A Procedure to Assess Student Outcomes in the Penn State Surveying Programs

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Presentation Outline:

- Introduction and Overview
- Review of SUR E Outcomes
- Periodic Assessment Plan (6 year)
- Evaluation Procedure Development via example
- Rubric for Evaluation of Level of Achievement
- The Evaluation and Action Plan
- Example Evaluation for ABET Outcome "f"
- Summary and Conclusions
- Questions

Introduction and Overview

- Penn State Wilkes-Barre has two degree programs
 - Associate of Engineering Technology in Surveying Engineering Technology (SUR TE), an ETAC program
 - Bachelor of Science in Surveying Engineering (SUR E), an EAC program
- Accreditation visits for both programs during Fall 2012
- Outcome assessment plan developed during 2009 for use in interim reports required from the previous ABET accreditation visit (2005-2011)

SUR E Student Outcomes

- (a) an ability to apply knowledge of mathematics, science, and engineering
- (b) an ability to design and conduct experiments, as well as to analyze and interpret data
- (c) an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
- (d) an ability to function on multidisciplinary teams
- (e) an ability to identify, formulate, and solve engineering problems
- (f) an understanding of professional and ethical responsibility
- (g) an ability to communicate effectively
- (h) the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
- (i) a recognition of the need for, and an ability to engage in life-long learning
- (j) a knowledge of contemporary issues
- (k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Periodic Assessment Plan

- Each student outcome assessed every three years (two assessments per outcome per accreditation cycle)
- Provides assessment of 3 or 4 outcomes per year (11 outcomes/3 years = 3.67 outcomes per year)
- Periodic assessment plan developed

Periodic Assessment Plan

Outcome	Assessment Year					
	1	2	3	4	5	6
а	Х			Х		
b		Х			Х	
С			Х			Х
d	Х			Х		
е		Х			Х	
f			Х			Х
g	Х			Х		
h		Х			Х	
i			Х			Х
j	Х			Х		
k		Х			Х	
No./yr.	4	4	3	4	4	3

Outcome Assessment Definitions

- <u>Strategies</u> the range of activities that can be used to assess attainment of an outcome
- <u>Source of Assessment</u> courses or activities used for the assessment of an outcome
- <u>Assessment Method</u> specific activity on which student performance can be measured
- <u>Grading Criteria</u> the specific ways student performance is measured

Example Procedure using Outcome "a"

- State the outcome:
 - "an ability to apply knowledge of mathematics, science, and engineering"
- Identify strategies:
 - Courses in which learning outcomes can be addressed, namely
 SUR 111, SUR 241, SUR 351, SUR381, SUR 455
 - End of course student surveys
 - End of program student exit surveys for outcomes assessment
- Identify sources for the assessment:
 - \circ SUR 111 and SUR 241
 - End of course student surveys for SUR 111 and SUR 241
 - End of program student exit surveys for outcome "a"

Example Procedure using Outcome "a" (Continued)

- Performance Criterion:
 - Demonstrate the ability to apply understanding of typical measurement types used in plane surveying
- Assessment Methods:
 - Objective (direct) Methods: Quiz in SUR 111, quiz in SUR 241
 - Subjective (indirect) Methods: end of course survey, end of program exit surveys
- Grading Criteria:
 - For each assessment method
 - Example: SUR 111 quiz, student must score 40/50 on one of three quizzes related to the outcome
 - Percentage of successful students in class determines level of achievement

Rubric for Level of Achievement

Percentage	Level of Achievement	Action
≥ 90%	Outstanding	No change necessary. Continue to assess regularly.
< 90% ≥ 80%	Very good	No change necessary, however review related activities and look for improvement
< 80% ≥ 70%	Acceptable	Review all activities related to this outcome. As deemed appropriate, modify or create new methods to deliver instruction to improve achievement
< 70%	Unacceptable	Review all activities related to this outcome. Modify or create new methods to deliver instruction to improve achievement of the outcome. Implement broad change as needed

Evaluation and Action Plan

- Review results of objective and subjective assessment methods
- Identify areas that need improvement
- Instructor makes recommendations for improvement
- Faculty curriculum committee reviews the results and revise the recommendations as deemed appropriate
- Industrial Advisory Committee reviews faculty evaluation and recommendation and concurs or makes suggestions for change as deemed appropriate.
- Final recommendations implemented for next review cycle.
- Next review results compared to determine improvements and the evaluation/action process is repeated

Example Assessment for Outcome "f"

- State the outcome:
 - "an understanding of professional and ethical responsibility"
- Identify strategies:
 - Courses in which learning outcomes can be addressed, namely SUR 272, SUR 372W, SUR 471
 - End of course student surveys
 - End of program student exit surveys
- Identify sources for the assessment:
 - Materials in SUR 272 and SUR 471
 - End of course student surveys for SUR 272 and SUR 471
 - End of program student exit surveys for outcome "f"

- Performance Criterion:
 - Demonstrate an understanding of the professional responsibility of the land surveyor to the client, the public and the profession.
- Assessment Method 1:
 - SUR 272 Research exercise 1: Characteristics of Land
 Surveying (focus: professional and ethical responsibility)
- Grading Criterion:
 - Prepare a report for research for grading
 - Mean percentage of 85.7% (very good level of achievement)

- Assessment Method 2:
 - SUR 471 Exam on PA registration law and code of ethics
- Grading Criterion:
 - Performance on each exam question (3 questions)
 - Mean percentage on question 1 = 83.5% (very good)
 - Mean percentage on question 2 = 88.9% (very good)
 - Mean percentage on question 3 = 87.2% (very good)

- Assessment Method 3:
 - SUR 272 End of course survey dealing with outcome "f"
- Evaluation Criterion:
 - Question regarding student's perception of their ability to "demonstrate an understanding of the professional responsibility of the land surveyor to the client, the public and the profession"
 - Likert scale range of 1 (lowest) to 7 (highest)
 - Mean value of 5.6 (converted to 80.3%) (very good)

- Assessment Method 4:
 - End of program exit surveys dealing with outcome "f"
- Evaluation Criterion:
 - Question regarding student's perception of their ability to "demonstrate an understanding of the professional responsibility of the land surveyor to the client, the public and the profession"
 - Likert scale range of 1 (lowest) to 5 (highest)
 - Mean value of 4.38 (converted to 87.5%) (very good)

Evaluation and Action for Outcome "f"

- Results of objective assessment methods 1 and 2:
 - Students attain "very good" level of achievement according to rubric
- Results of subjective assessment method 3:
 - Students attain "very good" level of achievement according to rubric
- Results of subjective assessment method 4:
 - Students attain "very good" level of achievement according to rubric

Evaluation and Action for Outcome "f" (Continued)

- Faculty Curriculum Committee recommendations:
 - No major changes are warranted. Suggest changing wording of question on end of course survey to better reflect the outcome.
- Industrial Advisory Committee recommendations:
 - No major changes are warranted. Concurred with the minor change suggested by the faculty curriculum committee.
- Instructor Action:
 - Carry out the recommendations of the FCC and IAC and reevaluate the level of achievement during the next evaluation cycle.

Summary and Conclusions

- Penn State uses standard ABET "a" through "k" student outcomes
- Evaluation cycle set up to allow two outcome evaluations per 6 year cycle
- Rubric established to assess the level of achievement of student outcomes
- Process established to allow evaluation of level of achievement of student outcomes using multiple assessment methods (based on ABET workshop)
- Action plan completes the CQI loop

