choose the topic and position they wished to debate. They would then be paired with a student willing to debate the opposing viewpoint. Although the debates had the same basic format and nearly the same set of topics in

each course that used them, there were some differences. These differences and the results for each course are described in the following sections.

DS 425: Winter, Spring, and Fall 2002: The suggested set of topics for DS 425 varied by quarter. In the Winter and Spring 2002, the topics included all the ones listed in the table above with the exception of virtual child pornography, Internet taxation, and the American Disability Act. In the Fall 2002 the topics included all the ones listed with the exception of virtual child pornography and Internet taxation. Students who participated in the debate were graded on their research document and debate performance. Students were told that when preparing their position statement, they should keep in mind the possible views that their opponent could take and prepare accordingly. Beyond this, little guidance was given other than the debate structure presented above.

Debating teams also included a third party: the interrogator. The role of the interrogator was to force pro and/or con side to address hard issues. The interrogators had to research the topic and produce a document describing the context of the topic and appropriate references. This document also had to include two questions to be directed at either the pro speaker or the con speaker. In addition, interrogators had to describe the answers they would expect. It should be noted that the requirements placed on the documents provided by pro, con and the interrogator force them to look at all sides of the topic.

The grading scheme for the debate was as follows: debaters (pro, con, and the interrogators) were graded on 20 points for the research documents they prepared and their debate performance. These points were directly added to their final exam score and excused them from the debate question on the final. Non-debaters had to answer a special question on the final that was related to some of the issues raised in the debates.

In the Winter quarter, there was one section with 52 students, in the Spring there was again one section but with 36 students, and in the Fall quarter there were two sections with 8 and 21 students respectively. During

Winter quarter, all topics had an associated debating team with the exception of the French government versus Yahoo! During Spring quarter, three topics attracted debating teams: The U.S. government versus Microsoft Corporation, legal issues in e-commerce and copyrighting digital media. During the Fall quarter, all topics except virtual child pornography, Internet taxation, code breaking, and the U.S. bill draft had debating teams. It is interesting to note that non-native English speakers accounted for more than half of the debaters in DS 425.

In the Winter quarter, with a few exceptions, it was quite evident that the speakers and interrogators had done extensive research of their topic. They were able to present their assigned position, regardless of their personal beliefs and appropriately evaluate the technical aspects of their issues. For example, when debating U.S. government versus Microsoft, the issue of creating a modular operating system had to be addressed. The DS 425 students were capable of appreciating the complexity of the task from a programmer's point of view, and they were able to see possible repercussions on software security and user privacy. During the Spring and the Fall, the results were much the same. Remarkably, however, the audience was far more participative and better prepared for the debates during those quarters. The audience thoroughly questioned the debaters, who in turn demonstrated excellent knowledge of their topic.

The significant increase in audience participation can be explained in two ways. First, the list of topics was given to the students in the Spring and Fall quarters much earlier than in the Winter quarter. This appears to have encouraged some students to look up the material on their own, as demonstrated by the fact that numerous non-debaters came in with notes, ready for the question period. Secondly, the debate topics were more closely integrated with normal lecture material during the quarter. For any solution or answer students provided, they were required to justify their specific choices, and if general users were involved, they were expected to explain how the users would be affected. This emphasis on the human components as part of any solution appears to

have better prepared students for the debates.

ECT 250: Spring 2002: The set of topics suggested to the ECT 250 students taking the course in the Spring 2002 included all of the ones listed above, with the exception of the U.S. bill draft, Internet taxation, the American Disability Act, the Bermann bill, and the Verizon case. Students were required to research at least one of the topics and produce a summary paper. At that point, they were given a choice: they could debate their topic and earn five extra credit points on the final exam, or they could answer extra questions on the final exam covering the topics debated in class. In the latter case, no extra credit would be awarded. The extra credit was offered as incentive to encourage the more reserved students to participate.

Additional guidance was provided to ECT 250 students on the format of the research paper. The students were required to produce a paper with four sections. The first section gave the context of the debate, including information necessary to understand either position – names, dates, laws, and other relevant facts. The second section was a summary of the position the students were to present. The third section of the paper required students to provide a summary of arguments against the opposing position. Finally, the last section of the paper was a list of supporting sources. ECT 250 students were required to give 10 sources and list at least two relevant quotes per source. Since ECT 250 students have less experience in preparing written documents, we felt that this extra guidance would help them to produce a better quality final product.

The debate portion of the course was worth 10% of their overall grade. For the debate portion of the course, the timely choice of a topic is 10%, the research paper 40%, and the debate or exam questions answered 50% of the overall debate grade.

During the Spring 2002 there were 14 students in the course. Four debates were scheduled, one on copyrighting digital media, one on the Skylarov case and code breaking in general, and two on offensive Web content. The debates were scheduled two per class session during the last week of the quarter. Given the poor overall preparation of the class in other aspects of the coursework, our expectations for the debates were low. We were pleasantly surprised. Half of the debate participants had thoroughly prepared, and all were able to list some important dates, names, and other relevant facts. Unfortunately, the other half of the debates were unorganized, and several important facts were missing from the required statements. Although all students were articulate, many inserted their own opinion into the debate instead of providing facts to back up their position. The most enthusiastic exchanges during the debates were in the question and answer periods. Students seemed less hindered and more spontaneous and were able to integrate factual data better into their arguments.

ECT 250: Winter 2003: The set of topics suggested to the ECT 250 students taking the course in the Winter 2003 included all of the ones listed above, with the exception of the American Disability Act, the Bermann bill, and the Verizon case. Students had the choice of participating in the debate, writing a five-page research paper on one of the debate topics, or producing a business plan and Web site for a hypothetical e-commerce company. Students participating in the debate were required to prepare a two-page report following the same guidelines as given to the Spring 2002 students. Students who selected the third option were required to develop a business plan for a new e-commerce business and an associated Web site for that business. The Web site was required to implement the elements found in the business plan and required more advanced Web programming such as CGI coding, Java, or Javascript. The site was not required to be fully functional, but it was expected to have the main elements outlined in the business plan. This option was provided so that CTI students taking the course during their junior or senior year would have an option that provided them with sufficient challenge.

The debate topics portion of the class counted as 15% of the grade. The grading of the debates was based on the general completion of the requirements, meaning the proper presentation of the appropriate side in the debate and the completed report with all its required components. Students

who participated in the debate earned five extra credit points.

There were two sections of the course during the Winter 2003 quarter, one with 13 students and one with 23 students. There was one debate scheduled in each section, one covering the offensive Web content issue and the other copyrighting digital media. All participants in the debate were able to present their side well and give legitimate rebuttal to their opponent. In both debates, the students giving the con arguments (offensive content should not be controlled and copyrights should not be enforced), used a less formal method of response, simply stating what they felt personally rather than using references to support their arguments. Unfortunately, students presenting the pro side of the debate fared only slightly better, as many of them were simply reading from their written papers. Overall, participation was mainly from the same group of students who normally participate in classroom discussions. However, students seemed to appreciate the benefits of the debates. One student remarked in the course evaluations that engaging the class in discussions helps solidify the material in the course.

ECT 250: Spring 2003: Unlike the previous quarter, students taking ECT 250 in the current quarter are only provided with two options: they can either participate in the debate or create a business plan and associated Web site for a new business. There is no extra credit provided for those students participating in the debate. The topics given for the debates are the same as in the Winter 2003. The grading for the business plan/Web site project has been further refined, with 75% of the credit associated with the business plan and 25% of the credit for the Web site. The goal of this refinement is to emphasize the relative importance of developing a sound business plan.

In an effort to encourage students' participation in the debates during this quarter, students were told to prepare for each class by reading, at a minimum, the different societal issues covered by each chapter in the textbook. Students were divided into groups of four or five and were given 10 minutes of class time in which to discuss the topic of that day. The goal of the discussion is to agree upon a unified opinion on the subject.

These exercises are intended to create an atmosphere where students are comfortable speaking with each other and feel prepared to tackle the more public debate project at the end of the quarter.

This portion of the course counts for 15% of the grade, as in the previous quarter. There are 20 students enrolled in the class, and 8 students will be participating in the debates. Two debates will be on the issue of Web taxation, one debate on copyright enforcement, and 1 debate on virtual child pornography. As of now, the debates have not taken place.

Informed Discussion
The less structured discussions were conducted in the CSC 200 course. There were three distinct approaches taken over the four quarters that we taught the course. In each approach, the last 20 minutes of class were reserved for the discussions, and the students were required to come to class prepared. The details of what preparation means for each type of informed discussion, the topics the students were directed to research, and the results we obtained are described in the remainder of this section.

Current Events: The first approach we used in the course was to ask the students to bring articles related to relevant current events. This approach was taken during the Fall quarter 2001, as the events of September 11th motivated the students to consider the role technology played in the terrorist attacks. We made technology and terrorism the theme for the informed discussions, and the students were required to bring in articles linking the two topics. In three cases, the students were directed to think about specific questions: 1. Do U.S. citizens have a right to privacy? 2. Should citizens' privacy be compromised in the search for terrorists? 3. Has technology surpassed our humanity? During the time allotted for the informed discussion, we directed the session by asking each student to share their articles and provide their opinion on the topic of the day.

Students were graded based on the articles they brought to class, not on their contribution to the discussion. The students either received full points for bringing a relevant article or they received a zero. Informed

discussions counted as 10% of the course grade.

The results from this quarter were excellent, in part because the students' motivation was so strong. Nearly 100% of the students in the class participated, with students eager to share the information they gathered. The three specific points suggested above generated excellent discussions.

Course Topics: In an effort to engage the students more fully in the material covered by the class, the second approach taken toward informed discussions was to require students to bring articles related to the topics covered during lecture that week. This approach was taken in the Winter 2002, Spring 2002, and part of the Fall 2002. The course topics covered by the informed discussions included the following: 1. Information technology 2. The Digital Divide and computing in education 3. Advances in hardware 4. Data storage 5. Networking 6. The Internet, privacy and security, Web development 7. Programming languages 8. Operating systems and software applications 9. Advances in MIS 10. Ethics.

The students' grade on the informed discussion was based on the submission of the article and comprised 10% of the course grade. Full credit was given for appropriate article submission, and a zero was given to students who did not submit articles.

The results for this approach varied by quarter. In the Winter 2002, class participation was good to excellent, although some students, particularly non-native speakers, were reluctant to speak in class. Nearly every student contributed a good number of articles, but not all students participated in the discussion, despite our attempts to engage all the students. In the Spring 2002, more of an effort was made to engage the students in the ethical considerations of each topic. This seemed to have improved the dynamic, and class participation was excellent. Discussions often went past the end of the regular class session, and on occasion, the topics were revisited during the next class period. Students mentioned on the course evaluations that the articles brought in were one of the most beneficial aspects of the course because it related the material to "real life." Unfortunately, results were dra-

matically different in the Fall 2002. Very few students brought in articles, despite the fact that this was a graded part of the course. Not surprisingly, class discussions were hampered by this lack of enthusiasm. The poor results during this quarter inspired us to try a new technique described in the next section.

Debates: During the 7th week of the Fall quarter 2002, in an effort to improve participation, we switched from a discussion based on articles submitted by students on course topics to debates centered on particular controversial topics. The topics considered during these debates are given in the following table:

Monitoring Web content: Should laws exist for monitoring Web content? Should they be the same as for printed media? How would these laws be enforced? Are there differences between Web publications and other media that should be considered?
Credit card transactions on-line: How binding are credit card transactions occurring on the Internet?
The ethics of data gathering/sharing: Should individuals be in control of information pertaining to them that is kept in massive databases where such information can be easily disseminated? Should companies be required to obtain written signatures from individuals before disseminating information regarding them?
Electronic voting: Is it feasible? Should it be done?

Students were required to bring material, including books, articles, Web pages, etc., relevant to the debate topic and were instructed that they must be prepared to defend any position that could be taken on the issue.

The grading of the informed discussion was based strictly on the materials they submitted, not on their class participation. The students either received full points for bringing a relevant article or they received a zero. Articles submitted for the informed discussions counted as 10% of the course grade.
The switch to a slightly more structured format centered around current events dramatically affected class participation. Students were far more likely to bring materials and actively discuss issues than before. The

class became lively and exciting. The only drawback is that students seemed to feel that taking a position compatible with the one perceived to be taken by the instructor was important. Students tried to ascertain our position on the debate topics and align themselves with that position, even when their guess about our opinion was incorrect.

Observations: From our experiments with different formats for informed discussions, we can draw some conclusions. Current events proved the best device to increase class participation and provided a compelling method for discussing the ethical uses of technology. Articles addressing specific areas of technology solely guided by the syllabus were the least effective means of eliciting class participation. Students were better motivated to participate when they were given topics that addressed practical concerns. Articles addressing more theoretical material were not of an interest to this group, a result that is not surprising given this is an introductory course for students new to information technology. As in the debates, students tended to focus more on personal opinion than on facts. However, since the discussions were less structured, this impacted the results less. Another apparent weakness is the students' ability to integrate the topics and the ethical concerns. When asked to bring material focusing on a particular technology, they were less able to imagine the ethical concerns than when the assignment specifically addressed ethics.

4. IMPACT ON EVALUATIONS

We now consider the impact that the various forms of informed discussion had on the course evaluations for each of the courses considered in this paper.

Course Evaluations in CTI
CTI conducts evaluations of every course during every quarter. The evaluations are conducted on-line, via the CTI Web site. Students must log into the system and may only submit one evaluation per course. All identifying information about the student is removed from the evaluation, making them anonymous. Completing a course evaluation is mandatory for all students enrolled in CTI courses. Course evaluations are completed

during the eighth and ninth weeks of the quarter.

The evaluations consist of a series of twenty-two multiple choice questions and a section for comments on particular areas. The multiple choice questions ask the student to rate various aspects of the course and the instructor for the course. The ratings are on a scale from 0 - 10, and the meaning associated with a value depends on the question. In general, a higher number indicates a greater degree of student satisfaction with the area addressed by the question. A zero indicates that the student feels the question is not applicable. A listing of all multiple choice questions can be found on the CTI Web site (DePaul CTI 2003).

For the purposes of this work, we are interested in six of the twenty-two questions on the course evaluation. We selected these questions because they best capture the students' reactions to informed discussions. The six questions are (the numbering is relative to all course evaluation questions):

Question	Scale and meaning
9. What is your overall estimate of this course?	1-3: One of the least interesting, uninformative, unuseful (sic), personally unhelpful course 4-7: Average in interest, usefulness, etc. 8-10: One of the most interesting, informative, useful, personally helpful course
10. How valuable was this course in terms of your technical development?	1-3: Not valuable 4-7: Reasonably valuable 8-10: Extremely valuable
13. Does the instructor motivate student interest in the subject?	1-3: Discourages student interest 4-7: Arouses fair amount of student interest in the subject 8-10: Arouses enthusiasm among students for the subject
14. How well does the instructor relate the course material to other fields?	1-3: Poorly 4-7: Adequately 8-10: Exceptionally
15. Did the instructor encour-	1-3: Does not encourage participation

age participation from the students?	4-7: Adequately encourages participation 8-10: Encourages participation and precisely answers questions
20. Would you recommend this course to another student?	1-3: No 4-7: Possibly 8-10: Definitely

Evaluations and Informed Discussion

In this section we consider course evaluation data for the six questions listed above. The data is taken both from courses in which we conducted informed discussions and courses in which we did not. However, the data is restricted to the previously mentioned courses, namely ECT 250, CSC 200, and DS 425. Note that data from the Winter 2003 and Spring 2003 sections of ECT 250 are not considered. Both were taught by a separate instructor from the other ECT 250 courses. Although the Winter 2003 evaluation data is available, the spring data is currently being gathered, and no other data is available for that instructor for comparison purposes. Note that all numbers given in the remainder of the section are class averages.

The crucial observation gleaned from the data for DS 425 indicates that debates improve student satisfaction provided that discussion about the debate topics is well-integrated into the course material. Recall that Winter 2002 was the first quarter in which debates were conducted in the DS 425 course, and that debates continued every quarter thereafter. The scores for the question dealing with participation (Question 15) improved dramatically, moving from 8.2 in Spring 2001 to 9.04 in Fall 2002. Students felt more motivated once debates had been introduced with scores starting at 8.3 in Spring 2001 and moving to 8.7 in Fall 2002 for the relevant question (Question 13). When considering students satisfaction with their technical development (Questions 9 and 10), the debates again dramatically improved students' perception with scores moving from 7.8 (Question 9) and 7.5 (Question 10) in Spring 2001 to 8.4 (Question 9) and 8.2 (Question 10) in Fall 2002. The scores on the remaining questions (14 and 20) were inconclusive.

The results for ECT 250 show improvement in all areas covered by the six questions ex-

cept for the one asking students if they would recommend the course to others (Question 20). The scores on each of the remaining questions improved, with small variations. Students felt that the course was more relevant for their technical development (Questions 9 and 10), with scores moving from 7.2 (Question 9) and 6.8 (Question 10) in Spring 2001 to 8.3 (Question 9) and 7.8 (Question 10) in Fall 2002. Satisfaction with motivation and participation (Questions 13 and 15) improved slightly less, moving from 7.6 (Question 13) and 7.5 (Question 15) in Spring 2001 to 8.3 (Question 13) and 8 (Question 15) in Fall 2002. The students felt that the course material was slightly better related to other areas (Question 14) with scores moving from 7.5 in Spring 2001 to 8.1 in Fall 2002.

The data for CSC 200 is more difficult to analyze, in part because the types of informed discussions used in the course have varied significantly across quarters. It does appear, however, that structured discussions motivated by current events and integrated into the course, rather than topics dictated by weekly course material, were better received by students. Their satisfaction with the course dramatically increased on all six questions during the Fall 2002, the only quarter in which current events were addressed in an informed discussion similar in style to structured debates. The scores on each of Questions 9, 10, 13, 14, 15, and 20 during Fall 2001 were 6.6, 6.4, 6.5, 6.9, 6.5, and 6.4 respectively. The scores on each of Questions 9, 10, 13, 14, 15, and 20 during Fall 2002 were 8.1, 7.7, 8.2, 8.3, 9, 8.6 respectively.

In summary, the best course evaluations are obtained when the topics for the informed discussions are well integrated into the course while remaining focused on current events. Doing this improves student satisfaction with both participation and motivation, as is expected, but surprisingly also with their perception of the technical merit of the course. It would seem that the value students assign to a technical education is improved when the instructor encourages them to see its relevance to the broader world.

5. CONCLUSIONS AND FUTURE WORK

In this paper we present evidence that informal debates based on significant prior research, called informed discussions, provide an optimal way to educate students about ethical, social, and legal issues in information technology. Although more structured debates prove useful for more mature graduate students, less structured discussions allow undergraduates to engage more fully in the process. Current events provide the best topics for informed discussions, and issues that address practical concerns are more relevant to students than ones discussing more theoretical questions. The best results are obtained when the topics are integrated into the class material throughout the quarter. Informed discussions not only help engage students in social, ethical, and legal issues in information technology, but also improve their perception of the technical merit of the courses in which they occur.

As mentioned earlier, the role of CSC 200 is changing in the curriculum at CTI. The course is no longer a requirement for students within CTI, and it is being reformulated as a general education course. The Liberal Studies Program at DePaul requires students to take at least one scientific course (DePaul Liberal Studies Program 2003), and a proposal to allow CSC 200 to count for the Scientific Inquiry Domain in Liberal Studies is currently under review. The subject matter of the course remains primarily the same as the course that was previously taught to CTI majors, with one significant change: debates are now required in the course. In the new version of CSC 200, the debates are used to teach students about the importance of communication in science, and to inform students about the ethical considerations crucial to information technology.

It would be interesting to consider adding debates to other courses in the CTI curriculum. An excellent choice would be the capstone courses in each of the undergraduate degrees at CTI. As part of the Liberal Studies Program at DePaul, undergraduates are required to take a course that integrates their general education requirements and the body of knowledge gained in their major (DePaul Liberal Studies Program 2003). This context provides an optimal environment for introducing debates on ethical, social, and legal aspects of information technology. A similar idea has been applied in the Biology department at DePaul with great success (DePaul Department of Biological Sciences 2003).

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