Student Learning Assessment and the ABET Student Outcomes Criteria: "Good News/Bad News"

Gloria Rogers
Rose-Hulman Institute of Technology

Introduction

In recent years there has been criticism from the engineering education community of the Accreditation Board for Engineering and Technology (ABET) accreditation process. The criteria were often seen as fostering a "bean counting" process which did not allow for differences among programs and discouraged innovative approaches to engineering education. ABET has responded by undertaking a process which has led to the "drastic downsizing of the criteria and are-orientation of its accreditation philosophy. "[1] This has resulted in *Engineering Criteria 2000* which has been published and distributed for review and comment for the next two years. That's the good news. Unfortunately, few engineering colleges are prepared to deal with the challenge of providing evidence in a systematic way which validates student achievement in the areas defined by "Criterion 3. Program Outcomes. " That's the bad news. This paper will compare the previous ABET criteria to the new proposed criteria and illustrate a process which can be used in the development of a plan to assess student outcomes.

What has changed?

After examining the criteria which was developed for the 1996-97 accreditation cycle, a comparison was made with the proposed *"Criteria 2000. "* Figure 1 illustrates the relationship between the current and proposed student outcomes criteria. Although not exhaustive, one can see that the basic expectations for student outcomes has not changed significantly. However, it is clear that what has changed is the focus of the ***process*** of accreditation. Figure 2 illustrates the basic differences which have been identified in the approach that ABET will be using to determine a program's accreditation status. ABET is now putting the responsibility for developing the metrics used to determine student outcomes on the individual engineering program. This means that the assumption will no longer be that if an institution does certain things *(i.e.*, checks off certain boxes) the outcomes will be assumed and the criteria met. Engineering programs will need to consider the following for each student outcome:

- what indicators will be used to define whether or not the outcomes are being achieved
- what is being done to achieve the outcomes (e.g., classroom/laboratory practice or requirements)
- what assessment methods are being used

This will require each engineering program to have in place an assessment program that provides assessment for the evaluation of student outcomes.

Figure 1. Current ABET Student Outcomes and Proposed ***Criteria 2000.***

Curricular Objectives - Current	**Criterion 3. Program Outcomes - Proposed**
(1) a capability to delineate and solve in a practical way the problems of society that are susceptible to engineering treatment	(j) a knowledge of contemporary issues, and the techniques and skills necessary for engineering practice.
(2) a sensitivity to the socially-related technical problems which confront the profession	(h) the broad education necessary to understand the impact of engineering solutions in a societal context
(3) an understanding of the ethical characteristics of the engineering profession and practice	(f) an understanding of professional and ethical responsibility
(4) an understanding of the engineer's responsibility to protect both occupational and public health and safety	(I) a recognition of the need for and an ability to engage in life-long learning; and,
(5) an ability to maintain professional competence through life-long learning.	(e) an ability to identify, formulate and solve engineering problems;
IV.C.3.b. The overall curriculum. . . ability to apply pertinent knowledge to the identification and solution of practical problems in designated area of engineering specialization.	(a) an ability to apply knowledge of mathematics, science and engineering appropriate to the discipline;
IV.C.d.(3) Engineering Topics . . .Among the fundamental elements of the design process are the establishment of objectives and criteria, synthesis, analysis, construction, testing, and evaluation. . . Further, it is essential to include a variety of realistic constraints, such as economic factors, safety, reliability, aesthetics, ethics, and social impact. . . must develop competence to conduct experimental work . . .	(b) an ability to design and conduct experiments, analyze and interpret data; (c) an ability to design a system, component, or process to meet desired needs; (g) an ability to communicate effectively
IV.C.3.i. . . Competence in written communication . . . oral communication skills must be demonstrated through student work.	(d) the interpersonal and social skills necessary to function on a multi-disciplinary team;
IV.C.d.(3)(d) . . not. .all design work must be done in isolation by individual students; team efforts are acceptable where deemed appropriate.	

** This figure has been developed for illustrative purposes only and should not be viewed as exhaustive. It does not have the endorsement of ABET.

Gloria Rogers - 3/96
Rose-Hulman Institute of Technology

Figure 2. ABET Changing Focus

ABET Focus -Then	ABET Focus -Proposed
"What are you doing"	"How is what you're doing achieving the desired outcomes?"
Input	Outcomes
Educational activities as an end	Educational activities as a means to an end
Practice determines the outcomes	Outcomes informs practice
Process for meeting external standards	Process for feedback/improvement

Development of an Assessment Plan:

Assessment and evaluation are often tasks which are delayed in favor of immediately pressing issues which demand attention. However, with the focus of the proposed *ABET 2000*, assessment may BE the immediately pressing issue which demands attention. Each program will have to provide evidence of achievement and may, in some cases, continue to use some of the indicators that have been used in the past (*e.g.,* graduation rates, FE exam passing rates, *etc.*). The development of an assessment plan for the engineering program will provide a framework within which evidence can be collected and compared against the outcomes criteria. The following steps in the development of a plan are the focus of an unpublished document, "*A Guide for Developing an Assessment Plan.*[2]"

Step 1. Statement of desired student outcomes.

Step **2.** For each student outcome identify **objectives** which are derived from the goal and define the circumstances under which it will be known if the desired change has occurred.

Step **3.** Develop **performance criterion(s)** for each objective. The performance criterion(a) defines the level of performance required to meet the objective. Since performance, such as critical thinking or valuing life-long learning, is often not directly assessable, indicators of performance must be sought. If we can find evidence or **indicators** that the desired activity is taking place at the expected level, we can say we have met our performance criterion and thus, achieved our desired outcomes.

Step **4.** Specify assessment methods to be used for data collection for each of the objectives/criterion.

It is important to note that this is a simplification of the complete process. To be effective, an assessment plan should be developed which informs the educational practices of the engineering program. In most cases, however, assessment is an afterthought to satisfy the requirements of a funding or accrediting agency. Used properly, assessment can provide valuable information for the improvement of the educational practices and

processes which are currently being used. It is believed that this was the intent of the proposed *Criteria 2000.*

The focus of the proposed criteria is clearly on the self-evaluation and accountability of the effects of engineering programs on students. It is hoped that the criteria established for specific engineering programs by the professional societies will follow same philosophy. Only time will tell if the fare will be a buffet or beans, beans, beans.

1. "Engineering Criteria 2000--For Review and Comment. Engineering Accreditation Commission of The Accreditation Board for Engineering Technology, December, 1995.

2. Rogers, Gloria and Jean Sando, (March, 1996) *A Guide for Developing an Assessment Plan.* Rose-Human Institute of Technology, Terre Haute, Indiana, USA.