

**AC 2009-1838: ACCREDITATION OF ENGINEERING TECHNOLOGY
PROGRAMS**

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Accreditation of Engineering Technology Programs

Abstract

The Technology Accreditation Commission (TAC) of ABET, Inc. is proposing some major changes to the General Criteria for Accrediting Engineering Technology Programs. In particular Criterion 3, the criterion dealing with Program Outcomes, has been split into two parts, one that addresses baccalaureate degree programs and the other specific to associate degree programs. To further clarify the differentiated criteria for the two different types of programs, Criterion 5 dealing with curriculum, has also been modified. There have also been some modifications to the other criteria in an attempt to increase the commonality among the criteria for all four commissions of ABET as well to clarify the language in the overall criteria. This paper discusses the major changes in the TAC criteria and in particular, how TAC has attempted to make the criteria for associate degree programs a better fit to such programs.

Introduction

Several years ago the Accreditation Board for Engineering and Technology (ABET) started a process called harmonization in regard to the general criteria for accreditation. This was an attempt to get the four commissions of ABET, namely the Applied Science Accreditation Commission (ASAC), the Computing Accreditation Commission (CAC), the Engineering Accreditation Commission (EAC), and the Technology Accreditation Commission (TAC) to modify their respective general criteria to be similar in format. This was done to help institutions that had programs that were accredited by more than one commission with the accreditation process by having similar criteria among the four different commissions. In particular, of the eight general criteria, all but Criterion 3 dealing with Program Outcomes, and Criterion 5 dealing with Curriculum, were to be as similar as possible. While this process was taking place, TAC was also attempting to update the criteria for technology programs as the last major criteria changes were in the year 2000 with the introduction of the TCK 2000 criteria. This paper describes the some of the proposed changes to the TAC criteria and the rationale behind those changes.

It should be noted that the author has served on the Technology Accreditation Commission for five years and most recently completed his third year as an at-large member of the Executive Committee of TAC. He has also been serving on the Criteria Committee and as such, has been directly involved with the development of the revised criteria and has been an advocate for differentiated criteria for associate degree programs. While the specific criteria referenced in this paper are taken directly from the appropriate ABET documents, the opinions expressed by the author are his and his alone and are not the official opinions of either TAC or ABET.

Criterion 3 – Program Outcomes

The definition from the current 2008-2009 Criteria¹ used for program outcomes is as follows: “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.” The title of this definition has

been changed in the proposed criteria² to Student Outcomes and the definition has been changed to read: “Student outcomes 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 attain as they progress through the program.” The change from the term program outcomes to the term student outcomes was made to strengthen the concept that these outcomes are attributes that we want the students to achieve, not the program. These outcomes are well known as the a through k program attributes that visiting teams are looking for as demonstrated through assessment.

The use of the word “narrower” in the current criteria refers to the idea that the outcomes are narrower in scope than the program educational objectives that are currently defined as follows: “Program educational objectives are broad statements that describe the career and professional accomplishments that the program is preparing graduates to achieve.” This definition has also been modified such that the proposed definition now reads: “Program educational objectives are broad statements that describe what graduates are expected to attain within a few years of graduation. Program educational objectives are based on the needs of the program’s constituencies.” Note the addition of the sentence containing the term “the program’s constituencies” emphasizing that programs must include input from their constituencies in developing their program objectives.

In rewriting the program outcomes, now student outcomes, the TAC attempted to accomplish two major goals. The first was to bring the language more in line with the Sydney³ and Dublin³ Accords such that the resultant criteria would be more international in scope. The second goal was to provide a slightly different and less onerous set of required outcomes for two-year degree programs. Thus the total number of outcomes for four-year degree programs remains at eleven (a-k) but the number of outcomes for two-year degree programs has been reduced to nine (a-i). The major rationale for this reduction is that two-year degree programs obviously only have half as much time to prepare a graduate to achieve the required outcomes. It should be noted that differentiated criteria are not new to ABET as the ASAC already has two sets of outcomes, one for four-year graduates and one for two-year graduates. Further, the program specific criteria (Civil, Construction, Manufacturing, Mechanical, etc.) for technology programs have had differentiated criteria for two-year and four-year programs for many years. The differences between the existing Criterion 3 set of Program Outcomes and the proposed Program Outcomes for both four and two-year degrees are outlined below.

Current and Proposed Program Outcomes

The existing program outcomes are listed below with the proposed outcomes for baccalaureate and associate degree programs in columns immediately following each currently existing outcome. The current Criterion 3 lead-in to all of these outcomes states that “Each program must demonstrate that graduates have:”

The proposed lead-in for Criterion 3 would be “Each program must have documented student outcomes that prepare graduates to attain the program educational objectives. There must be a documented and effective process for the periodic review and revision of these student outcomes. For purposes of this section, broadly defined activities are those that involve a variety of resources, that involve the use of new processes, materials, or techniques in innovative ways, and

that require knowledge of standard operating procedures. Narrowly defined activities are those that involve limited resources, that involve the use of conventional processes and materials in new ways, and that require knowledge of basic operating processes.” For both baccalaureate and associate degree programs, the student outcomes must include, but are not limited to, the following learned capabilities (listed in their respective columns).

The outcomes are as follows:

- a. an appropriate mastery of the knowledge, techniques, skills, and modern tools of their disciplines

Proposed – Baccalaureate	Proposed - Associate
an ability to select and apply the knowledge, techniques, skills, and modern tools of their disciplines to broadly-defined engineering technology activities	an ability to apply the knowledge, techniques, skills, and modern tools of their disciplines to narrowly defined engineering technology activities

- b. an ability to apply current knowledge and adapt to emerging applications of mathematics, science, engineering, and technology

Proposed – Baccalaureate	Proposed - Associate
an ability to select and apply a knowledge of mathematics, science, engineering, and technology to engineering technology problems that require the application of principles and applied procedures or methodologies	an ability to apply a knowledge of mathematics, science, engineering, and technology to engineering technology problems that require limited application of principles but extensive practical knowledge

- c. an ability to conduct, analyze and interpret experiments, and apply experimental results to improve processes

Proposed – Baccalaureate	Proposed - Associate
an ability to conduct standard tests and measurements; to conduct, analyze, and interpret experiments; and to apply experimental results to improve processes	an ability to conduct standard tests and measurements, and to conduct, analyze, and interpret experiments

- d. an ability to apply creativity in the design of systems, components, or processes appropriate to program educational objectives

Proposed – Baccalaureate	Proposed - Associate
an ability to design systems, components, or	an ability to function effectively as a

processes for broadly-defined engineering technology problems appropriate to program educational objectives	member of a technical team
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- e. an ability to function effectively on teams

Proposed – Baccalaureate	Proposed - Associate
an ability to function effectively as a member or leader on a technical team	an ability to identify, analyze, and solve narrowly defined engineering technology problems,

- f. an ability to identify, analyze and solve technical problems

Proposed – Baccalaureate	Proposed - Associate
an ability to identify, analyze, and solve broadly-defined engineering technology problems	an ability to communicate effectively regarding narrowly defined engineering technology activities

- g. an ability to communicate effectively

Proposed – Baccalaureate	Proposed - Associate
an ability to communicate effectively regarding broadly-defined engineering technology activities	an understanding of the need for and an ability to engage in self-directed continuing professional development

- h. a recognition of the need for, and an ability to engage in lifelong learning

Proposed – Baccalaureate	Proposed - Associate
an understanding of the need for and an ability to engage in self-directed continuing professional development	an understanding of and a commitment to address professional and ethical responsibilities including a respect for diversity, and

- i. an ability to understand professional, ethical and social responsibilities

Proposed – Baccalaureate	Proposed - Associate
an understanding of and a commitment to address professional and ethical responsibilities including a respect for diversity	

- j. a respect for diversity and a knowledge of contemporary professional, societal and global issues

Proposed – Baccalaureate	Proposed - Associate
a knowledge of the impact of engineering technology solutions in a societal and global context, and	

k. a commitment to quality, timeliness, and continuous improvement

Proposed – Baccalaureate	Proposed - Associate
a commitment to quality, timeliness, and continuous improvement	a commitment to quality, timeliness, and continuous improvement

It can be seen that there are several distinct differences between the current outcomes and the proposed outcomes that go beyond just modifying and shortening the list of outcomes for associate degree programs. Firstly clarifying language has been added through the use of the terms “broadly defined activities” and “narrowly defined activities” to further differentiate between baccalaureate and associate degree programs. These modifiers also serve to match these outcomes more closely to the language of the Sydney and Dublin Accords.

Secondly, the criteria have been rewritten to have the outcomes more closely match the attributes that are expected of a competent engineering technologist or technician respectively. For example, item b presently states that “Each program must demonstrate that graduates have an ability to apply current knowledge and adapt to emerging applications of mathematics, science, engineering and technology”. This outcome has been modified to read that for baccalaureate degree programs “...student outcomes must include, but are not limited to, the following learned capabilities: an ability to select and apply a knowledge of mathematics, science, engineering, and technology to engineering technology problems that require the application of principles and applied procedures or methodologies.” The corresponding outcome for associate degree programs now reads “...an ability to apply a knowledge of mathematics, science, engineering, and technology to engineering technology problems that require limited application of principles but extensive practical knowledge.” It was felt that what we really want from our graduates is the ability to use math and science to solve engineering technology problems and not worry about adapting to emerging applications in these fields. Note also that the proposed criterion refers to the a-k or the a-i outcomes as learned capabilities meaning that we want our students to have attained these attributes as a result of having gone through their particular program.

Thirdly, we have also attempted to more closely match what is appropriate for a graduate from an engineering technology program by modifying the criterion which dealt with lifelong learning by replacing this term with continuing professional development. Again it should be noted that the title of Criterion 3 has been changed from Program Outcomes to Student Outcomes to more appropriately reflect that these outcomes apply to our students, not to the program.

Criterion 5 – Curriculum

To match up with the changes that were made in the outcomes criterion, in particular to differentiate between two and four-year degree programs, there were also several changes that were made in Criterion 5 dealing with curriculum. The current criterion requires that associate degree programs cover algebra and trigonometry and include an introduction to mathematics about the level of algebra and trigonometry. For an associate degree program, the proposed criterion requires only algebra and trigonometry at a level appropriate to the program educational objectives. This criterion has also been changed for baccalaureate degree programs as described below. In both cases, the other important change is that the math required by a program be appropriate to the program educational objectives.

The other major change in the area of curriculum was in the requirement for a capstone course. While the current criterion requires a capstone or other integrating experiences for both associate and baccalaureate degree programs, it was felt that this was too difficult a requirement for an associate degree program to meet. Therefore this requirement was made optional for two-year degree programs. These changes are shown below for each of these two areas. The current program requirements are listed in standard type while the proposed requirements for both baccalaureate and associate degree programs are in italics.

Mathematics The level and focus of the mathematics content must provide students with the skills to solve technical problems appropriate to the discipline and the program educational objectives. Algebra, trigonometry, and an introduction to mathematics above the level of algebra and trigonometry constitute the foundation mathematics for an associate degree program. Integral and differential calculus, or other appropriate mathematics above the level of algebra and trigonometry, constitutes the foundation mathematics for baccalaureate programs.

Mathematics Associate degree programs will at a minimum include algebra and trigonometry at a level appropriate to the program educational objectives. Baccalaureate degree programs will include mathematics above the level of algebra and trigonometry; the minimum level of mathematics will be integral and differential calculus or another mathematics that is appropriate to the program educational objectives.

Technical Content The technical content of a program must focus on the applied aspects of science and engineering in that portion of the technological spectrum closest to product improvement, manufacturing, construction, and engineering operational functions. The technical content must develop the skills, knowledge, methods, procedures, and techniques associated with the technical discipline and appropriate to the goals of the program.

- d. Capstone or other integrating experiences must draw together diverse elements of the curriculum and develop student competence in focusing both technical and non-technical skills in solving problems.

Technical Content The technical content must develop the skills and knowledge appropriate to the educational objectives of the program and must represent at least 1/3 of the total credit hours for the program but no more than 2/3 the total credit hours for the program.

- d. *Capstone or other integrating experiences that draw together diverse elements of the curriculum and develop student competence in focusing both technical and non-technical*

skills in solving problems are required in baccalaureate programs but are optional for associate degree programs.

Some other minor changes in other areas of the general criteria are also being proposed. For example, Criterion 6, Faculty, in the current criteria states that “The program must have an effective professional development plan for its faculty.” This has frequently been interpreted to mean that there must be a formal written faculty development plan. This requirement has been modified to say “The program must demonstrate that the faculty is engaged in professional development activities that support the field of instruction and the program educational objectives.” It was felt that the important thing with respect to this criterion is that the faculty are engaged in professional development, not that a written plan exists.

Conclusion

This paper has attempted to describe some of the major changes that are being proposed to the TAC criteria, in particular to provide differentiated criteria for associate degree programs that are separate from the criteria for baccalaureate degree programs. These proposed changes were approved by the Technology Accreditation Commission (TAC) and were brought before the ABET Board of Directors on November 1, 2008 for preliminary approval. Before being approved for final implementation in the accreditation process, these proposals have been published on the ABET website (www.abet.org) for circulation among the institutions with accredited programs and other interested parties for review and comment.

The ABET Board of Directors has approved a two-year first reading review and comment period for the proposed TAC Criteria. Comments will be considered until April 1, 2010. The ABET Board of Directors will determine, based on the comments received and on the advice of the TAC, the content of the adopted harmonized criteria in the fall of 2010 and if approved will first be applied for accreditation actions during the 2011-2012 academic year. Suggestions related to the proposed criteria should be addressed to: Accreditation Director, ABET, Inc., 111 Market Place, Suite 1050, Baltimore, MD 21202-4012 or to accreditation@abet.org. Readers may also send comment or suggestions directly to the author at whill@weber.edu.

Bibliography

1. Technology Accreditation Board of ABET, Inc., *2008-2009 Criteria for Accrediting Engineering Technology Programs*, Incorporates all changes approved by the ABET Board of Directors as of November 3, 2007
2. Technology Accreditation Board of ABET, Inc., *2009-2010 Criteria for Accrediting Engineering Technology Programs – Proposed Changes*, Incorporates all changes approved by the ABET Board of Directors as of November 1, 2008
3. Engineers Mobility Forum, *Graduate Attributes and Professional Competencies*, Ver 1.1-13, June 2005