

## A PROPOSED SET OF RUBRICS FOR PROGRAM EDUCATIONAL OBJECTIVES

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### Abstract

There is still a great deal of confusion within the community of engineering programs regarding Program Educational Objectives for ABET accreditation. Many programs continue to have difficulty in deciding what is the *appropriate content* for a Program Educational Objective, and in choosing an *appropriate assessment and evaluation process*. This paper addresses first the question of the content of an objective in order to allow programs to craft meaningful objectives. Secondly, the process for assessment and evaluation is discussed to ensure that the objectives can remain meaningful, and to enable academic teams to implement effective actions for continuous improvement. Finally, a set of rubrics is proposed which the team can use to self-evaluate the substance of program content of its own particular objectives concomitant with the selected assessment and measurement process. This integrated approach can then be used to evaluate, for any specific program, the “real-world” applicability of its objectives and how well they satisfy ABET, Inc., Criterion 2.

### 1. Introduction

In a previous paper [1], a process for insuring continuous improvement in the verification of desired program outcomes was described. This process included the periodic reassessment of measurement instrument effectiveness, desired program outcomes, and program objectives, and a closed-loop feedback process to track required corrective actions. Considerable data was gathered and analyzed, and from analysis of the data corrective actions were developed, put into the tracking system, and finally implemented. While the new system did work well for the outcomes, and in fact led to several significant program improvements, there was ultimately some confusion in the process of understanding and effectively evaluating the Program Educational Objectives. Apparently, this is a common experience. Although most programs now have mature processes in place to develop, measure, and assess program outcomes, and to document continuous through the exercise of that process, confusion remains with regard to program outcomes, and this has become the subject of recent interest and emphasis at ABET, Inc. workshops and ASEE conferences [2 - 4].

Consequently, this paper will address those issues pertinent to correctly defining the appropriate content and substance of a set of program objectives, and determining an effective evaluation process to ensure that meaningful objectives are included in the process. Finally, a set of rubrics

is proposed for self-evaluation of the objectives in a manner complementary to the selected assessment and measurement process.

## 2. Content of Program Educational Objectives

### 2.1 Objectives Focus on Career Achievements

Much of the confusion related to Program Educational Objectives has to do with a lack of a clear understanding of the difference between outcomes and objectives. Thus, it is perhaps best to begin with the official definition of each [5]:

Program Educational Objectives – Program educational objectives are **broad** statements that describe the **career** and professional **accomplishments** that the program is preparing *the graduates to achieve*.

Program Outcomes – Program outcomes are **narrower** 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. [emphasis added]

A mistaken approach has sometimes been to focus on the dichotomy between broad (for objectives) and narrow (for outcomes). The unfortunate result is that too often programs craft objectives that are mere abstractions of the outcomes. That is not the intent.

A better approach would be to recognize that objectives focus on accomplishments and achievements, while outcomes focus on knowledge and abilities. Another way to say this is that outcomes describe what a graduate is able to do, while objectives describe what the graduate actually does. In other words, outcomes insure the potential for professional success, while objectives describe the realization of that professional success. The outcomes provide the tools used to achieve the desired professional accomplishments (objectives). In addition, another distinction is the timeframe: outcomes describe knowledge and abilities at the time of graduation, while objectives describe accomplishments achieved during the engineer’s professional career.

The following table may help in distinguishing between an outcome and an objective.

Outcome	Objective
Knowledge and abilities	Accomplishments and achievements
What the student is able to do	What the graduate actually does
Potential for success	Realization of success
Tools needed for success	Actual accomplishments
At time of graduation	During professional career

Table 1 – Contrast Between Outcomes and Objectives

For example, the following sample objective meets the above definition of an objective:

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Graduates of the Mechanical Engineering Department at the University of Southwestern Dakota earn Nobel Prizes.

Although this objective satisfies all the definitions above, there is obviously still something wrong here. This unrealistic objective leads us to the next point.

## *2.2 Objectives Must Be Consistent With the Mission of the Institution*

Criterion 2 (a) states:

Each program for which an institution seeks accreditation or reaccreditation must have in place:

- (a) published educational objectives that are **consistent with the mission of the institution** and these criteria [emphasis added]

So unless the mythical University of Southwestern Dakota has made the production of Nobel Prize winners part of its institutional mission, then the Mechanical Engineering Department cannot realistically set such a lofty goal as one of its Program Educational Objectives.

## *2.3 Objectives Must be Based on the Needs of the Constituents*

In addition, unless the constituents (students, employers, parents, etc.) of the mythical Mechanical Engineering Department at the University of Southwestern Dakota are different than most programs, there is probably no real demand for graduates to earn Nobel Prizes. Objectives should be crafted to closely reflect the needs of the program's unique set of constituents.

Criteria 2 (b) states that:

Each program for which an institution seeks accreditation or reaccreditation must have in place:

- (b) a process that periodically documents and demonstrates that the objectives are **based on the needs of the program's various constituencies**

This shows that there must be a process to periodically insure that the objectives are based on the needs of the program's constituencies. It is not sufficient for the faculty to get together once to decide on the program objectives and then set them in concrete for all time. Instead, the constituents must be identified and consulted on a regularly-scheduled basis. The following questions might be useful when consulting with the constituents:

Question to elicit objectives from constituents: "What do you want our graduates to be able to achieve and accomplish in their professional career within three to five years after graduation?"

Question to narrow responses: “Is it realistic for us to expect our graduates to be able to achieve and accomplish what you ask within three to five years of graduating?”

Question to check for consistency with other outcomes, “Would a typical graduate be able to achieve or accomplish the stated objective if all of our outcomes were met at graduation?”

#### *2.4 Objectives Must Be Supported By the Outcomes and Other Criteria*

Criterion 2 (a) states:

Each program for which an institution seeks accreditation or reaccreditation must have in place:

- (a) published educational objectives that are consistent with the mission of the institution **and these criteria** [emphasis added]

The program must also assess whether the objective is consistent with the rest of the ABET, Inc. criteria (1-9), which include the program outcomes, the curriculum, the faculty, facilities, and level of institutional support. If the objective cannot realistically be achieved given the state of the rest of the program, then the objective is probably unrealistic. One way to get a quick feel for whether the objective is consistent or not is to ask: If all the program outcomes were satisfied at graduation, would it be reasonable to expect that most of our graduates would achieve the objective during the first three to five years of their career?

#### *2.5 Objectives Should Focus on the Portion of Career Most Affected By Formal Education*

Although ABET, Inc. does not specify the exact time period that should be addressed by the objectives, the time period of 3-5 years following graduation is considered to be the portion of a person’s career that is most affected by formal education. Beyond that timeframe, career accomplishments are more likely to be affected by motivation, experience, on-the-job training, an advanced degree, or other personal factors. As a result, objectives should be set that can realistically be achieved within 3-5 years following graduation.

#### *2.6 Objectives Should Identify What is Unique About a Program*

Potential students, employers, and other constituents should be able to read the program objectives to identify what is unique about a particular program. Although the standard outcomes (a-k) are mandated by ABET, Inc. Criterion 3, those outcomes are not meant to be an exclusive list. Individual programs can, and often do, require more of their graduates. Furthermore, the objectives are an area where a program can highlight the particular area of emphasis toward which its outcomes are directed. For example:

Graduates of the Electrical Engineering Department at the University of Southwestern Dakota assume positions of increasing responsibility primarily in the telecommunications industry.

Graduates of the Civil Engineering Department at the University of Southwestern Dakota become registered Professional Engineers in responsible charge of large engineering projects, primarily in the transportation industry.

If every objective from every university looked exactly the same, then they would cease to have any value for the constituents, or for the program. Another note is that although objectives are meant to relate to most graduates of a particular program, they are not meant to (and could not possibly) dictate the career choices of the graduates. For example, not every Civil Engineering graduate from the University of Southwestern Dakota has to become registered as a P.E. in order for the objective to be satisfied, as long as that career choice would be supported by the program, and as long as most of the graduates do in fact accomplish that objective.

### *2.7 Objectives Should Be Widely Published*

Constituents cannot use the Program Educational Objectives to make informed decisions about a program if they cannot locate and read the objectives. Therefore, once the objectives are crafted and approved, they should be widely disseminated to all constituents. The minimum acceptable level of dissemination would be to post them on the program's web site. But it would be even better to publicize the objectives to the constituents in a more proactive manner, through a variety of media.

## **3. Process for Assessing Program Educational Objectives**

Developing appropriate Program Educational Objectives and publishing them is the easiest part of the process. Measuring and assessing the extent to which the objectives are being met, and making program improvements as necessary, is more difficult. By now, most programs in the United States have mature processes in place for assessment and measurement of their Program Outcomes, and for continuous program improvement based on outcome data. Fewer programs have mature processes in place for doing the same for objectives, yet the mandate and the general procedure is really the same.

Criteria 2 (c) states:

Each program for which an institution seeks accreditation or reaccreditation must have in place:

(c) an **assessment** and **evaluation** process that **periodically** documents and demonstrates the **degree** to which these objectives are **attained**. [emphasis added]

### *3.1 Objectives Must Continue to Be Based on the Needs of the Constituents*

The first part of the assessment process is to periodically review the objectives to insure that they continue meeting the needs of the constituents over time.

Criteria 2 (b) states that:

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Each program for which an institution seeks accreditation or reaccreditation must have in place:

- (b) a **process that periodically documents and demonstrates** that the objectives are based on the needs of the program's various constituencies [emphasis added]

The same questions outlined in Section 3.3 above may be useful for this task.

This periodic review must take place on a regular schedule, but care must be exercised not to make changes to the objectives too rapidly, otherwise any measurement data collected 3-5 years after graduation will be hopelessly out-of-phase with the current state of the program.

### 3.2 Objectives Must Be Measurable

The objectives must be crafted in a manner that is measurable using appropriate instruments. For example, it would be a relatively easy matter to determine whether graduates are becoming licensed P.E.s, but rather more difficult to determine if they are behaving in an ethical manner in their profession. When designing the measurement instruments, one should consider that direct measures (such as the percent of graduates who become licensed) are always preferable to indirect measures such as opinion surveys. If only indirect measures are possible, however, then it is better to use multiple instruments to measure the same objective. Care should be exercised to insure that every objective is being measured by one or more (preferably direct) instruments. Sometimes it is helpful to create a matrix that maps instruments to outcomes to insure complete coverage, as shown in Table 2 below.

	Instrument 1 (direct)	Instrument 2 (indirect)	Instrument 3 (indirect)	Instrument 4 (indirect)
Objective 1	X			X
Objective 2	X	X	X	
Objective 3		X		X

Table 2 – Mapping of Objectives to Instruments

Rubrics should be developed for each objective to assess the degree of attainment of that objective. For example, the following rubric could be used to determine whether graduates are “assuming positions of increasing responsibility.” The measurement instrument in this case might be a survey of alumni who graduated 3-5 years ago. Survey questions could solicit information regarding their current job title, how many people they currently supervise, and the level of budgetary control they have. This information could be collated, evaluated, and scored by a faculty committee to give evidence of the degree of satisfaction of the objective using a rubric such as the one shown in Table 3.

Objective	Objective Not Satisfied	Objective Satisfied at Minimum Level	Fully Satisfies Objective
Graduates assume positions of increasing responsibility in industry.	Graduate is currently serving in an entry-level position with little or no budgetary authority.	Graduate is currently serving in a first-level supervisory position with limited responsibility	Graduate is currently serving in a supervisory position with significant responsibility

Table 3 – Sample Rubric for Measuring the Degree of Satisfaction of an Objective

### 3.3 Objectives Must be Measured Regularly

Objectives must be measured on a regular basis using the instruments and rubrics described above. Note that measurement does not need to occur every semester, but the assessment schedule should span multiple years and should indicate when the various instruments will be used to assess the objectives. The assessment plan must actually be exercised in a regular and sustainable manner. The results of the assessment procedure should be collected, archived, and acted upon as described below.

### 3.4 The Results of the Assessment Process Must be Evaluated and Used to Improve the Program

The results of the assessment process should be thoughtfully evaluated by the faculty to determine whether corrective actions should be taken. Corrective actions should be documented and tracked to completion, and their effect on the program over time should be noted to determine whether additional corrective actions are necessary.

## 4. Rubrics for Program Educational Objectives

This paper has discussed the basic principles behind Criterion 2, Program Educational Objectives, but sometimes it is helpful to have a condensed checklist to determine the extent to which the objectives and their associated assessment procedure satisfy every aspect of Criterion 2. To that end, a proposed set of rubrics has been developed to measure, prior to an accreditation visit, the degree of a program’s compliance with Criterion 2. The first set of rubrics, dealing specifically with the *content* of the objectives, i.e., “what they should say,” is shown in Appendix 1 below. This set of seven rubrics is mapped to a three-level spectrum of performance categories for self-evaluation purposes. Appendix 2 contains a proposed set of rubrics designed to measure the maturity of a program’s assessment plan and continuous improvement procedures, tied to the same three performance categories.

## 5. Conclusion

Institutions invest a great deal of time and energy in their assessment programs. The real value of any assessment program comes not from external validation in the form of accreditation, but

rather in the continuous improvement of the program. It is envisioned that these rubrics will allow programs to optimize their assessment procedures so as to gain the maximum value from them for program improvement, while at the same time investing a level of energy which is sustainable over the long-term and remaining compliant with the ABET, Inc. Criterion 2.

## References

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**Appendix 1**  
**Proposed Rubrics for Content of Program Educational Objectives**

<b>Rubric</b>	<b>Needs Improvement</b>	<b>Satisfies Requirements</b>	<b>Serves as a Model for Others</b>
Objectives focus on professional accomplishments and achievements, rather than knowledge and abilities.	Most objectives focus on knowledge and abilities, and merely lump together and/or generalize the outcomes.	Most objectives focus on professional accomplishments and achievements.	All objectives focus on professional accomplishments and achievements.
Objectives are consistent with the mission of the institution and program.	Objectives bear no relationship to the mission of the institution and program.	Objectives partly support the mission of the institution and program.	Objectives fully support the mission of the institution and program.
Objectives are driven by the needs of the constituents.	Objectives were drafted by the faculty. Constituents were not consulted.	Objectives were drafted by the faculty. Constituents were asked to ratify them after the fact.	Objectives were drafted in consultation with constituents and reflect their needs and concerns.
Objectives are consistent with other ABET, Inc., criteria, including outcomes and program-specific criteria.	Because the objectives are inconsistent with the other criteria, the objectives are not likely to be achieved in the professional career of the graduate, even if all outcomes and program criteria were achieved at graduation.	Objectives are somewhat likely to be achieved in the professional career of the graduate if all outcomes and program criteria were achieved at graduation.	Objectives are very likely to be achieved in the professional career of the graduate if all outcomes and program criteria were achieved at graduation.
The focus of the objectives is on the portion of the professional career most affected by formal education, namely 3-5 years after graduation.	Focus of objectives is either too short (near graduation) or too long (near end of career).	Most objectives identify accomplishments that are appropriate for the 3-5 year time- frame.	All objectives identify accomplishments that are appropriate for the 3-5 year time-, frame.
Objectives identify what is unique about the program.	Objectives are so generic that they say nothing about the program.	Objectives give some idea of the nature of the program.	Objectives allow prospective students or employers the ability to make informed decisions regarding the program.
Objectives are published.	Objectives not widely published.	Objectives are published on the website and kept current whenever changes are made.	Current objectives are published on website and disseminated by a variety of means, so they are readily available to constituents.

**Appendix 2**  
**Proposed Rubrics for Process of Assessment and Evaluation of Program Educational Objectives**

<b>Rubric</b>	<b>Needs Improvement</b>	<b>Satisfies Requirements</b>	<b>Serves as a Model for Others</b>
Objectives are reviewed by constituents on a regular basis to insure that they remain relevant.	Objectives are not reviewed by constituents.	Objectives are reviewed in an ad hoc manner, or are only reviewed by a subset of the constituents.	Objectives are reviewed by all constituents often enough to note changing market conditions.
The objectives are measurable.	Objectives are so vague that they cannot be measured.	Objectives are specific enough to be measured, but no rubric is defined.	Objectives are specific enough to be measured, and a rubric has been defined.
Objectives are being measured on a regular basis to determine the degree to which they are being attained.	Objectives are not measured.	Objectives measured in an ad hoc manner. No formal plan for assessment.	A formal plan for assessment exists and is exercised on a regular basis.
Results from assessment of objectives are used for program improvement.	No program improvement is effected.	Program improvement takes place in an ad hoc manner.	The assessment data is analyzed to identify needed improvements. Actions identified for improvement are tracked until complete, and the impact of the change is assessed.