

Using WebCT to Assess ABET ET2K Outcomes

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Abstract

A characteristic of the new criteria for TAC/ABET accreditation is the assessment requirements. This part of the new criteria seems daunting to many people. However, assessment of the outcomes of education has always been a part of the university experience through the use of grading. The conventional criteria evaluated this assessment by requiring the school to capture graded student work and create course books with these captured samples in them. By looking at the assessments of the students done by the teachers during a course, an evaluator could come to some conclusions about the quality of teaching being done.

The old method is adequate for capturing the outcomes that are directly related to what is now called Criterion 1 Subsection A. The new criteria are more specific about what should be measured and this new specificity is captured in Criterion 1 Subsections B-K Criteria. The new criteria also require assessment data to be presented in a new form, summarized and collated according to the program outcomes; i.e., the new criteria require alignment between the stated outcomes of a program and the curriculum being taught. It is these outcomes that require assessment, and not the sometimes nebulous content of a course that may or may not directly contribute to them. This paper documents a method to begin capturing assessment of our program outcomes by using WebCT on-line testing.

The need

This paper is concerned with what is referred to by Gregory Neff from Purdue University Calumet as course embedded assessment¹. There are many other assessment techniques that are mentioned in that article and other places which will not be addressed here.

TAC/ABET curriculum evaluators using the conventional criteria made this assessment of the school by requiring the school to capture graded student work and create course books with these captured samples in them. By looking at the assessments (graded work) of the students done by the teachers during a course, an evaluator could come to some conclusions about the quality of teaching being done.

TAC/ABET curriculum evaluators using the TC2K criteria make this assessment by requiring the school to assess their students against a stated set of outcomes defined by the institution. These outcomes must be seen to fulfill the criteria set by ABET. A summary of these criteria are the infamous A-K Subsections of Criterion 1, and are as follows²:

Criterion 1. Students and Graduates

An engineering technology program must demonstrate that graduates have:

- a. an appropriate mastery of the knowledge, techniques, skills and modern tools of their disciplines,*
- b. an ability to apply current knowledge and adapt to emerging applications of mathematics, science, engineering and technology,*
- c. an ability to conduct, analyze and interpret experiments and apply experimental results to improve processes,*
- d. an ability to apply creativity in the design of systems, components or processes appropriate to program objectives,*
- e. an ability to function effectively on teams,*
- f. an ability to identify, analyze, and solve technical problems,*
- g. an ability to communicate effectively,*
- h. a recognition of the need for, and an ability to engage in lifelong learning,*
- i. an ability to understand professional, ethical and social responsibilities,*
- j. a respect for diversity and a knowledge of contemporary professional, societal and global issues, and*
- k. a commitment to quality, timeliness, and continuous improvement.*

The need is to have a means of demonstrating assessment of students similar to, but not the same way as the course books demonstrated it in the past.

Why not use course books?

First, course books assumed a great deal of consistency in the material being covered from a program in one institution to a program in another. This assumption places the institution at the mercy of the evaluator when content in a course is different than the content that the evaluator is more comfortable. Under the new criteria, having stated outcomes frees the institution to develop a program that is tailored to a specific job market or student body that could be significantly different than the one the evaluator is from.

Second, the course books represented a significant time commitment by the evaluator to review and evaluate during the visit. Although the institution can make the presentation easier to digest, it is still difficult to prepare and difficult to evaluate. Under the new criteria, it is the institution's responsibility to show that they are assessing the students and to provide to the evaluator the results of that assessment. Since the data is already summarized, it might even be included in the self study, and be reviewed by the evaluator at leisure instead of during the visit.

Third, as on-line learning and teaching methods become more and more ubiquitous, the ability to create a paper course book with a sample of the students work annotated by the instructor is less and less possible.

Fourth, and certainly not least important, the course books might or might not demonstrate that the teachers are or are not evaluating the students well (with quality) based on some nebulous concept of what should be taught that is part of the shared knowledge of both the faculty of the institution and the evaluator looking at compliance. However, **they definitely do not demonstrate that the institution is examining the data themselves and using it to determine**

if something ought to be changed. The execution of this process of continuous improvement is the essence of quality management.

Note, that it has long been true that institutions have feedback from Industrial Advisory Committees and from student surveys. We have both of these at the University of Memphis. It has also been documented that changes have been made to the curriculum because of these mechanisms in operation.

What is missing then is the feedback of student performance itself to curriculum issues. This is often referred to as “Closing the Loop.” In truth, faculties and curriculum committees do this already. When it is discovered in a class that students are not prepared, in a healthy environment the issue is discussed and remedied. The new criteria institutionalize the process and require reporting of the assessments made, and improvements attempted.

What should we use then?

First, based on trials that have been reported of the first schools using the new criteria³, the presentation should be based and organized around the A-K Subsections of Criterion 1. So the institution should report on their fulfillment of each of the A-K Subsections.

Second, it is obvious by looking at the A-K Subsections that they are not designed to map one-to-one with the outcomes for any course or set of courses. So, it has been suggested that the institution must designate a set of measurable outcomes that is then cross-related to the A-K Subsections. If you wish to do this in a manner that impacts your courses as little as possible, then the outcomes should be tied directly to your courses. In that way, with care, the process of taking the course can be made to demonstrate the fulfillment of the outcomes.

Third, once these outcomes are created they should be listed in the course outline as the expected result of students doing the course work. In this way, the teacher and the students have the outcome up front as something to work for.

Fourth, a means of assessing student performance of the stated outcome is needed. As it is already normal for the teacher to assess the performance of students, all that is needed is to relate that assessment to the outcome. This relation can be accomplished in a number of ways. An easy to implement method uses an on-line portal, such as WebCT. One advantage of this method is that if you are already using such a tool, adapting it to accomplish the relation of the assessments already being done to the outcomes for the course is straightforward.

The tool

WebCT⁴ is the main tool provided by WebCT Inc. for its objective to provide on-line environments for teaching and learning. It is designed to be flexible enough to be used both as a primary tool for delivery of course material, or as a supplement to courses that are taught in a more traditional manner. Here, at The University of Memphis, we use it both ways. Many people use the tool as a supplement to their normal lectures and labs done in the course of teaching. The ruling body for The University of Memphis, the Tennessee Board of Regents (TBR) uses WebCT to offer a very successful on-line course program. It provides an easy to configure mechanism for distributing course materials, and a useful way to get student feedback.

Most importantly, it has a fairly sophisticated mechanism for preparing and delivering on-line surveys and testing. It is this last mechanism that is important to this paper.

Quizzes are formed by selecting individual questions which are stored in a database for the course.⁵ Questions can currently be of the following types:

- Multiple Choice
- Matching
- Calculated
- Short Answer
- Paragraph

The questions each have a user provided category. This feature is important to the use of the tool as a mechanism for assessment of performance. If the categories match the outcomes for the course, the questions can be classified by the outcomes that they belong to. This allows the teacher to be sure that the outcomes are adequately covered by the examinations.

The question database also provides a statistical analysis of the question used. This analysis includes the numbers for sample size, mean and standard deviation of responses given by students. It also includes a discrimination factor which is related to whether it was the higher scoring students or the lower scoring ones that got the answer to this question correct. This is a useful number in evaluating the question itself, but is not useful for this paper (actually a low discrimination factor could point to a fault in the course itself, but it usually means the question is faulty).

When a teacher wishes to determine whether the students have mastered the outcome, a test containing the questions dealing with that outcome is appropriate. Of course most quizzes will contain questions from more than one category and will apply to more than one outcome. After the students have taken the test, the teacher can go to the question database, view those question for a specific outcome, select those that were on the recent quiz, and gather the statistics on their performance. Thus, the teacher can have an objective measure backing a statement that the students have mastered a topic. More importantly, perhaps, the teacher can compare results from semester to semester and then judge the results of modifications to the curriculum.

Of course there is no reason that the teacher cannot do all of the above with a paper method of doing examinations. It requires only:

- Reviewing the outcomes before preparing the exam, and making sure that there are questions for each outcome to be assessed.
- Analyzing the results of the exam by question to see how the students did as a group.
- Collating the analysis with the outcomes.

There are perhaps some teachers that already do this to be sure that their examinations are reasonable and adequate. However, since what is generally required of the institution is only a grade for the overall performance of the students, such diligence is probably rare.

The process

The Department of Engineering Technology at the University of Memphis has just completed an accreditation visit by the TAC/ABET using the conventional criteria. We are anxious to be sure

that we are prepared for the TC2K criteria at the next cycle. We have taken the first step of creating outcomes for each course currently being offered. By limiting the work to the current courses, the faculty has a minimum impact on their load in preparing for their courses.

Only a few of the teachers use an on-line portal to assist teaching their courses, so one of them was selected to do a trial of using WebCT for assessment. If the trial proves successful, more courses will be added beginning in the fall of 2004.

As courses are taught, the outcomes will be added. As teachers go on-line, they will be trained in using the outcomes to categorize questions, in addition to their regular training in WebCT development.

What is the trial?

A course was selected to trial the assessment of the course outcomes using the WebCT portal. This is the Data Structures course in the Computer Engineering Technology curriculum. The teacher of this course is already using WebCT to handle testing of the students in this course. The outcomes have been developed the same as the other courses being taught this semester.

This course already has a set of questions for quizzes from previous semesters, so they will need to be re-categorized to reflect the outcomes. At that time, it may be necessary to add additional questions to the database to fill in holes in the assessment of outcomes.

At the beginning of the semester, a pre-test will be done to gather information on how the students do with the outcomes. This test will not be considered part of their grade. At the end of the semester, the final will contain all of the questions from the pre-test, and any additional questions that the professor prepares at that time.

Student performance data will be collected for all tests done during the semester, and the results will be analyzed and presented at the conference.

What about classes not under WebCT?

For the classes not being done using WebCT, the relation to the outcomes is still necessary. In order to make a first attempt at closing this loop, two surveys are being prepared for each class being taught. One is for the students and one is for the teacher. The student survey is an addition to the standard survey administered each year to every class at the University of Memphis. There is a provision for adding survey questions to this survey, and so it is with minimal work that the additional questions were added.

The survey questions already being done have the form of a statement which the student marks SA, A, N, D, or SD, for Strongly Agree, Agree, Neither agree or disagree, Disagree, or Strongly Disagree respectively. The new questions follow the suggested value in the Neff article cited above¹. The questions used are:

1. General Course Impact Questions
2. Specific Course Objective Questions.

Number one is essentially allowing the students to state whether they think that they improved on any of the items A-K as a result of taking the course. An example is:

As a result of this course, my mastery of the knowledge, techniques, skills, and modern tools of the Computer Engineering Technology has improved.

Number two is a restatement of the outcome. An example is:

In this course I demonstrated an ability to describe data structures using appropriate diagrams.

The survey for the teachers is simpler, and perhaps more difficult. For each outcome, the teacher is asked:

Did you cover this outcome during this course?

Did you assess the students on this outcome during this course?

Based on your assessments of the student's performance, on a scale from 1-10, 10 being completely mastered, how well did the students master this outcome?

This mechanism while not as objective as some should be useful in capturing the same kind of information that might have been done in informal discussions by a motivated faculty as mentioned above.

Conclusion

The Engineering Technology department at The University of Memphis has high hopes that the mechanism will perform as envisioned. We are also in the process of researching other mechanisms that will more directly support this function. We will have data from the trial at ASEE in Salt Lake City.

¹ Gregory Neff, Susan Scachitti, and James Higley, "Counting Down to 2004: Some Insights and Strategies for Satisfying TC2K While There is Still Time," Session 2149, 2003 *ASEE Annual Conference and Exposition*, June 22-25, 2003.

² ABET web site with technology accreditation criteria, online at: http://www.abet.org/criteria_tac.html

³ ABET Program Evaluator Training: TC2K slides, Approved May 2002. Handouts

⁴ "Learning Without Limits, Flexible E-Learning Solutions for Institutions Across the Educational Spectrum," White paper published by WebCT, Inc., Six Kimball Lane, Lynnfield, Massachusetts 01940, Aug 2000, online at: <http://www.webct.com>

⁵ "WebCT Campus Edition 4.1 - Getting Started Guide," by WebCT, Inc., Six Kimball Lane, Lynnfield, Massachusetts 01940, Aug, 2003, online at: <http://www.webct.com>

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