

Guidelines to Institutions, Team Chairs and Program Evaluators on Interpreting and Meeting the Standards Set Forth in Criterion 3 of the Engineering Accreditation Criteria

PREAMBLE

The following information is intended to provide guidelines to institutions, team chairs and program evaluators on interpreting and meeting the standards set forth in Criterion 3 of the Engineering Accreditation Criteria. These guidelines do not supercede ABET's "Criteria for Accrediting Engineering Programs" or ABET's "Accreditation Policy and Procedure Manual." Furthermore, institutions, team chairs and program evaluators should not be relying solely on these guidelines for interpreting and meeting the standards set forth in Criterion 3. Institutions, team chairs and program evaluators are encouraged to attend the Commission Summit at the ABET Annual Meeting, ABET's Faculty Workshops, Program Evaluator Training Sessions, etc. Information about such workshops and sessions is available on the ABET website.

Criterion 3 of the Engineering Accreditation Criteria deals with program outcomes and assessment. Criterion 3 for the 2004-2005 accreditation cycle states:

"Although institutions may use different terminology, for purposes of Criterion 3, program outcomes are statements that describe what students are expected to know and be able to do by the time of graduation. These relate to the skills, knowledge, and behaviors that students acquire in their matriculation through the program.

Each program must formulate program outcomes that foster attainment of the program objectives articulated in satisfaction of Criterion 2 of these criteria. There must be processes to produce these outcomes and an assessment process, with documented results, that demonstrates that these program outcomes are being measured and indicates the degree to which the outcomes are achieved. There must be evidence that the results of this assessment process are applied to the further development of the program.

Engineering programs must demonstrate that their students attain:

- (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 multi-disciplinary teams
- (e) an ability to identify, formulate, and solve engineering problems
- (f) an understanding of professional 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.

In addition, an engineering program must demonstrate that its students attain any additional outcomes articulated by the program to foster achievement of its education objectives."

The criterion has led institutions, team chairs and program evaluators to debate the interpretation of the criterion as well as to question what needs to be submitted or presented to document that the standards set forth in this criterion are being met. Some questions that come to mind are:

What does a program need to provide in order to “demonstrate” ability?

Does a program need to demonstrate assessment and achievement of each and every item listed in (a) through (k), most of (a) through (k), or just some subset of (a) through (k)?

Does the program need to demonstrate that each and every student has achieved each and every element listed in (a) through (k), or is it acceptable to show that a random sampling of students within a program has achieved each and every element listed in (a) through (k)?

If a program has in place a curriculum that includes each and every element listed in (a) through (k) and if a student successfully completes the program, is it safe to assume that each and every student has achieved each and every item listed in (a) through (k)?

Must all program constituents be involved in outcomes assessment?

The following material is intended for use as guidelines for institutions, team chairs and program evaluators to determine whether programs are meeting the standards set forth in Criterion 3.

First, programs must have in place a curriculum, or other program requirements, that provide students opportunities to learn, practice and demonstrate the elements listed in (a) through (k).

Second, programs must have in place an appropriate assessment process that produces documented results that demonstrate that students have achieved each and every item listed in (a) through (k). It is expected that all students will demonstrate achievement of every item listed in (a) through (k). Programs must show, even by appropriate sampling, that there is convincing evidence to assume that all students by the time they have graduated have demonstrated achievement, to a level acceptable to the program, of every item listed in (a) through (k). However, it is not necessary for evidence to be provided for each and every student.

Third, the assessment process should include direct and indirect measures and does not rely only on self-report surveys and evidence that the material is “covered” in the curriculum. Evidence that needs to be provided must be “convincing” evidence. Student self-assessment, opinion surveys, and course grades are not, by themselves or collectively, acceptable methods for documenting achievement of outcomes.

The attached table lists required features of Criterion 3, possible acceptable evidence for documenting assessment processes, achievements of outcomes and unacceptable practices.

Criterion 3 does not require involvement of external program constituencies in outcomes assessment; this is required in Criterion 2b. However, programs may choose to involve outside constituents (e.g., advisory boards, alumni) in assessment of outcomes (as in alumni surveys), the analysis of results, and/or in other aspects of program evaluation, assessment and improvement.

Criterion 3. Program Outcomes and Assessment

Objectives: Statements that describe the expected accomplishments of graduates during the first few years after graduation.

Outcomes: Statements that describe what students are expected to know and be able to do by the time of graduation.

Required Features of Criterion 3	Possible Evidence	Generally not acceptable	Comments
Demonstration of Student Outcomes <ul style="list-style-type: none"> • Outcomes linked to the curriculum 	<p><i>Evidence must be directly linked to the specific outcome being assessed.</i> A limited set of performance indicators have been developed that define each of the outcomes to be assessed. Data collection methods are focused on the indicators and can include such things as: student portfolios; subject content examinations; performance evaluation of work/study, intern or co-ops; and/or performance observations. Surveys and other indirect measures provide secondary evidence and should be used in conjunction with direct measures such as those above.</p> <p>Map of outcomes to the curriculum or associated program activities (student professional groups); course syllabi that indicate the desired program learning outcomes that are 'covered' in the course.</p>	<p>Student learning outcomes that have not been defined (e.g., What is "effective communication skills?" How will you know "effective communication skills" when you see it?) Student self-assessments and surveys are used as the only evidence of student outcomes. Using course mapping as an indicator of student learning.</p>	<p>Students do not possess the long-term, objective, calibrated perspective on their performance level that faculty do. Therefore, student opinion surveys are a weak method for demonstrating achievement of outcomes. Using course mapping to document student learning only document what is "taught" not what is learned.</p>
Assessment Process <ul style="list-style-type: none"> • With documented results • Results applied for program improvement 	<p>Schematic drawing of the assessment process with a timeline that reflects systematic processes. Documentation of how the process is being sustained and what multiple assessment methods are being used to assess the various outcomes.</p> <p>Summary of results are available that reflects evidence of systematic outcomes assessment. Summaries, evaluation of results, and action taken is presented outcome by outcome.</p> <p>Data must be evaluated by the faculty or a group of faculty and recommendations for action documented. For those institutions that have had multiple cycles of assessment, documentation should reflect the results of previous improvements.</p>	<p>Making the assumption that students achieve all outcomes by merely completing the curriculum.</p> <p>Collecting information that is not used to evaluate outcomes.; inappropriate use of assessment methods; no <u>direct</u> measures of student learning, overuse of surveys; data collection is irregular; inefficient process; inordinate faculty program assessment load; faculty not involved in the decision making process.</p> <p>Documentation that does not focus directly on the process; presentation of raw data or charts of raw data instead of brief summaries of findings and action taken (i.e., "data dump").</p> <p><i>Ad hoc</i> consideration of program improvement; "traditional" course evaluations & student "satisfaction" surveys used as basis for improvements. Failure to document how the changes that are made relate to the evaluation of the assessment data.</p>	<p>The educational experience to achieve the targeted program outcomes should be guaranteed to all students; it is not necessary that all outcomes have the same emphasis in all programs.</p> <p>Every outcome does not need to be assessed yearly; assessment cycles should meet program needs for information, but must be systematic. Systematic timeline for data collection should be evident. Process coordinator is desirable.</p> <p>Documentation of results with evaluation is important to this process. Generally, a lot of raw data or tables of results with no summaries generally reflect inadequate evaluation processes.</p>

**Required Features
of Criterion 3**

- Measurement of outcomes

**Outcomes related to
Program Educational
Objectives**

Possible Evidence

Outcomes are measurable, in that there are performance indicators for each outcome, which enable direct measurement.

Clear linkages between the after graduation program objectives and student learning outcomes.

Generally not acceptable

Faculty not involved in decisions about assessment; assessment is done by external parties; use of methods that do not align with program's own definition of its outcomes
No clear distinction between objectives and outcomes. Terms are used interchangeably throughout the document, and it is not clear that a distinction has been made between how they are assessed and evaluated.

Comments

Course grades do not constitute measurement of outcomes. Surveys allow measurement, but are not directly focused on student work.

It is important to note that the terms "outcomes" and "objectives" are not standardized. Some programs may use other terms to describe the same processes. It is important to understand the terms being used by each program.