

**Blackboard Collaboration:  
Consolidation of On-Line Course Materials and Assessment  
for Multiple Sections Using Blackboard**

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Abstract

This paper describes the efforts of four Virginia Tech College of Engineering faculty members who used Blackboard collaboratively to reduce the overall effort required to administer one required introductory course.

Blackboard is Virginia Tech's preferred course management tool. Virginia Tech uses Blackboard to complement and supplement traditional courses and to support classes that are fully online. By mid-2003 at Virginia Tech more than 6,300 active courses in Blackboard were being used by more than 1,100 faculty and 24,600 students. Additional courses are continually being added. Students now expect their courses to be supported by this tool.

Limitations of this tool are evident when multiple sections of a class are involved. The authors combined their 12 sections of EF2984, Virginia Tech's introductory engineering exploration course, into one Blackboard site. This paper addresses the authors' efforts to simplify course management, to provide a unified and consistent source of information for students, to facilitate common on-line quizzes, and to eliminate duplicate efforts by faculty who previously managed individual sites.

The authors additionally address their experiences with common time and common location testing of these 12 sections of class. Test administration issues, honor code violations, and results are discussed.

Engineering Exploration (EF1015/EF2984) at Virginia Tech

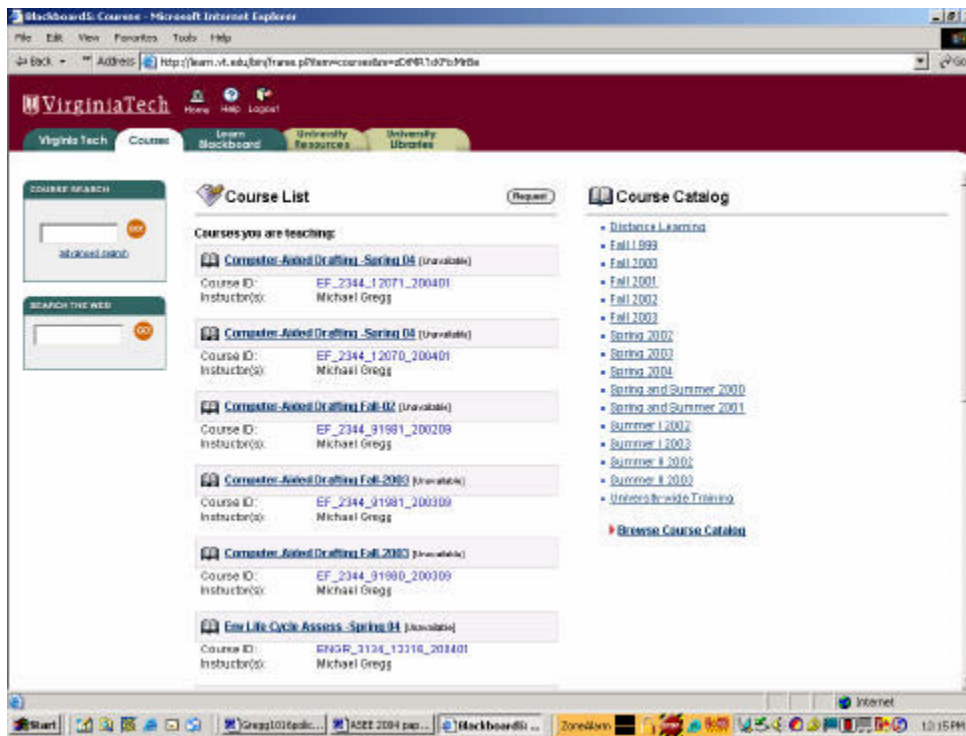
Engineering freshmen at Virginia Tech typically take one introductory engineering course during their first semester; this course, Engineering Exploration I, covers data analysis, graphing, engineering ethics, problem solving, and programming. This course is a prerequisite for all higher-level engineering courses and is offered every semester. Approximately 1200 General Engineering (GE) students enroll in Engineering Exploration I in the fall; GE students are those who have already been accepted into the College of Engineering at Virginia Tech. In the fall, professors use a common syllabus, are provided

with lesson material, and generate their own quizzes. Every student who takes EF1015/EF2984 is required to own a laptop computer approved by the College of Engineering.

During the spring, most of the students taking Engineering Exploration I fall into one of three categories: GE students who did not successfully pass the course in the fall, University Studies students (who are undecided about their majors), and transfer students. During the spring of 2003, approximately three hundred students were enrolled in Engineering Exploration I. Four professors taught the twelve sections that were offered, each containing 28-32 students. Waldron and Lo each taught 4 sections while Robinson and Gregg split the remaining sections. The twelve sections used a common syllabus, took the same online quizzes, and took the same exams. Although a course coordinator provided slides for each lesson, each instructor was allowed to modify the slides to suit his needs. The common syllabus suggested homework problems, but instructors were allowed to alter the homework assignments.

### Blackboard at Virginia Tech.

For teaching purposes, the university strongly encourages use of Blackboard. Blackboard is a web-based educational software platform used by more than 2800 institutions in over 50 countries<sup>1</sup>. Examples of Blackboard usage at other institutions have been documented.<sup>2,3,4</sup> Rather than ask students to access a separate web address for each course, Blackboard offers the students a “one stop shopping” experience. When students or faculty first enter the Blackboard portal, they see all of the Blackboard courses that are available to them.



Website navigation is intuitive, and instructors can customize their Blackboard courses. Through online tutorials and various faculty development initiatives, instructors have multiple opportunities to learn how

to use Blackboard and maximize their use of Blackboard's capabilities. Some of Blackboard's features include allowing instructors to post documents, to create discussion boards, to generate online quizzes that are automatically scored, and allowing students to see their grades. For every instructor, Virginia Tech's Online Course Systems (OCS) automatically generates one Blackboard course per section, regardless of whether or not the faculty member chooses to use Blackboard. Those professors with multiple sections have the option of combining their sections together into a single Blackboard course. Sections taught by different instructors may also be combined into a single Blackboard course.

#### Reasons for combining sections into a single Blackboard course

Reasons for consolidating sections into one Blackboard course include saving time, allowing common quizzes and providing consistent information to students who will take common exams. Since EF professors are given Powerpoint<sup>tm</sup> slides to use for instructional purposes, professors may benefit from uploading a single version of the slides to the Internet. This also holds true for uploading other common documents and generating hyperlinks to other websites needed for the class. During spring 2003, approximately 25 lessons (each containing two PDF versions of 3 to 20+ slides), 12 reading assignments, and about 30 homework-related documents were posted to the shared Blackboard course. Each file had to be uploaded to Blackboard one at a time. To access Blackboard, add a new item to a folder, and upload a 1 MB file takes approximately two minutes. Time is also necessary to set up the course so that the proper areas are available to the students and items in each area are arranged in the order as desired by the instructors. For EF1015/EF2984, two hours each week can easily be spent maintaining the Blackboard course. As with all software programs there is a learning curve related to becoming fluent in that software. A corollary is that there is a 'forgetting' curve as well – not using the software regularly requires revisiting the learning curve.

A shared Blackboard course allowed students to take common quizzes; this ensured that students had been quizzed over the same material before taking the test. The quizzes not only reinforced the material students were learning, but provided motivation to the students to understand the material before taking the quiz. By giving online quizzes, instructors used class time more effectively because in-class quizzes were eliminated. Instructors were encouraged to contribute questions to the question pools. Some instructors chose to verbally contribute questions so that others more knowledgeable in Blackboard use could enter their questions into the system.

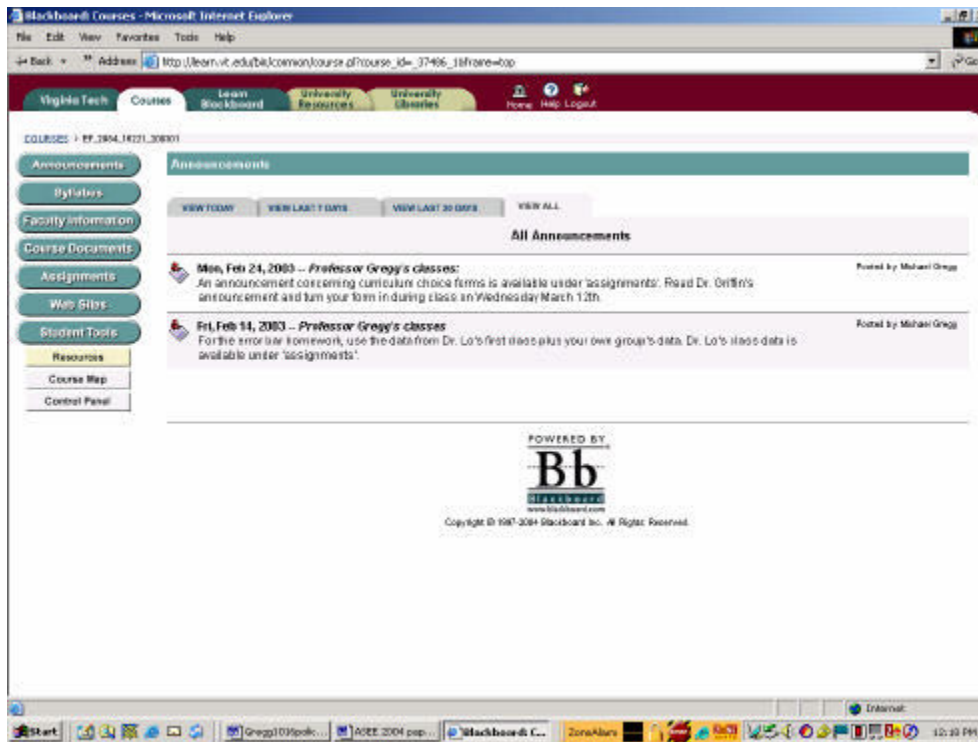
All students had equal access to all materials posted online. Students could benefit from what their instructor or any other instructor had posted to the website. Combined sections also benefited from a common email list for contacting students.

#### Disadvantages to combining sections

A few disadvantages to combining sections include the need for students to filter out material that is pertinent to their section, inadequacies related to the gradebook feature, and the effort required coordinating instructors. Individual instructors wishing to email just their students must manually identify the students in their sections; Blackboard does not currently provide a separate means of identification.

Instructors who wished to download only the grades of their students had to download all grades and then eliminate the grades of those students not in their sections. This became an issue because a substantial portion of the course assessment was not done via Blackboard and faculty needed to incorporate those Blackboard grades into their own spreadsheets.

At the beginning of the spring 2003 semester, students were told that the Blackboard course for Engineering Exploration I would be common to all students, so that they would consciously look for material and announcements pertaining to their sections. The Announcements page is the first thing students see when accessing a Blackboard course. Since the Announcements page is global (meaning everyone with access to the Blackboard course could see any posted announcement), instructors prefaced any section specific announcements with “For Prof. xxx’s students...” Students needed to determine which announcements were general and which were section specific ones. To avoid posting section specific announcements, instructors could email announcements by generating groups on Blackboard or by avoiding Blackboard and using a listserv provided by the university.



Since students must enter Blackboard using a PID and password, the Blackboard gradebook is a convenient way to distribute grades to individual students without violating privacy issues.<sup>6</sup> Only the individual student and the instructor are allowed to view that student’s score. For the instructor, the gradebook lists all students enrolled in the Blackboard course. Although an instructor may set up groups for discussion board, file exchange, and discussion board purposes, there is no way to extract groups of students from the gradebook. Therefore, each professor must spend time exporting the overall gradebook from Blackboard and then extracting his students’ grades from the gradebook. Likewise, if a professor wants to import grades to the Blackboard gradebook, his grades would have to

be entered in a spreadsheet containing all students' grades (including ones not in his section). Most professors found it easier to enter each student's grades one at a time into the Blackboard gradebook, but as this is a time-consuming process, most professors chose to make only a limited number of course grades available to the students via the web.

Also, if one professor decides to post grades for a particular item (test, assignment, etc.), but another does not, the student with no posted grade sees a blank space associated with that item. This creates confusion for some students, who then believe they did not receive a grade for that item. These students then email their instructors who end up using valuable time explaining the situation.

Students also see a course average, variance, standard deviation, maximum score, and minimum score associated with each item (graded work) when they check their grades. This may give some students a false impression of their relative performance in a particular instructor's class since the other instructors may have graded their work using a different grading scale or different grading scheme.

#### Blackboard for common online quizzes

For spring 2003, common online quizzes for EF1015 were given weekly as an outside of class assignment. A 30 minute math assessment was also given via Blackboard. Each week, quizzes covered multiple topics; each topic was assigned to a question pool within Blackboard. Students were given instructions to work alone and to abide by the university honor code. In order to reduce cheating, random selection of questions from the question pools were used and each student's quiz was likely different from the others. Questions consisted of three types: multiple choice with a few correct answers, multiple choice with a single answer, and true/false. Some questions involved engineering calculations while others were related to the assigned readings or Powerpoint<sup>tm</sup> lesson slides. For the most part, quizzes consisted of five to ten questions, with each question coming from a pool of questions. Each pool contained two to five questions. Students were given four days to complete a weekly timed quiz, with quiz availability closing each Friday at noon. Depending on the number and type of questions, students were given 10-20 minutes per quiz.

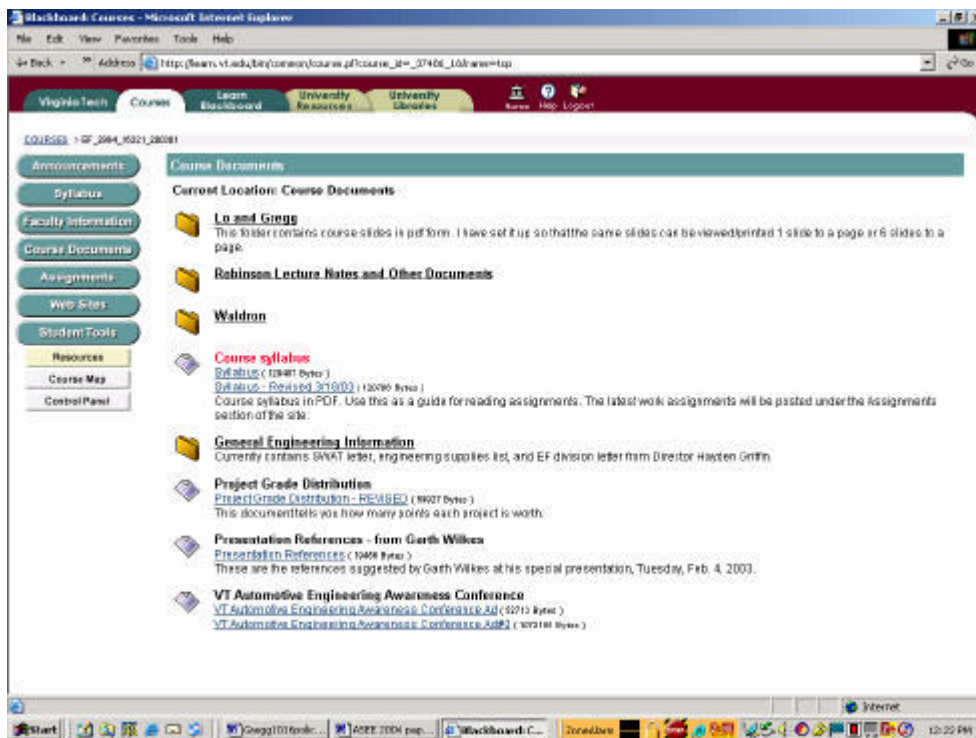
With the use of a collaborative Blackboard site for the posting of quizzes, any error in a posted quiz question is accessible by all students in all sections at the same start time. A common Blackboard site accessed by instructors requires coordination between instructors and assumes that each instructor understands how to use Blackboard's features. A primary instructor was in charge of assembling the quiz each week and instructors were encouraged to add to the various question pools.

Since Blackboard does not allow an instructor to change any part of a posted quiz without first deleting recorded grades for that assessment, cross-checking between instructors is necessary to verify the accuracy of all quiz questions before the posting to students. One of the limitations of Blackboard is that pools of questions may not be changed once they are active in an assessment. This means instructors must spend time looking at more questions than they would have if they had developed a smaller number of questions for their own individual class use.

One caveat in using Blackboard for administering quizzes is that a student (for unforeseen reasons) may experience technical difficulties in submitting a quiz electronically. In this case, a padlock icon appears in the electronic gradebook. The same icon appears in the gradebook while a student is in the process of taking the quiz, so the cause for the icon is not easily identified. In the case of student inability to submit a quiz, the instructor can re-set the quiz by clicking on the padlock, and the student can re-try the quiz submission; instructors are obligated to base the re-set of a quiz on student reporting of the inability to submit a quiz. Not only does this require an “honor accountability”, but the time elapsed between a student’s attempt to submit a quiz and a student’s contact with the instructor may result in a request to re-take the quiz after the Blackboard submission deadline.

### Other issues related to Blackboard

One issue to consider is how to maintain some degree of individual instructor control. Some professors wanted to provide altered slides or course documents to their students. To handle this, a subfolder for each instructor was generated. Two (Lo and Gregg) of the four professors shared a single subfolder. With Lo and Gregg, if the two professors were doing different things in their sections, they noted this for the students in their Blackboard subfolder.



By tracking the online gradebook, which immediately enters a grade when the student is done with his quiz, most weeks showed that about 50% of the students took the quiz on Friday mornings. Some students complained they had experienced difficulty in accessing Blackboard during Friday mornings; it may be that on those mornings, the university server and/or Blackboard was overloaded with students not only from Engineering Exploration I but also other university classes as well.

In theory, with other professors maintaining the common Blackboard course, it is possible for a professor to never need to even see the online aspects of the course, and thus never need to spend the time to learn how to use Blackboard.

#### Common tests

This introductory course has common time testing to primarily allow for the use of a single test for all students in the multiple sections of the class. This is true in the 'off semester', this case, where we have twelve sections and approximately three hundred students. Common time testing is also used in the 'regular' or fall semester, accommodating 47 or more sections of this class and 1100 or more students. The many benefits to this approach include:

- Two separate tests satisfies both those students taking the test at the normal time and that portion of the student population which have excused absences from the test
- Testing is done at the same time under the same conditions. Students don't have an opportunity to compare 'notes' after an early test.
- Common time testing provides additional incentive to generate tests that are machine gradable. This not only saves faculty time in the grading process but also normalizes the grading.
- An overall analysis can be easily generated looking at common errors or mistakes. This allows faculty and course administrators to determine if a particular topic needs to be addressed in a different fashion or in greater depth during class.
- A similar analysis can be made concerning common answers to generate statistics concerning possible cases of collusion or cheating.

The detriments of common time testing are also numerous:

- Security of original exam is more critical
- Advances in technology makes in-class cheating more possible
- Common tests may not test those topics of importance to, and stressed by, individual instructors
- The committee approach to generating a common test can be logistically, administratively and politically painful.

The Division of Engineering Fundamentals, which offers these introductory courses, instituted common time testing a number of years ago in an effort to normalize the rigor and graded outcomes of multiple sections of these classes. The reality of space allocation at most universities limits the availability of testing space. At Virginia Tech there is no one teaching facility which would accommodate 1100 students at one sitting. The venues which would accommodate such a large group (football stadium, basketball stadium, main auditorium) are not suitable for test taking. The division has no alternative but to locate as many classrooms as possible at the same time to accommodate all required students. In this case most instructors, typically teaching 4 sections of class, have 4 different (usually adjacent) classrooms for testing purposes. Tests cannot be (easily) started at the same time, and the faculty member must continually move from room to room to maintain a presence.

The authors did not enter the semester with a plan to offer common-room testing in this class. The common use of Blackboard, however, was an early decision. Prior to the first of two tests in this class, one of the authors discovered that a classroom capable of handling our 320 students (all 12 sections) was available on the day and time of the common test. This classroom was scheduled and the others released. Students were told before hand of the common-room testing, and upon arrival at the test location were allowed to select their own seats. Only one form of the test was generated, with 12 multiple choice questions.

Administration of the common-room test was a success. One faculty member could administer the test to all 300 plus students, although three faculty were in attendance. For the second test, however, a number of changes were made. This second test had two forms, A and B, which were the same 19 questions in a different order, with the multiple choices for each question also reordered. In addition, seating was assigned. Prior to the test the names of all students were printed out and then individually taped to the desktop where they were assigned. To ease the administrative process, the order was alphabetical by last name. When students entered the classroom for test 2, they located their test seat, then removed their pre-printed name from the desk and attached it to their test form. Students were also required to display their university photo-ID cards during the test, making it more difficult for a 'ringer' to take the test, and making it easier for faculty to confirm that the photo-ID, the tester, and the preprinted name were the same.

Virginia Tech's office of Testing Services not only scores these machine-gradable tests but also generates a cheating analysis on the tests. The correct and incorrect answers for every possible pair of students are compared and similarities examined. For those student pairs whose answers reveal a greater than 99.9% probability of similar responses not being random were identified. The results of the tests were surprising, although they probably should not have been.

For test one, 67 individual students (out of 314) were identified as having a statistically significant chance of collusion. In other words, there was a very small probability that their common wrong (and right) answers were arrived at randomly. Two statistics were actually generated, G1 and G2. The G1 statistic looked at both similarities in correct and incorrect answers, and was used to compare lower-scoring pairs. The G2 statistic looked at just incorrect answer similarities. Of the 67 students, some occurred in multiple pairs, and although most were identified based on the G1 statistic, 11 were identified on the G2.

For test two, only 9 different students (out of 290+) were identified as likely cheaters, and none of those were identified by the G2 statistic. The analysis of these cheating statistics by the authors was not intended to be statistically rigorous; in fact the examination of this data was an afterthought. Avoiding the obvious statistical limitations of this analysis, the following might be surmised.

- Much more cheating occurred when students were allowed to select their own seats.
- The use of a second form of the test may have been a factor in the reduction of cheating from test 1 to test 2
- Assigned seating significantly reduced the incidence of presumed cheating.



- Assigned seating could correlate with the student pairs suspected of collusion. The recognition of this correlation by students may have removed some of the temptation.
- The increase number of multiple choice questions (from 12 to 19) may have been a factor.
- Students may have not been as ‘stressed’ over test 2, and therefore the apparent cheating was reduced.
- Coverage of ethics in the class between test 1 and test 2 helped reduce the apparent collusion.
- Student maturity and familiarity with the class material may have reduced the apparent cheating.

The overall result of this attempt at common-room testing by the authors tends to substantiate their beliefs that:

- Common room testing is beneficial and worth the logistical effort to implement
- Assigned seating for tests should be policy, irrespective of common room and/or common time.
- Cheating is much more common than generally recognized by most faculty.<sup>5</sup>

#### Future directions

Future endeavors include using Blackboard’s online quiz capabilities in the classroom as well as incorporating the discussion boards. Although students are not required to establish wireless internet service, many students do have the hardware and software to perform wireless connections which would be required for in-class quizzes.

The logistics and effectiveness of using discussion boards for a large community will be explored. Students may be asked to discuss topics related to current events, ethics, class material, etc. The discussion boards may also be used as a way for students to communicate about homework related material.

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<sup>4</sup>Carlos Sun, Transportation Course Transformation through the Use of Instructional Technology, Proceedings of 2002 American Society for Engineering Education Annual Conference and Exposition.

<sup>5</sup> Cheating, Writing, and Arithmetic. U.S. News and World Report, November 22, 1999, p.54

<sup>6</sup> Family Educational Rights and Privacy Act (FERPA). The Family Educational Rights and Privacy Act (FERPA) (20 U.S.C. § 1232g; 34 CFR Part 99) is a Federal law that protects the privacy of student education records. The law applies to all schools that receive funds under an applicable program of the U.S. Department of Education. <http://www.ed.gov/policy/gen/guid/fpco/ferpa/index.html>

## BIOGRAPHICAL INFORMATION

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