

Closing the Teaching and Learning Loop with an Assessment Gradebook

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Author Biography

Dr. Chunlei Liu received his Bachelor and Master of Science degrees from Wuhan University in China and his Ph.D. in Computer and Information Science from The Ohio State University. He is now a Professor in the Department of Computer Science at Valdosta State University. He was the ABET Accreditation Coordinator for VSU's Computer Science program and led the program's successful accreditation in 2016. Dr. Liu's research interest is in computer networks, scientific computing, computer science education, accreditation, and assessment.

Goal of Activity

A very important goal of teaching a course is to meet the learning outcomes. Even though learning outcomes are almost always listed in the syllabus, instructors often lack a procedure and a tool to measure whether the learning outcomes are met, let alone to identify problems and weaknesses and propose changes for future offerings of the course. In such a situation, teaching and learning without proper assessment is not a closed loop, where you can iterate and make continuous improvement semester after semester.

Measuring whether the learning outcomes are achieved and making continuous improvement are also the requirements of many accreditation agencies. In the preparation for the ABET accreditation of our Computer Science Program at Valdosta State University, as the accreditation coordinator, I designed an assessment gradebook tool for our faculty to assess their courses.

Since 2010, this tool has helped us identify numerous problems and make many improvements in our courses. The ABET evaluation team visited our campus in September 2015 and concluded that our Computer Science program had no deficiencies, no weaknesses, no concerns, and excelled the criteria for accreditation. In August 2016, they granted us six years of accreditation, the longest of their accreditation period.

The method and procedure of this assessment gradebook can be applied to all disciplines and can be used for any course assessment to close the teaching and learning loop so instructors can identify problems and make continuous improvement in their courses. In this paper, I will share this practice with fellow faculty members.

Assessment Procedure

The implementation of the assessment gradebook consists of the following steps.

1. Establish a common set of learning outcomes among all instructors who teach the course. These objectives are common among faculty members and stay stable for several years to maintain the course's consistent role in the curriculum, but can also be updated when needed.
2. Select a few typical assessment questions for each learning outcome and make sure these questions or similar questions are used in homework, projects, quizzes or exams to assess students' knowledge and skills for this learning outcome. These assessment questions act like probes in the assessment and may be slightly different among different faculty and in different semesters, but they should assess the specific knowledge or skills needed to achieve a learning outcome. In order to achieve a reliable result, each learning outcome is usually assessed by three or four questions.

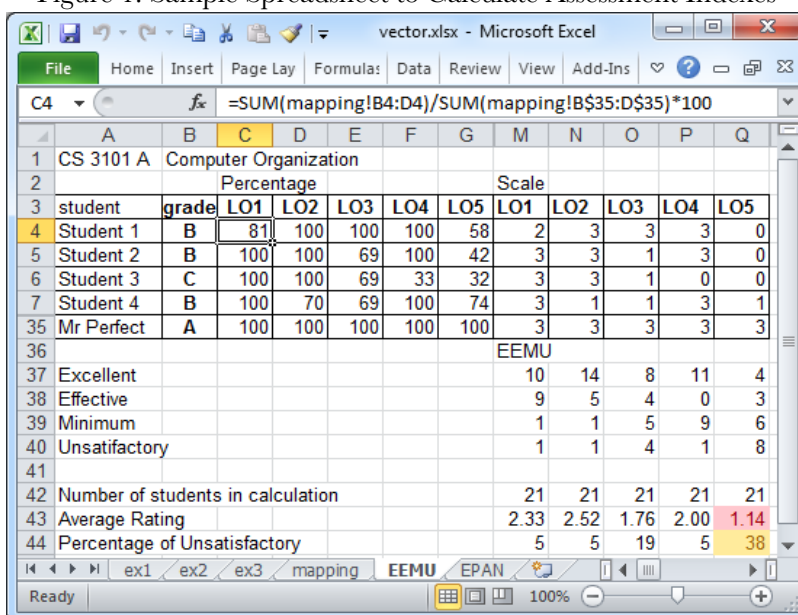
- Build a spreadsheet (see Figure 1) to facilitate the data entry and to calculate the assessment indexes. The spreadsheet allows the instructor to enter all students' test scores for the assessment questions, and calculate the EEMU (Excellent, Effective, Minimal, and Unsatisfactory) vector for each learning outcome, i.e., the number of students whose test average score for the assessment questions is above 90% (Excellent), between 75% and 89% (Effective), between 60% and 74% (Minimal), and below 60% (Unsatisfactory). It then calculates the Average EEMU Rating as:

$$\frac{3 \times \text{Excellent} + 2 \times \text{Effective} + 1 \times \text{Minimum}}{\text{Excellent} + \text{Effective} + \text{Minimum} + \text{Unsatisfactory}}$$

and the Percentage of Unsatisfactory as:

$$\frac{\text{Unsatisfactory}}{\text{Excellent} + \text{Effective} + \text{Minimum} + \text{Unsatisfactory}} \times 100\%$$

Figure 1. Sample Spreadsheet to Calculate Assessment Indexes



- Identify learning outcomes that are not met. Our criterion for judging whether a learning outcome has been met is:

$$\text{Average EEMU} \geq 1.5 \text{ and Percentage of Unsatisfactory} \leq 20\%$$

This criterion has two aspects. The average EEMU rating represents the overall student performance. A rating lower than 1.5 means the majority of students have not quite achieved this learning outcome. Revising the teaching approach or spending more time on related topics, for example, can help to improve the average. A 20% or higher Percentage of Unsatisfactory rating means the students' learning on this learning outcome is very uneven. Individual conference or homework comments for the weak students, for example, can help to reduce the Percentage of Unsatisfactory rating. The numbers 1.5 and 20% are empirical, but have served our purpose pretty well.

In the assessment gradebook, the mapping between the input spreadsheet and the calculation sheet and the calculation formulas for the assessment indexes are built in. Once the instructor enters the

test scores for the assessment questions, the calculations are performed, and any unmet learning outcomes are marked with orange or yellow colors automatically.

5. The final step of the assessment is to reflect on the analysis results and to propose actions of improvement for future offerings. Besides the quantitative data like the EEMU vectors, the instructor can also document qualitative results such as Student Feedback for Professor, Student Opinion of Instruction, Peer Evaluation of Teaching, etc. The instructor then proposes actions for course improvement, which will be the basis of modification for future offerings of the course.

Reflection

1. The assessment method and procedure described here have been used in our ABET accreditation and have been proved to be effective in identifying problems and weaknesses in course teaching and learning.
2. The assessment gradebook is designed to facilitate data input and to automate assessment calculation. Modifying an existing gradebook for a new course takes only about half an hour. Adding the test score entry time, it takes only one hour or so to conduct a quantitative assessment of the teaching and learning in a course.
3. At the end of each semester, I usually take a couple of hours to reflect on how I taught the course and how well the students learned, gauge what activities were effective and what were not, and write down things I would do differently in the future. In a few years, I will have a well-documented list of techniques and activities for good teaching. My students will benefit tremendously from the few hours I spent each semester on the assessment and continuous improvement. When the reevaluation for accreditation comes, I will have well-documented assessment data and proof of continuous improvement.