

AC 2008-669: ASSESSMENT PROCESS: A VIEW FROM THE TRENCHES

Carol Lamb, Youngstown State University

Carol M. Lamb, is Assistant Professor and Coordinator of the Design and Drafting Technology Program at Youngstown State University. She has over 10 years of professional experience in design and drafting of structures. She teaches variety of courses in structural design, construction methods/materials, drafting, and introductory engineering technology.

David G. Kurtanich, P.E., Youngstown State University

David G. Kurtanich, P.E. is Associate Professor and Coordinator of the Civil and Construction Engineering Technology Program at Youngstown State University 44555, USA. He has over 27 years of professional experience in design, analysis and investigation of structures. He teaches a variety of courses in structural analysis and design, hydraulics and land development, computer applications in engineering technology, and capstone design.

ASSESSMENT PROCESS: A VIEW FROM THE TRENCHES

Abstract

This paper presents some of the hurdles that the engineering technology programs at Youngstown State University struggled with during the reaccreditation process and are still refining. With less formal direction from TAC-ABET as to what they are focusing on or require for accreditation, it took several iterations along with networking with other institutions to gather insight and suggestions just to begin to understand the depth and breadth of the assessment process and its impact on department resources. Starting at the beginning of the process and continuing through the revisions and the ongoing refinement. The topics discussed include; what to assess and how to assess the criteria identified; development of the assessment rubrics; decisions on how to collect the data; restructuring courses to cover topics that need to be assessed; revising the rubrics and data collection to gather meaningful data; and development of a sustainable internal assessment process. Issues generated from the managing of the ongoing assessment efforts on workload and strategies for developing a sustainable assessment and evaluation process for a multi-program engineering technology department are considered.

Introduction

A multi-program engineering technology department completed the TAC-ABET reaccreditation process during the 2005-2006 cycle. These engineering technology programs offer both associate and baccalaureate level degrees in civil and construction engineering technology, electrical engineering technology, and mechanical engineering technology. This was the first re-accreditation for these programs under the new evaluation process that focused on assessment of the results rather than verification of the curriculum to meet specified criteria.

This paper looks at several aspects of the impact that the ABET assessment and evaluation process has on faculty motivation, workload and department resources. With over 460 students (full and non-traditional part time) enrolled in the programs and only eight full time faculty members and one department staff member, the challenges to manage ongoing assessment efforts while maintaining program curriculums and departmental operations are time-consuming and place additional pressure on limited resources.

Discussion – reaccreditation process

During the 2005-2006 academic year the engineering technology department at Youngstown State University encountered the new TC-2K TAC-ABET reaccreditation process. The engineering technology department had been through the reaccreditation process before; based on the old criteria in which you collected student work and the evaluation team looked at a snapshot in time of the programs⁵. However, we knew that this reaccreditation process would be different.

The initial stages of preparation for the 2005-2006 TAC-ABET visit was very similar to previous reaccreditation visits. Student material, notebooks, homework, projects, and various other materials, were gathered and displayed for the evaluation team. The department did have a

limited amount of general data that had previously been collected for faculty research projects, which was analyzed and used for the visit. The department, as a whole, had information from alumni and employer surveys, which we were able to use for some outcomes assessment. The department did not have any real hard data to present regarding student(s) learning outcomes, course accomplishments with respect to the student(s) and, obviously, therefore could not assess course outcomes or individual program outcomes. Nor could the department/program even begin to look at closing the loop of making changes to improve a course or program for the students. *What was the view from the trenches at this point? We were in the middle of a never ending downpour and the trench was filling up fast.*

As a department there was not a clear sense of what TAC-ABET was looking for and what the individual programs should be assessing. Part of this was due to the fact that the new assessment process is designed to be less regulated from TAC-ABET. While giving programs more latitude with curriculum, this also proves to be one of the major hurdles the department and the programs would have to tackle, exactly what should the programs be assessing. As a department the decision was finally made that we should assess the outcomes, stated in the individual ABET program criteria, 'a' through 'k'. While the newly developed evaluation process by TAC-ABET was put into place to avoid mechanical responses and less directive, it appears that outcomes 'a' through 'k' are the outcomes that many programs are assessing². While less regulated by TAC-ABET, having the 'a' through 'k' criteria is more of an implied guideline to be assessed.

In preparation for the accreditation visit it became clear that there was an urgent need to develop some assessment methods and at least begin collecting data for individual courses, the programs, and the department. One of the first hurdles that the department as a whole needed to establish was an overall department objective. Once the faculty had developed the departmental objectives, it was time to look at the individual programs. In the engineering technology department at Youngstown State University, many of the courses are taken by all of the students, regardless of the major. So as a department, the mapping of outcomes to assess needed to include these courses that all of the students take and this data/outcomes assessment would be used for each of the individual program assessments. In looking at the individual courses, as faculty, we struggled with many questions, as have others; What exactly to assess and how to assess it; How to develop the rubrics for assessment; What methods to use to collect the data (quizzes, reports, homework) and what data will be gathered from which course to name a few. The faculty began to develop rubrics and matrices to use for assessment, while doing so we soon discovered that we had fallen into one of the pitfalls of assessment, that being gathering too much data and a lot of data that was not really useful⁸.

During the accreditation visit some of the members of the TAC-ABET evaluation team shared with the engineering technology department faculty some ideas regarding the collection of data, assessment, and the various tools used for assessment, thus guiding the department to not reinvent the wheel, but rather borrow and modify existing assessment tools and ideas from other sources³. This was a tremendous help and the department was able to gain a better focus on the assessment process and the overall picture. While there was still an overwhelming amount of work to be done, from this point on the faculty and department seemed to begin to make forward

progress. *What was the view from the trenches at this point? The trench was still full of water, but the rain had stopped.*

The department now had some assessment tools, had decided on what data the faculty needed to gather, one of the next decisions that needed to be made was how to incorporate the necessary information into the individual courses so that we could assess the student(s) and program progress. The fact became clear that the faculty would somehow have to squeeze in additional topics in to several course curriculums ¹. The department had decided that the assessment data would be gathered by full-time faculty only. First, due to the time involved and the consensus was to not put undue burden on the part-time faculty, but more importantly, the department wants to ensure that there is consistency from semester-to-semester ⁴.

In reviewing what the department faculty had developed up to this point; what and how to assess; the rubrics to assess the data collected; there were several improvements that were made to the various items. The rubrics (see Attachment A for an example of the rubrics) were revised so that all of the departments were using an assessment scale of one to four as follows:

- 1 = unacceptable
- 2 = satisfactory
- 3 = above average
- 4 = excellent

The target for each outcome is for all students to demonstrate at least satisfactory (2.0) achievement of the outcome. Achieving a class average of 2.5 is considered to be acceptable; continuous improvement efforts target outcomes when aggregate student scores are below 3.0. Attachment B is an example of a class assessment. This particular course, which is one of the first engineering technology courses the students take, the data gathered, showed that as a whole the students are slightly below the average of 2.5, with respect to understanding reciprocals. The data for this particular class will be compared with the data collected for the other classes to analyze the overall results. If there seems to be consistency between data from other groups, the faculty, with input from the IAB, will decide what changes will be made to try to improve the scores.

Information collected in a course included both direct and indirect methods on each student in the selected classes and summarized into spreadsheets to allow evaluation of the data. Data was collected from multiple sources such as: instructor evaluation of specific assignments, instructor-prepared problems on exams and homework, and from team projects and professional development assignments. The performance of each assessed outcome was normalized to a 4.0 scale so that the results can be aggregated for multiple measures.

The faculty re-evaluated what data would be collected from the individual courses, instead of evaluating all or the majority of the ‘a’ through ‘k’ items in each course, the programs decided to be selective in which ‘a’ through ‘k’ items would be assessed in any given course and only evaluate a maximum of three items in each course, yet assessing all ‘a’ through ‘k’ items over the entire expanse of courses in each program. Attachment C is a matrix showing the ABET ‘a’ through ‘k’ outcomes to be assessed and in which courses these individual criteria will be assessed. This matrix is for the civil and construction program only. The faculty of the

department wanted to make sure that all ‘a’ through ‘k’ criteria were being assessed in at least three courses throughout the program curriculum. They felt that this was important for two reasons; the more data collected, hopefully the more accurate the assessment, but they also wanted to make sure that the criteria was being evaluated over the curriculum for both the associate and the baccalaureate programs.

Use of SWOT Analysis

The engineering technology department at Youngstown State University viewed the TAC-ABET evaluation process as a SWOT (i.e. Strengths, Weaknesses, Opportunities, and Threats) analysis, this aided in the development of the department assessment process and continued improvement development plan for each of the programs.

(S) Strengths

The department did have some strengths that we could draw on in preparing for the reaccreditation. While having these strengths, with ABET wanting to be less restrictive, it leaves the waters muddy due to the fact that ABET has not given direction as to what needs to be assessed and how the evaluator will determine whether or not the objectives/outcomes have been met⁷, this obviously leaves a big question mark for any program preparing for evaluation. None the less, you build on the strengths that you have. Some of the strengths that the department had:

- Tenured faculty that knew the programs and had been through previous TAC-ABET accreditations, albeit under the program based assessment.
- Two faculty members who serve as TAC-ABET evaluators.

(W) Weaknesses

The three different programs, within the engineering technology department, seeking TAC-ABET accreditation consists of; Civil & Construction, Electrical, and Mechanical Engineering Technology. There were several weaknesses that each of the departments had going into the TAC-ABET visit.

- Probably the biggest weakness was that none of the programs, nor did the department as a whole, had any significant amount of data collected for student/course outcomes.
- To support the department, in which there is enrollment of approximately 460 students, there are only eight full-time faculty members, one of these being the department chair, one coordinator per program and on average one other full-time faculty member per program and one department secretary.
- With the limited number of faculty in this department the time required to implement the assessment tools, gather the data, and analyzing the data collected is tremendous.

(O) Opportunities:

The department and programs, due to commencing with the TC-2K method of assessment, had multiple opportunities. While looking back, these are viewed as opportunities, during the preparation and process of the TAC-ABET visit the faculty did not refer to them as such.

- Develop the departmental objectives and align the individual program objectives to the overall department objectives.
- Decide on criteria to assess and the methods for assessment.
- Edit existing rubrics to fit our needs for assessment.
- Analyze the data collected and evaluate the student(s) / program outcomes.
- Share this information with each of the program's the Industrial Advisory Boards IABs and then revise / update the respective courses / curriculums as deemed appropriate.

(T) Threats

There were obvious threats as the department embarked into the accreditation process. Some of these threats overlap the weaknesses listed previously.

- There was a possibility that the department and/or programs would be cited for deficiencies, which could lead to loss of the ABET accreditation or require another visit by ABET. The tenured faculty's intuition was that the program(s)/department would be cited for weaknesses and at a maximum would require an interim report as to the progress to correct the weaknesses.
- One of the most burdensome parts of this shift to outcomes based assessment was the time commitment. Again, with limited full-time faculty, the time involved in the beginning was tremendous. Sanders and McCartney were on point when they stated that, "Assessment is a difficult and time consuming process."⁶
- The faculty and department here at Youngstown State University, as can many others that have gone through the TC-2K accreditation process, can attest to the statement that E. Sener makes in their paper, "Does It Also Make Economic Sense: Economics of Assessment", "... assessment is really taking a toll on the scarcest of resources of all academic departments, namely, faculty/administrator time and its inherent cost"⁷.

Conclusion

The department and programs have been collecting data for several semesters, still fine tuning the course curriculums and the assessment tools, but are moving forward with data collection and assessment. With the end of the Spring 2008 semester each program will have collected four semesters of data, while not every course is taught every semester it means that some of the courses there is only two sets of data. However, the individual programs, with the data that has been collected, are beginning to create the last link in the loop; revise the initial plan. In closing the loop, the individual programs will analyze the data, identify the weakness or deficiencies and present this information to the various IABs, together they will decide on the needed modifications to correct the deficiencies and adjust the courses accordingly.

While this process, outcomes assessment, as with anything in the beginning was very cumbersome and taxing to the faculty and department. As time goes on it is becoming easier, somewhat less time consuming, and even interesting to analyze the data to see where there maybe problems in the various courses. The faculty will continue to collect, monitor, and assess data on student progress to validate the reference levels for each outcome (based on a broader snapshot obtained by combining data from several semesters). Each program's IAB will review one or two specific outcomes at each meeting to benchmark the assessment tools. *What is the view from the trenches at this point? The sun is beginning to shine and the water is receding.*

Bibliography

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- 4) Meyer, D., (2006). Strategies for Assessing Course-Specific Outcomes. *ASEE Annual Conference & Exposition*, 2006, American Society for Engineering Education.
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Attachment A

Outcome 2 g. – An ability to communicate effectively (written)

Metric & Weight (W)	Unacceptable (Score, S=0)	Marginal (Score, S=1)	Acceptable (Score, S=2)	Exceptional (Score, S=3)	Points (P) P = W*S
Organization & Style (W=2)	Sequence of information is difficult to follow. No apparent structure or continuity. Purpose of work is not clearly stated.	Work is hard to follow as there is very little continuity. Purpose of work is stated, but does not assist in following work.	Information is presented in a logical manner, which is easily followed. Purpose of work is clearly stated assists the structure of work.	Information is presented in a logical, interesting way, which is easy to follow. Purpose is clearly stated and explains the structure of work.	
Content & Knowledge (W=3)	No grasp of information. Clearly no knowledge of subject matter. No questions are answered. No interpretation made.	Uncomfortable with content. Only basic concepts are demonstrated and interpreted.	At ease with content and able to elaborate and explain to some degree.	Demonstration of full knowledge of the subject with explanations and elaboration.	
Format & Aesthetics (W=1)	Work is illegible, format changes throughout, e.g. font type, size etc. Figures and tables are sloppy and fail to provide intended information.	Mostly consistent format. Figures and tables are legible, but not convincing.	Format is generally consistent including heading styles and captions. Figures and tables are neatly done and provide intended information.	Format is consistent throughout including heading styles and captions. Figures and tables are presented logically and reinforce the text.	
Spelling & Grammar (W=1)	Numerous spelling and grammatical errors.	Several spelling and grammatical errors.	Minor misspellings and/or grammatical errors.	Negligible misspellings and/or grammatical errors.	
References (W=2)	No referencing system used.	Inadequate list of references or references in text. Inconsistent or illogical referencing system.	Minor inadequacies in references. Consistent referencing system.	Reference section complete and comprehensive. Consistent and logical referencing system.	
Total Points (TP=ΣP)					

Overall Performance Criterion: TP≥14	Unacceptable 0≤TP≤8	Marginal 9≤TP≤13	Acceptable 14≤TP≤20	Exceptional 21≤TP≤27
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Attachment B

**ENTC 1505 Engineering Technology Concepts
ASSESSMENT RUBRIC**

September 19, 2007

Exam No. 1

		TOTAL		Hierarchy of Operations	Scientific Notation	Engineering Notation	Reciprocals	Exponents	Radicals	Compute Area and Volume
		Prob No.		1-4	5-7	8-13	14-17	18-25	26-30	31
points	%	85	8	6	12	8	16	10	25	
Student	A	96	82.0	6.0	5.0	12.0	8.0	16.0	10.0	25.0
Student	B	75	64.0	7.5	3.5	9.0	6.0	14.0	8.0	16.0
Student	C	0	0.0							
Student	D	62	52.5	7.5	5.0	5.0	1.0	16.0	8.0	10.0
Student	E	71	60.5	6.0	3.0	10.0	3.0	15.5	10.0	13.0
Student	F	0	0.0							
Student	G	0	0.0							
Student	H	83	70.5	6.0	3.0	10.0	8.0	13.5	5.0	25.0
Student	I	76	65.0	5.0	4.0	2.0	8.0	16.0	10.0	20.0
Student	J	95	81.0	8.0	5.0	12.0	8.0	16.0	10.0	22.0
Student	K	89	75.5	5.5	5.0	12.0	6.0	16.0	9.0	22.0
Student	L	85	72.0	7.0	5.0	12.0	1.0	16.0	6.0	25.0
Student	M	69	59.0	5.5	1.0	11.5	0.0	16.0	5.0	20.0
Student	N	83	70.5	4.5	5.0	12.0	4.0	16.0	9.0	20.0
Student	O	98	83.0	7.0	5.0	12.0	8.0	16.0	10.0	25.0
Student	P	95	81.0	8.0	5.0	12.0	8.0	16.0	10.0	22.0
Student	Q	0	0.0							
Student	R	51	43.0	7.0	4.0	7.0	0.0	4.0	4.0	17.0
Student	S	80	68.0	6.5	5.0	12.0	4.0	15.5	10.0	15.0
Student	T	82	70.0	8.0	5.0	9.0	0.0	16.0	10.0	22.0
		51.6	54.9	6.6	4.3	10.0	4.6	14.9	8.4	19.9
		Normalized to 4.0	3.14	3.28	2.85	3.32	2.28	3.73	3.35	3.19
Applicable CCET Outcome		Average	b.	b.	b.	b.	b.	b.	b.	b.
Outcome b.		3.14								

Attachment C

CCET Outcomes											
	mastery of knowledge, skills & tools of CCET	apply math, science, engineering & technology	experiments using civil & construction materials	Ability to apply creativity in design of systems, components or processes	work in teams	identify, analyze & solve tech. problems	communicate effectively	recognize need for lifelong learning	prof., ethical & social responsibilities	diversity, professional, societal & global issues	quality, timeliness & cont. improvement
CCET OUTCOME	a	b	c	d	e	f	g	h	i	j	k
Course											
ENTC 1505		F/S	F/S				F/S	F/S	F/S	F/S	
DDT 1505							F/S				
CCET 2604	F/S	F/S				F/S					
CCET 2614			F/S		F/S						
CCET 3706		S									
CCET 3709						F					F
CCET 3714			*F/S								
CCET 3724					S		S		S	S	
CCET 4807								*F/S			*F/S
CCET 4812				*F/S		*F/S					
CCET 4816	*F/S			*F/S		*F/S	*F/S				
CCET 4884	F/S			F/S	F/S		F/S	F/S	F/S	F/S	F/S

Note: **F/S** - denotes that data will be collected for the respective CCET Outcome in both the Fall (F) and Spring (S) semesters.

***F/S** - denotes that the course may be offered either in the Fall (F) or Spring (S) depending on the year.