2006-222: THE ASSESSMENT WORKSHOP: A TOOL FOR PROMOTING FACULTY INVOLVEMENT

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Abstract

Continuous improvement and outcomes-based assessment have now been included in accreditation requirements for all ABET engineering and engineering technology programs. One of the biggest challenges in implementing the new requirements at many institutions has been involving all faculty members in the process. At Milwaukee School of Engineering, a year-end Assessment Workshop was created with the goal of increasing faculty involvement in assessment of program objectives and outcomes. The format and results of the workshop are discussed in this paper.

Background

The TC2K requirements of the Technology Accreditation Commission (TAC) of ABET place high importance on the continuous improvement process. Preparing and implementing a continuous improvement plan, selecting assessment methods, and preparing for ABET visits have been the subjects of numerous papers, articles, and workshops over the last few years. Several common threads are apparent when reviewing the literature: the need to select assessment tools that are efficient to implement, the importance of interpreting the assessment data that is collected, and the benefits of involving all faculty members in the assessment process.

Outcomes-based ABET accreditation requirements have their roots in a series of Accreditation Reform Workshops that were sponsored by ABET in 1994. In September 2002, the leaders of the workshops gathered to discuss the progress toward implementation of the new requirements. Their findings were summarized in a report titled “Sustaining the Change: A Follow-Up Report to the Vision for Change.” Among the concerns noted were:

- A focus by institutions on producing a quantity of assessment data, creating a heavy workload and contributing to the impression that accreditation is an “onerous task.”
- Sustainability of assessment efforts.
- Confusion over processes that not only contribute to continuous improvement, but also ensure that minimum standards are met.

These concerns, among others, were found in a survey by Mayes and Bennett of 27 institutions with ABET-accredited programs (although these were engineering institutions, the similarity of accreditation requirements between engineering and engineering technology make their results of interest to both communities). In terms of faculty involvement, the most-often mentioned method of ensuring faculty involvement was leadership from the top. That is, top-down leadership and support were seen as critical in faculty involvement. Other methods included engaging faculty at faculty meetings, faculty retreats, and training sessions and workshops.

Assessment methods for demonstrating achievement of outcomes most mentioned by the surveyed institutions were examples of student work (at selected points during the students’ careers), embedded course-based measures (such as standard exam questions or lab reports),
capstone projects, and portfolios. While many other methods of assessment were mentioned, most of those surveyed stated the need for primary evidence (course work) to demonstrate achievement.

At the ABET TAC Institutional Representatives Day in July 2005, the presentation contained these instructions for preparing materials for an accreditation visit:

- Display materials need to be interpreted.
- The materials should show how each criterion is being satisfied.
- Student work should be organized according to outcomes rather than by courses.

Also in this presentation, the importance of involving faculty in the continuous improvement process was emphasized.

The observations of a TAC of ABET visitor after two visits under the TC2K criteria were given by Skvarenina. Among his findings was this observation of faculty involvement:

Regardless of which method is used to come up with the POs [Program Outcomes], it is critical that all of the faculty be involved in the process. They should be aware of what TC2K contains, what the POs are and how they are assessed. Part of the accreditation visit is interviewing faculty members and in both visits, when I inquired about the process for developing and assessing outcomes, I found faculty who made statements like, “Well the department head took care of all that.” Clearly, when faculty members make statements like that, it is hard to conclude that the continuous improvement process is institutionalized in the department.

At Milwaukee School of Engineering, as we prepared for a TAC of ABET visit for our Mechanical Engineering Technology Program, we realized that even though we had a sufficient number of assessment tools, a continuous improvement plan that was functional and sustainable, and a faculty that was willing to cooperate, there were flaws in our assessment implementation:

- The continuous improvement plan had procedures for implementing both course-level and curriculum-level improvements, but lacked specific methods of measuring achievement of program outcomes.
- While faculty participated in the assessment process in terms of formulating and reviewing the program objectives and outcomes and administering the assessment tools, the interpretation of the results was being done primarily by the program coordinator.

We attempted to correct these flaws by the greater use of student work samples and the implementation of an annual assessment workshop.

Student Work Samples

A continuous improvement process can measure and evaluate many variables, including student satisfaction with classes/instructors/text books, retention and graduation rates, adequacy of prerequisites for individual classes, etc. While all of these factors are important to the vitality of a program, it is important to note that TAC of ABET requirements are specific as to what must be evaluated:
Each program must utilize multiple assessment measures in a process that provides documented results to demonstrate that the program objectives and outcomes are being met...

Therefore, while course-level and even curriculum-level assessment processes are needed and should in fact contribute to the achievement of program objectives and outcomes, these measures are not sufficient to demonstrate that the objectives and outcomes are being met.

In an analogy to a manufacturing process, the customer requires only that their specifications are met. It may be necessary to test or inspect the products to ensure compliance. However, relying on the final inspection to control the manufacturing processes is inefficient. It is difficult or impossible to isolate what process step or steps lead to non-compliance. Rather, by monitoring variables throughout the process, problems can be identified at an early stage and corrected.

Similarly, the ABET requirements that results of assessment of program objectives and outcomes be used to improve the program cannot be efficiently implemented unless those results are used in conjunction with the “lower-level” assessment results to identify the areas where improvement is necessary. At MSOE, this lower-level assessment consisted of student and instructor surveys for each technical course, and an annual survey of students.

Program objectives refer to the expected accomplishments of students in the first few years after graduation, so direct measures are difficult to obtain. Alumni and employer surveys are the primary source of data for assessment of objectives. Placement and salary data is also used, as continued hiring of graduates by industry is an indication of satisfaction with the preparation of graduates to perform in entry-level positions.

Assessment of the outcomes can be accomplished through results from standard exams or through evaluation of student work. In Wisconsin, engineering technology students are not allowed to take the Fundamentals of Engineering exam until after graduation, and so this source of assessment data is not available. Therefore, we employed the use of student work samples to show achievement of the outcomes.

One of the biggest challenges to using student work samples is organizing and interpreting the materials. It is easy to accumulate a large amount of data, but deciding what to do with it is more difficult. We found that involving the faculty early was critical in producing meaningful data. The process that we followed is outlined here:

- Carefully select classes for student work evaluations. Upper-division courses are most appropriate, since we are attempting to show achievement of the given outcome. We selected eight classes, with most covering multiple outcomes. The form of the student work was to be either a project, an assignment, a lab report, or exam questions which addressed the given outcome.
- Discuss the objectives of the assessment at the beginning of the quarter with the instructor.
• Provide a standard format for summarizing the assessment results. An example of the summary sheet that we used is shown as Figure 1. (Note that “objective” is used on the form instead of “outcome”; we have since changed to the ABET nomenclature.)

The instructor evaluates the student work using a standard rubric:

- 4 = Superior achievement of the outcome
- 3 = Satisfactory achievement
- 2 = Achievement below expectations
- 1 = No significant achievement toward outcome

Ideally, we would want 100% of our students to achieve the outcome to at least a satisfactory level. However, for any given assignment there will usually be students who fail to satisfactorily achieve the outcome. We have established a target of 75% achievement at the 3 or 4 level.

Assessment Workshop

Once data from all of the assessment tools has been collected, it must be interpreted. Under “old” ABET criteria, the interpretation task often occurred only in preparation for a visit. In a continuous improvement system, interpretation must occur regularly, and the results used to improve the program.

At MSOE, the interpretation task had fallen to the program coordinator, who was required to review all assessment data annually and document the results to a university-wide assessment committee. There are several drawbacks to having one person reviewing and interpreting the data, most notably:

- Faculty expertise in technical areas is not utilized.
- Faculty members who collect and evaluate the data from their courses are not given the opportunity to place their results in a broader context by viewing data from other classes.
- The impression that assessment is the role of the program coordinator, instead of an essential task for all faculty members, is reinforced.

The idea of conducting a workshop in which faculty members would evaluate the assessment data was first proposed at a program faculty meeting. The reception was positive, with most faculty members supportive of the idea and willing to participate. The first workshop was
scheduled for early summer so that all of the relevant assessment data from the year could be collected and assembled.

The program coordinator collected the data, and divided it by program objective/outcome. A folder was made for each objective/outcome, and all related assessment data was placed in that folder. At the workshop, faculty members reviewed and discussed the data. A faculty member was assigned to each objective/outcome to serve as the moderator for the discussion. The entire group then arrived at consensus answers to the following questions:

- Is there sufficient evidence to measure the level of achievement for the objective/outcome?
- Based on the evidence, is the objective/outcome being achieved at a satisfactory level?
- What recommendations should be forwarded to the program Curriculum Committee and/or individual course coordinators?

As an example, consider the program outcome: “Graduates of the Mechanical Engineering Technology Program will have the necessary skills to work in an industrial environment, including knowledge of economics, quality control, and project management.” The folder for this outcome included the following assessment data:

- A student work summary from MT-4901, the Capstone Project course, showing ratings for this outcome from faculty reviews of project presentations and reports.
- A summary of results from Industrial Advisory Committee reviews of capstone project presentations (IAC members rated “Consideration of realistic practices” for each project).
- Results from a survey of senior students rating their achievement of the outcome (shown with results from all outcomes and from the previous year for comparison purposes).
- Results from a question on the discipline-specific portion of the alumni survey related to the graduate’s ability to work in an industrial environment (shown for graduates from one year and five years ago).
- Results from a question of the general portion of the alumni survey related to the graduate’s foundation in business and economics (shown for graduates from one year and five years ago for both MET students and for all MSOE graduates).

Based on this evidence, the group concluded that this outcome was being achieved, with a sufficient amount of supporting data. However, it was noted that the individual components of the outcome (economics, quality control, and project management) were not assessed. A recommendation was made to formulate more specific questions for the Capstone Project assessment by faculty and IAC reviewers.

This first workshop was well-received by the participating faculty members. In particular, the workshop format allows for a thorough review of all assessment data at one time, rather than incrementally as the data is received during the academic year. Placed in this context, it is much easier to make conclusions regarding student achievement. Most of the recommendations made concerned the assessment process itself: where to collect data, the specific wording of questions, etc. One general recommendation concerned the student work evaluations. It was recommended that the specific form of the student work (project, assignment, exam questions) be left up to the instructor to determine.
From the program coordinator’s viewpoint, the annual collection and evaluation of assessment data greatly reduces the effort required at the time of an accreditation visit to assemble an effective display of student work. By collecting and evaluation annually, the student work display is created incrementally, and any areas where student work is lacking can be identified and corrected.

Conclusion

The use of an assessment workshop can be easily added to an existing continuous improvement plan, providing a direct link from assessment data to objective and outcome evaluation. By allowing faculty members to actively participate in the interpretation of assessment results, they become more integrally involved in the continuous improvement process. This in turn enhances the effectiveness and sustainability of the continuous improvement process. The data collected and evaluated for each workshop can also form an effective display for the next accreditation visit.

References