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Student Outcome Assessment and Course Continuity for Programs With Moderate Faculty Turnover

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Abstract

In today's academic environment of outcome based assessment, there is an increased need to maintain course continuity to ensure attainment of learning objectives and student outcomes. This is especially important for institutions that offer ABET-accredited programs, where they are required to address ABET Criterion #4 – Continuous Improvement. This can be especially challenging for schools that experience moderate faculty turnover, and/or heavily rely on adjunct instructors. In this paper we present a relatively simple End of Course Review (EOCR) process as the means to achieve these ends. More importantly however, the EOCR process instills a culture of assessment into all of our instructors, both junior and senior faculty.

Introduction

A. Program Quality, Assessment and Accreditation

The goal of every undergraduate engineering department is to deliver a quality, but cost effective program to its students. More specifically, that its graduates attain the stated program objectives and thereby be successful in their professional careers. The students, alumni, upper administration and other constituents not only expect, but demand such achievement. A large measure of a program's quality is it satisfying the criteria provided by such accreditation bodies as ABET. Put another way, the ABET criteria serves as a means of a program's *quality control* and *improvement*. The ABET criterion includes categories such as attainment of student outcomes, continuous improvement, and safety. For example, ABET's Criterion 4[1], states the following:

> *"The program must regularly use appropriate, documented processes for assessing and evaluating the extent to which student outcomes are being attained. The results of these evaluations must be systemically utilized as input for the continuous improvement of the program."*

Note the keywords of *assessment*, *documented*, *attainment*, *continuous improvement* and *processes*.

To achieve the ABET mandate for engineering programs, the U.S. Coast Guard Academy (USCGA) has adopted an assessment process as described by Colella[2] and diagramed in Figure 1. The assessment process shown in Figure 1 illustrates the key elements of the assessment process which include (a) department review, (b) program review and (c) end of course review (EOCR). Note this process involves the stakeholders such as students, alumni, graduating seniors, and faculty and addresses the appropriate ABET criteria. Note that this process is not confined to a single program, but when appropriate reaches out to assist other programs and departments for mutual benefits. Particularly noteworthy is when the outcomes of one course

impact another. A similar assessment system is presented by Pierrakos and Watson[3]. Of course any assessment plan involves the assessment of faculty effectiveness[4], teaching[5], and learning[6-8].

B. The Challenge of High Faculty Turnover

Maintaining a consistent assessment process in order to meet the ABET Criteria, as well as attaining student outcomes, maintaining course continuity and connectivity to other courses and programs can be especially problematic in programs that have high faculty turnover. For example, at the USCGAs Electrical Engineering (EE) program, mandatory re-assignment and promotion of personnel, we typically call "rotators," creates an annual faculty turnover of about 10%. Note 60% of the program's instructors are permanent. Similarly, schools that hired numerous faculty at one point in time may undergo a high rate of retirement or in the case of research demands or budget constraints a program may for a period of time have to rely on adjunct instructors. Certainly new instructors bring fresh ideas, perspectives and teaching methods into a program. However, even at the course level, there is the need to maintain some "institutional memory" with respect to its content, how it was taught, and how the outcomes were assessed. This should be more than simply last year's syllabus and a random assortment of notes and exams. Consistency is especially important in programs where program changes are initiated by assessment results. This certainly doesn't necessarily imply that new faculty cannot change the course, but only that course modifications are done in an orderly process with the full knowledge of what occurred in the past so that previous mistakes are not repeated, and any changes will not adversely affect other courses. Put another way, in the spirit of continuous improvement, courses and student outcomes should evolve into something better than what occurred in the past. Finally whether or not there is high turnover, the EOCR contributes a culture of assessment and expedites faculty "buy-in" into the assessment process.

C. EOCR Solution

To assist us in overcoming the above challenges, as well as documenting continuous improvement we describe a relatively simple EOCR process. Our EOCR process is completed at least annually for every course. The end result is a document that describes the essential content of the course (i.e. syllabus, learning objectives, outcomes, projects, sample exams, sample notes, etc.), assessment data and rubrics, and recommended changes. This EOCR package can then be used to (a) give the next instructor a suitable starting point for when they teach the course, (b) provide assessment information for program reviews and curriculum revisions, (c) provide assessment data to serve as a reference point for when the next time the outcomes are assessed, and (d) provide necessary and objective information to the person writing the accreditation self-study document. This latter point is especially important since in the case of ABET accredited programs, the EOCR contributes to a well-documented story on how a program is meeting its assigned student outcomes and to what degree there is continuous improvement. It should be noted that the EOCR is especially valuable for curriculum reviews since any decisions to change the particulars of a program are based on hard evidence as stated in the EOCR and not simply anecdotal stories.

Some key aspects of the EOCR process include: (a) the instructor and interested faculty are involved in generating the EOCR document with the instructor providing the initial draft, and

then after deliberation a consensus is reached, and the final version is issued, and (b) assessment tools and corresponding rubrics. The latter is especially important in order to minimize instructor biases and outliers.

EOCRs are a significant part of the program's assessment plan and have been part of the USCGAs culture of assessment since at least 2000. The EOCR not only is a key element in a specific program's assessment plan, but is used to improve other aspects of the program not explicitly covered by the ABET criterion. The EOCR is a formal way in which we assure quality control and improvement in our course offerings.

In subsequent sections we will describe the USCGA's EOCR process and how it is used to both satisfy the various ABET mandates, as well as create a high quality electrical engineering (EE) program.

EOCR Description

A. Overall EOCR Process

Initially, the Course Coordinator generates a draft, or "read-ahead" document that fully describes all aspects of the course, followed by a meeting attended by all course instructors (if multi-section), other relevant stakeholders such as students as well as other instructors impacted by the course. Attendees include faculty members both inside and outside of the program. At the conclusion, the draft document is revised to reflect the input of the EOCR attendees.

B. EOCR Outline and Content

Here the EOCR document provides the faculty a comprehensive snapshot of the course. This includes, or eventually includes the following:

1. List of EOCR attendees
2. Executive summary of course
3. Pending issues from the last EOCR
4. Summary of course changes in statement-resolution format
5. Course description including the objectives, a syllabus, a list of learning objectives, and a list of ABET a-k student outcomes, etc.
6. Course assessment instruments: homework, exams, quizzes, projects, as well as ABET a-k student outcome assessment tools
7. Assessment results including: course grades, test results, assessment averages (quizzes, exams, etc) and ABET a-k assessment results
8. Student surveys and instructor feedback from students
9. Rubrics used for ABET a-k student outcome assessment
10. Safety
11. Proposed course changes
12. Connectivity to other courses both in and out of the program
13. Appendix

14. Where applicable or useful, the Appendix will have the following topics:
    a. Course syllabus
    b. Course description
    c. Learning objectives and applicable ABET a-k student outcomes
    d. Sample set of course notes
    e. Set of projects

C. EOCR and assessment of student outcomes

Each course has an assigned set of student outcomes which are equivalent to the familiar ABET student outcomes a – k. In some instances, these outcomes are amplified into what we call performance indicators (PIs). For example, outcome g, "An ability to communicate effectively" has two PIs that are separately assessed by the instructor. These PIs are (1) Prepare well-written reports, and (2) Present information orally to an audience." Figure 2 shows the process in which these PIs are evaluated. Note the specific assessment tools such as quiz, or test questions are called Barometric Assignments (BAs). The process for evaluating student outcomes during the course review process is shown in Figure 2. Note the following: (a) The outcome assessment process is a significant part of the EOCR and drives the Program Review process, (b) outcome achievement is demonstrated if 70% of the students exceed the outcome score threshold of 75%. As readily observed, this process causes any course changes to be based on hard and consistent data, not anecdotal evidence.

D. EOCR Cost and Benefits

The EOCR requires about three hours of document preparation by the course coordinator and the meeting itself lasts for approximately one hour. One reason for the meeting efficiency is because all EOCRs have the same format, and thus minimizing the number of "premature questions." While it seems the overall time for this process is relatively long as compared to what was done prior to ABET 2000, the general consensus is that this process serves as a tool for inculcating a culture of assessment into the program, provides a means of program quality control and improvement, documents the full details of the course content and results, and provides a ready means of communication between faculty members and other support staff (e.g. technicians) who are connected to the course. For example, the math department considered eliminating coverage of the Laplace Transform in their Differential Equations (DEs) course. DE is a prerequisite for our sophomore signals and systems course and thus elimination of this topic would adversely affect the outcomes in signals and system. However, because the DE's EOCR was attended by some from EE, there was sufficient pushback to prevent Laplace Transforms from being eliminated from DE. Finally, a significant benefit is realized when the faculty member must plan on the next offering of the course, or hands it off to another instructor, particularly one who is inexperienced in that particular area. As Colella[2] states, "The continuity and detailed reflections contained in the course review documentation provide the information necessary to keep the course and curriculum focused on program, departmental and institutional outcomes." Finally, the EOCR serves to document the attainment of student outcomes and provides the necessary information to provide for continuous improvement.

Conclusion

In this paper we have presented a simple but elegant course quality control and improvement process that is currently being used at the USCGA's Electrical Engineering Program where the faculty turnover is at an annual rate of 10%. The benefits of this process are as follows: (a) creates a culture of assessment, (b) provides a valuable means to ensure ABET Criterion #4 is achieved, (c) fosters communication between faculty within and outside a given program, and (d) provides orderly handoff during instructor transitions. The EOCR process has enabled the USCGA's Electrical Engineering program to successfully complete two ABET cycles.

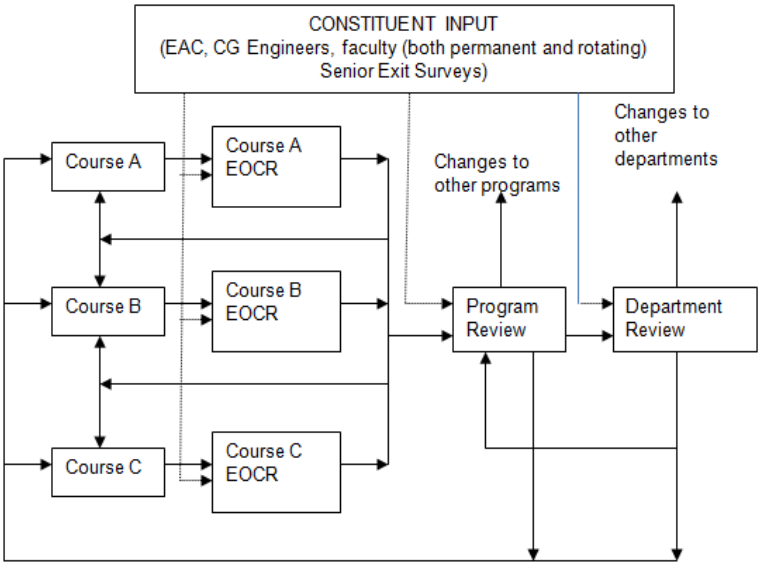

Figure 1. Electrical Engineering Assessment Process

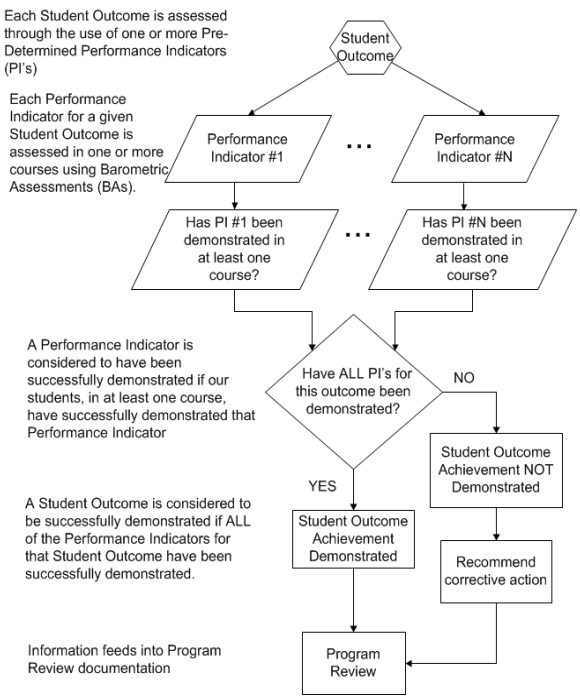

Figure 2. USCGA Student Outcome assessment process.

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