Managing Information Flow for Flexible Assessment of Student Learning in Large Lecture Classes

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Abstract: Large lecture courses provide numerous logistical challenges because of the volume of information about student performance that invariably arises due to the number of students involved. These challenges tend to limit the options associated with the assessment of learning. The advent of computer-graded tests was considered a triumph decades ago, in a large part because it took advantage of the efficiency of information organization that computers afford. The World Wide Web provides new efficiencies in information management that can support new flexibility in assessing what students learn in our courses. By utilizing online database software, information flow is enhanced, and this fact allows the inclusion of a variety of optional assessments for students. Providing choices of assessment to students acknowledges differences in learning styles and provides additional methods for students to succeed in entry-level courses.

[*] Introduction

Educational research has long established that individual learning styles vary [1–6]. Unfortunately, the large lecture environment that is common in entry-level college courses has significant logistical obstacles to incorporating ways to address these differences in learning styles. Goodwin and Gilbert [7] recently published a somewhat flexible grading scheme for moderate-sized classes (section sizes of 70 students) that notes the importance of tailoring to the interests of the students and their learning styles. This type of flexibility may seem imposing in larger lecture sizes of 100 or greater. The use of online database software, however, makes the organization of grading information significantly more convenient, and, thereby, allows for added flexibility in assessment even in these large sections.

In our General Chemistry for Engineering course (a one-semester course taken by all pre-engineering majors), we allow essentially two tracks for students. One track is referred to as "performance-only." This track assesses student learning with traditional methods of hourly exams, written assignment, laboratory performance, and the final exam. Students who choose this track are allowed to access homework problems or other ancillary assignments, but they do not turn them in for credit.

The second track is referred to as "performance + effort." In this track students have four areas where they must provide evidence of effort, with two options in each area. For homework, they may choose either weekly online homework (described elsewhere [8]) or a challenge problem assigned roughly every four weeks. In the laboratory they chose between completing the prelaboratory questions included in the laboratory manual [9] or additional safety exercises patterned after those devised by Greenbowe and coworkers [10]. The writing assignment is augmented by either participating in a peer-review exercise or carrying out an additional research paper utilizing Web-based sources [11]. Finally, we encourage students to make connections between engineering and chemistry using a scheme we call Gateway Examinations [12] or via case studies that are published on the Web [13]. With two options in each of four categories, plus the performance-only track, a student may obtain points for a grade in our course by 17 distinct paths.

Details of grading consume too much space to include here. The course grading scheme is provided as part of the syllabus at http://www.uwm.edu/~tholme/C105/main.shtml. It is worth noting, however, that those who choose "performance-only" have increased point values for the exams, including the final. When surveyed, students perceived that these differences were fair because the class was well informed of the difference when options were chosen. The logistics of carrying out this scheme using databases will note the choice procedure in detail.

The use of Filemaker Pro software in large lecture courses has been described elsewhere [8]. To use this software to provide assessment flexibility requires several databases and relationships between them. First, students register their choice of grading options during the first three weeks of the course. Presently, they are not allowed to change their grading option after the initial registration period is closed. The registration database includes a student username and password, the student ID number, and a randomly generated posting code for the posting of grades in tables on the Web. Most importantly, the student must choose a track (a default of performance-only is included when the registration Web page is brought up.) Whenever students submit assignments on the Web, their submission can be checked against their selection of choices in this registration database. For example, a student who does not choose to do the online homework for credit, but submits answers anyway, is automatically assigned a score of zero.

Because exams, papers, and laboratory reports have different values for those who are working with "performance-only" versus "performance + effort", several calculations in the database include IF statements that check for the student choice of track and calculate their scores accordingly. To help students understand their progress, database searches for

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scores are enabled using their student ID and posting codes as password. An example of this search can be obtained by entering through the site at http://kaboom.chem.uwm.edu/C105/Grades/default.htm. To observe the database, use an ID number of 55221 and a posting code password of 1311, which will provide an example of a database search. Because this course utilizes "resurrection points" [14], a grade calculator that also uses the Filemaker database can be reached from the page that reports results to the students.

The student response to having options for achieving grades has been very positive. In an optional survey students noted that they liked having the options, even if they chose performance-only and treated the class like any other. The logistics of handling various paths is readily handled by the use of online databases, so the improvement in student attitudes alone provides significant impetus to utilize this scheme. Student performance seems to improve when the effort options are included in the course, but statistical differences cannot be inferred with the current sample sizes provided by the first implementation of this scheme in a course with 120 students. Nonetheless, the computer shows promise for improving the implementation of flexible assessment in large lecture courses by virtue of the efficient handling of information flow via databases and the World Wide Web.

References and Notes

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