

Assessment and Evaluation Process for Engineering Technology Program

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Abstract: The Applied Engineering Technology (AET) Program at Drexel University recognizes the need for periodic assessment and evaluation to make sure that the AET is achieving its mission. This paper describes how the assessment and evaluation of Program Educational Objectives and Program Outcomes leads to a “Continuous Quality Improvement (CQI) of the Program Report” that is produced annually. The methodology is explained to show how assessment data is compiled, how the data is analyzed, and how the analysis is translated into an understanding of the program and required action to improve the program. Useful templates for collecting and storing assessment data are described and examples of histograms are presented that demonstrate the assessment results. All this information is summarized in a series of standard “Student Learning Outcomes at the Program Level” formats that present the evaluated results with the actions taken if needed. This information is also tied to the next cycle of the evaluation process.

Key words: Applied Engineering Technology, Assessment and Evaluation, Learning Outcomes.

Introduction

This paper describes the assessment and evaluation process of the Applied Engineering Technology Program Outcomes. This process is intended to validate that students are achieving Program Educational Objectives (PEO) [1]. An internal process is presented in details, which leads to understanding how program outcomes are translated into measurable performance criteria with assessment rubrics. Students and facilities are assessed to test the program educational practices and strategies based on the collected assessment evidence that is accumulated for analysis [2]. This evidence is interpreted to gain an understanding of the program and results in a continuous quality improvement (CQI) of the program through implemented actions [3, 4]. The major constituents’ role in this process is to assess and evaluate these PEO and approve any changes.

Continuous Quality Improvement Process

The CQI process is based on Program Outcomes that are consistent with the AET Mission and the Program Educational Objectives. A list of outcomes from a through k is designated by the Accreditation Board of Engineering and Technology (ABET). In general, the CQI process requires collection of assessment information from all aspects of the program that are scored to measurable performance criteria [5,6,7]. The assessment information is evaluated and a CQI of

the program report is produced annually, which implements program improvements through recommended actions. A flow chart titled, Continuous Improvement of the Program (Figure 1), depicts the details of this process. The CQI report may recommend changes to the Program Outcomes. The AET Curriculum Committee may then change the Performance Criteria and the corresponding assessment rubrics [5,6,7,8]. Changes can be made to each successive block in the CQI flow chart (Figure 1).

At the end of each term, the assessment information in the form of scored documents relating to individual student performance is collected from course instructors and CO-OP employers. A typical Assessment Sheet for a course is shown in Figure 2. This information is summarized in Course Assessment Summary Sheets and Survey Assessment Summary Sheets. Samples of these summary sheets are presented in Figure 3 and Figure 4. This information forms the basis for evaluation of each Program Outcome and is documented using the format “Student Learning Outcomes at the Program Level” [1]. Figure 5, and Figure 6 show Program Outcome *a*, “An appropriate mastery of the knowledge, techniques, skills and modern tools of their discipline”, displayed with all relevant information required by ABET and in a form useful for our AET Program improvement and follow up. The information presented in this format summarizes what was reviewed, the assessment methods used, and general information about the evaluator and evaluation time period. Further, the results of the evaluation are discussed with included histograms to summarize the findings and actions are recommended. All of these elements are compiled and used to produce an annual CQI report.

It was observed that students achieved an appropriate mastery of the knowledge, techniques, skills and modern tools of their disciplines. Here we see that 91%, 88%, 93% and 100% of scores from the Context for Assessment for courses and surveys met the Applied Engineering Technology goal. The included histograms show the results graphically. These results and some other capstone results from courses and surveys are presented. All performance criteria for this Program Outcome were assessed using triangulation from a variety of Assessment Methods and also encompassing the Educational Practices/Strategies as detailed in our Continuous Quality Improvement of the Program. The assessment summaries show agreement that the outcome was met through third party assessment.

Program Educational Objectives

The information collected and documented in Survey Assessment Summary Sheets indicates how well AET meets the Program Educational Objectives (PEO). Program objectives are broad statements that describe the career and professional accomplishments that our program is preparing our graduates to achieve. Program Educational Objectives are listed and discussed in self-studies that are provided to ABET prior to evaluation visits and it is important that PEOs are consistent with the program mission and with the program outcomes. This information is included in the CQI report and is made available to AET Industrial Advisory Committee. These

results are reviewed during the biannual meetings and may be used to improve or update Program Educational Objectives.

Summary

The AET Program at Drexel University has an effective methodology for assuring that the program is meeting the program mission. The student's data are collected into an understandable CQI report that accurately portrays how well the program is meeting the Program Outcomes and Program Educational Objectives. The format is consistent with the methodology suggested by ABET, so the program is assured to meet ABET requirements and the needs of industry. The collected information is useful to the program constituents and to the general public, so that they can form opinion about the program and understand the value of the program to the students. Examples of the documents used during the CQI process to help in the extensive task of accumulating and storing data are discussed. Visual tools, such as histograms and performance statistics are presented.

References

1. *2008 – 2009 Criteria for Accrediting Engineering Technology Programs*, ABET Inc., 2008
2. Robert Lingard. *A Process for the Direct Assessment of Program Learning Outcomes Based on the Principles and Practices of Software Engineering. Proceedings of the ASEE Annual Conference*, pp. 1-9, 2007.
3. Gloria Rogers, *Assessment 101 – Part I, Community Matters, ABET Publication*, Page 3, May 2007
4. Gloria Rogers, *Assessment 101 – Part I, Community Matters, ABET Publication*, Page 3, October 2007
5. Gloria Rogers, *Assessment 101 – Part I, Community Matters, ABET Publication*, Page 3, Sept 2006
6. Gloria Rogers, *Assessment 101 – Part II, Community Matters, ABET Publication*, Page 3, Oct 2006
7. Gloria Rogers, *Assessment 101 – Part III, Community Matters, ABET Publication*, Page 3, Nov 2006
8. Heidi Goodrich Andrade, *Understanding Rubrics. Educational Leadership*, 54 (4), pp.14 – 17, 1996.

MET 209 - Fluid Power – Goodwin College - Drexel University

Performance Criteria Assessment

Student Name: Joe Student

Instructor: Dr. Robert Instructor **Term:** Winter 200825 **Campus:** Drexel

Instructions: Circle one description that best represents your evaluation of each Outcome/Performance Criterion. Descriptions are found in either the **Exceeds, Meets, Minimally Meets, or Fails to Meet** columns.

Outcome/Performance Criteria	Exceeds (5)	Meets (3)	Minimally Meets (1)	Fails to Meet (0)	Score
Outcome k./Performance Criterion 2. Manages time and specifically plans for general review of work to improve results.	Manages time effectively and specifically plans for general review of work to improve results. Implements an improvement plan.	Manages time well and specifically plans for general review of work to improve results.	Sometimes fails to manage time well or sometimes does not set time for general review.	Manages time poorly and often does not set time for general review of work to improve results.	5

Figure 2. Course Assessment Sheet

Outcome Letter: a

Course Type: EET

Course Number: 202

Section Number: 701

Campus Taught: Drexel

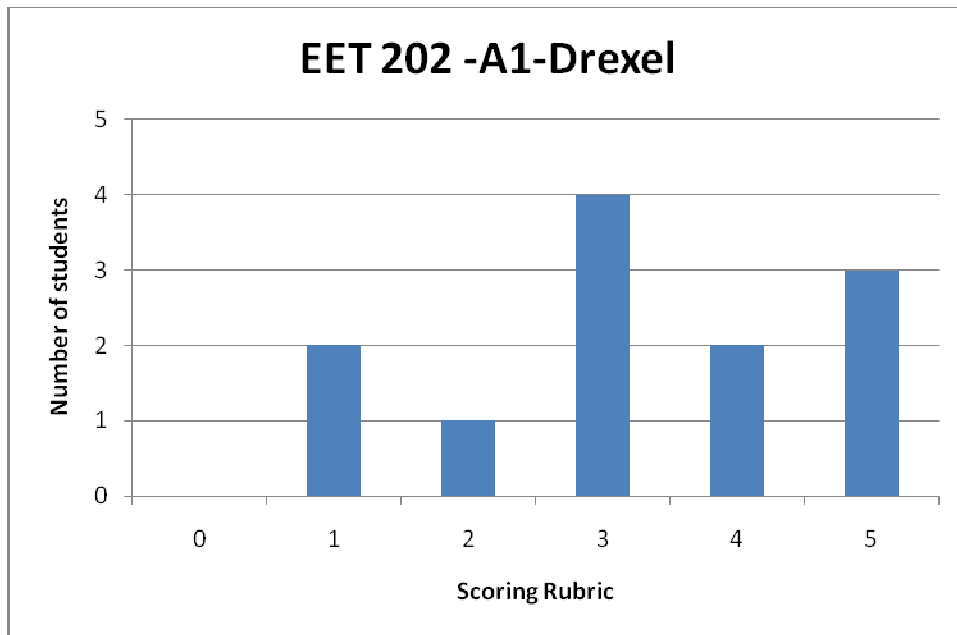
Term: Fall

Academic Year: 07-08

Performance Criterion Assessed: Demonstrates mastery of the skills of their discipline.

Assessment Method: Locally developed examination

Educational Practices / Strategies: Coursework and Curricular Patterns



Average Score = 3.25

1 Standard Deviation = 1.42

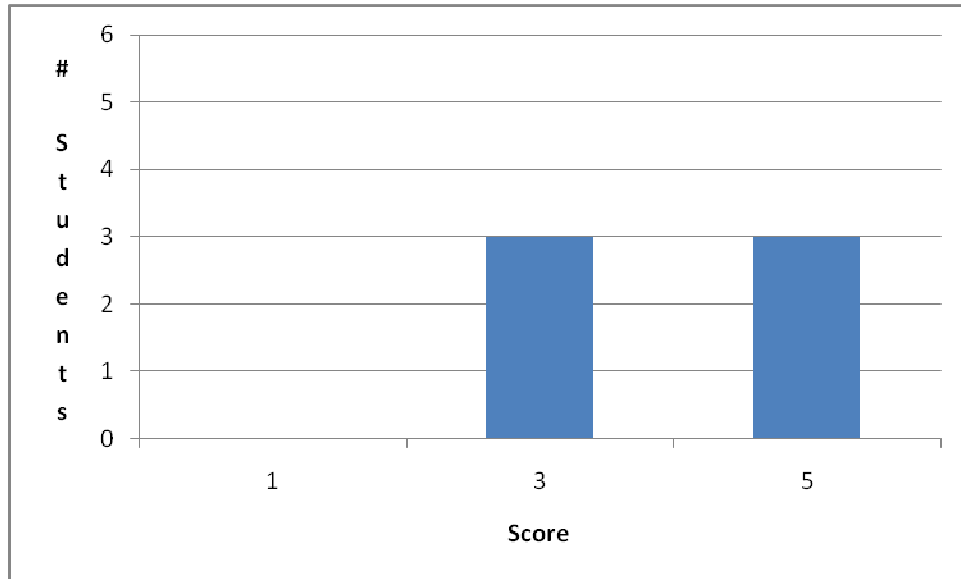
Figure 3. Sample of the Course Assessment Summary Sheet

Outcome Letter: a

Academic Year: 07-08

Survey type: 2. Example CO-OP Employer Survey

Performance Criterion Assessed: Demonstrates mastery of the skills of their discipline.

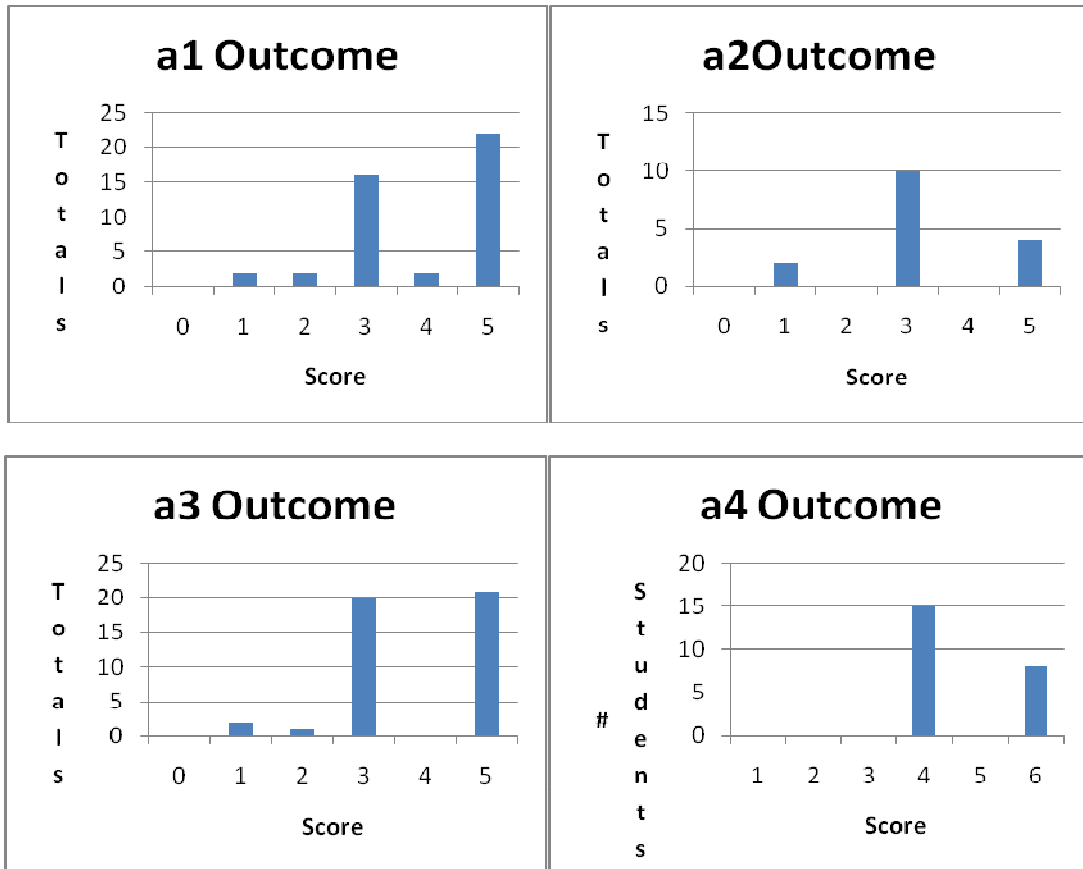


Average Score = 4.00 1 Standard Deviation = 1.10

Figure 4. Sample of the Survey Assessment Summary Sheet

Performance Criteria	Strategies	Assessment Method(s)	Context for Assessment	Time of data collection	Assessment Coordinator	Evaluation of Results
Demonstrates mastery of the skills of their discipline.	EET202, MHT222, MET421, MET422, MET423, EET404, MHT224, MHT405	Locally developed exams, external examiner, oral examinations, scoring rubrics	EET 202 MET 423	Start of academic year 07-08 on a three year cycle	William Danley	Department Assessment and Evaluation Committee
Applies techniques used in their discipline.	MHT205, MHT402, MET422, MET423, EET402	Locally developed exams, behavioral observations, scoring rubrics	MHT 205 MET 422	Start of academic year 07-08 on a three year cycle	William Danley	Department Assessment and Evaluation Committee
Demonstrates mastery of knowledge in their discipline.	EET206, MET421, MET422, MET423, EET407, MET380	Locally developed exams, external examiner, scoring rubrics	EET 206 MET 423	Start of academic year 07-08 on a three year cycle	William Danley	Department Assessment and Evaluation Committee
Employs modern tools used in their discipline.	MET100, MET310, EET324, MET422, MET423, MHT314	Locally developed exams, performance appraisal, scoring rubrics	MHT 314 MET 422	Start of academic year 07-08 on a three year cycle	William Danley	Department Assessment and Evaluation Committee

Figure 5. Learning Outcome *a*. An appropriate mastery of the knowledge, techniques, skills and modern tools of their disciplines.



Actions __ Summer 2008 __ (date): Based on the analysis of these results, no action is recommended at this time.

Second-Cycle Results _____ (date): Since no actions were recommended, the evaluation process as outlined in Continuous Improvement – Process Timetable for Assessment and Evaluation of Applied Engineering Technology Program of our self-study will be reviewed as indicated in the schedule.

Figure 6. Description of Results and Actions with Histograms for Outcome *a*