COMPARISON OF TODAY’S EAC/ABET ENGINEERING DEGREE CRITERIA TO FUTURE CAPABILITIES RECOMMENDED IN NSPE’S ENGINEERING BODY OF KNOWLEDGE

Prepared for ASCE’s Task Committee on Educational Requirements for Licensure

Stuart G. Walesh, PhD, PE

April 1, 2015

EXECUTIVE SUMMARY

The two purposes of this white paper are 1) to compare today’s EAC/ABET baccalaureate degree engineering criteria to the professional practice capabilities recommended in NSPE’s future-oriented Engineering Body of Knowledge (EBOK) and 2) to offer observations and draw conclusions based on the comparison. The comparison reveals that, while essentially all of the ABET criteria contribute to the EBOK, and in that sense ABET criteria and the EBOK are aligned, one-half of the EBOK capabilities are not supported by ABET criteria.

Closing the preceding “gap” could require a combination of:

- Further improvements to and/or lengthening of engineering baccalaureate programs
- More focused and systematic Engineer Intern experiences
- Addition of more post-baccalaureate formal education

The last of the three is necessary because many of the capabilities not supported by ABET criteria do not lend themselves to only effective on-the-job teaching and learning. Going forward, the formal educational requirements for licensure must be expanded and coordinated with a strengthened Engineer Intern experience.
INTRODUCTION

Purpose

The first of the two purposes of this white paper is to compare today’s EAC/ABET baccalaureate degree engineering criteria, which are minimums and apply to all engineering disciplines, to the professional practice capabilities recommended in NSPE’s future-oriented Engineering Body of Knowledge (EBOK), which are also applicable to all engineering disciplines. The second purpose is to offer observations and draw conclusions based on the comparison.

Consistent with that purpose and the capabilities focus of the EBOK, of the eight EAC/ABET General Criteria, the most relevant ones are General Criterion 3, Student Outcomes, and Criterion 5, Curriculum, with the two of them hereinafter referred to as Criteria 3/5. While Criterion 3 has the most relevant content (the 11 outcomes), Criterion 5 is applicable to this comparison project because it calls for “a general education component that complements the technical content of the curriculum and is consistent with the program and institution objectives.”

For ease of reference, Criteria 3 and 5 are included as Appendices A and B. Sources of the preceding quotes and the two appendices are ABET’s Criteria for Accrediting Engineering Programs Effective for Reviews During the 2015 – 2016 Accreditation Cycle. (see http://www.abet.org/eac-criteria-2015-2016/)

The EBOK is defined as “the necessary depth and breadth of knowledge, skills, and attitudes required of an individual to enter practice as a professional engineer [licensed] in responsible charge of engineering activities that potentially impact public health, safety, and welfare.” The source of this definition and all references in this white paper to the EBOK is Engineering Body of Knowledge – First Edition which was published by NSPE in late 2013. (see http://www.nspe.org/sites/default/files/resources/nspe-body-of-knowledge.pdf)

Major Fundamental Differences Between Criteria 3/5 and the EBOK

Note that, while this white paper seeks to compare Criteria 3/5 to the EBOK, they are different in many ways including two that are fundamental. First, Criteria 3/5 apply to and set minimum expectations for today’s baccalaureate degree. In contrast, the EBOK applies to a later point in an engineer’s career, that is, entry into professional practice, and is aspirational. As stated in the EBOK report, “Given the uniqueness of this effort, including its future orientation and its intent to encompass all engineering disciplines, this report should be viewed as an aspirational and living document.”

This first fundamental difference is illustrated in Figure 1. Comparing Criteria 3/5 to the EBOK is like comparing apples to oranges. The comparison is difficult but possible and, as shown in this white paper, yields some useful insights.
**Figure 1.** Criteria 3/5 and the EBOK are fundamentally different with respect to their timing of their roles in an engineer’s early career.

The second major difference between Criteria 3/5 and the EBOK is that the former is mandatory and the latter is not. Engineering baccalaureate programs that want to obtain/retain ABET accreditation must satisfy Criteria 3/5, as well as other criteria. In contrast, the overriding intent of the EBOK is to encourage various engineering profession stakeholders (10 categories of stakeholders are cited in Chapter 2 of the EBOK Report) to use the EBOK to think about where they are and where they may want to go.

**Audience**

This white paper assumes that the reader is very knowledgeable about licensure and may have served or is serving on a licensing board. It also assumes that the reader is generally well informed about the body of knowledge movement, over the past decade or so, within some engineering disciplines.

**NSPE’S ENGINEERING BODY OF KNOWLEDGE**

Let’s look further at the EBOK because it is much newer than Criteria 3 or 5 or earlier versions of them. The knowledge, skills, and attitudes mentioned in the Purpose section of this white paper are referred to in the EBOK as capabilities. “A capability is defined as what an
individual is expected to know and be able to do by the time of entry into professional practice in a responsible role. A given capability typically consists of many diverse and specific abilities.”

“Each capability is usually acquired through a combination of engineering education and experience.” NSPE does “not attempt to tease apart what aspects or parts of the capabilities are fulfilled through education or experience because these means may vary significantly across disciplines and in varying employment circumstances…The capabilities are broadly defined and will have differing priorities in various engineering disciplines and in different employment situations. For each capability, several abilities are presented as examples; and are precisely that - examples. The specific abilities required in each engineering job, and in each discipline, will vary significantly.” The names of 30 capabilities comprising the EBOK are listed here and organized for clarity in three categories, namely, Basic or Foundational, Technical, and Professional Practice.

**Basic or Foundational Capabilities:**
1. Mathematics
2. Natural Sciences
3. Humanities and Social Sciences

**Technical Capabilities:**
4. Manufacturing/Construction
5. Design
6. Engineering Economics
7. Engineering Science
8. Engineering Tools
9. Experiments
10. Problem Recognition and Solving
11. Quality Control and Quality Assurance
12. Risk, Reliability, and Uncertainty
13. Safety
14. Societal Impact
15. Systems Engineering
16. Operations and Maintenance
17. Sustainability and Environmental Impact
18. Technical Breadth
19. Technical Depth

**Professional Practice Capabilities:**
20. Business Aspects of Engineering
21. Communication
22. Ethical Responsibility
23. Global Knowledge and Awareness
24. Leadership
25. Legal Aspects of Engineering
26. Lifelong Learning
To reiterate, the names are just that, they do not describe the capabilities. For descriptions of the 30 capabilities refer to Appendix D in the EBOK report. The description of each capability includes examples of supporting abilities which are presented in the Bloom Taxonomy format. An example of a capability description (Capability 5: Design) is included as Appendix C of this white paper to illustrate the format and content.

The EBOK is designed to apply across the engineering profession. However, each engineering discipline and employment situation combination is likely to focus on an appropriate subset of the capabilities. Furthermore, for a given capability, each engineering discipline - employment situation combination will be inclined to select or emphasize only some of the example abilities and/or articulate some of their own. Preparing a profession-wide BOK for a profession as diverse as engineering is challenging and worthwhile.

COMPARISON OF CRITERIA 3/5 TO THE EBOK

As stated in the Purpose section of this white paper the first of its two purposes is to compare today’s EAC/ABET baccalaureate degree engineering criteria to the professional practice capabilities recommended in NSPE’s future-oriented EBOK. This comparison is presented using a tabular format in Appendix D.

Column 1, with the shorthand name Target, lists the 30 EBOK capabilities. It is called Target because, as illustrated in Figure 1, it lists the capabilities needed to “practice as a professional engineer [licensed] in responsible charge of engineering activities that potentially impact public health, safety, and welfare.” It is the end point, in time, for purposes of this white paper. Column 2 uses various parts of ABET’s Criteria 3/5 to indicate how Criteria 3/5 contribute to the Target.

Because of all the differences between the EBOK and Criteria 3/5, this is the only meaningful way to compare them. That is, recognize their different places on the early career timeline and determine how the earliest of the two (Criteria 3/5) supports the latest of the two (EBOK). Then any gaps between the two would, assuming acceptance of the EBOK, have to be filled with different or more formal education and/or an enhanced Engineer Intern experience.

Column 2 includes, for some capabilities, the statement NOT SUPPORTED BY CURRENT ABET CRITERIA. This indicates that the EBOK capability listed in Column 1 is not supported by any of the Criteria 3/5.
Constructing the table required many judgments as indicated by Column 3 entries. The process of developing the table was hindered by ABET not providing more detailed descriptions of Criteria 3/5. Absent such descriptions, I had to try to determine what was meant by the minimal ABET text. For example, ABET 3(f), professional and ethical responsibility, has many interpretations. Obviously it contributes to EBOK 22, Ethical Responsibility, but does it support EBOK 27, Professional Attitudes? I decided that it did not. Similarly, ABET’s 3(j), a knowledge of contemporary issues, would require a major a leap of faith to credit it as contributing to EBOK 29, Public Policy and Engineering. Again, I decided it did not. Finally, ABET’s use of vague terms such as “an ability to,” “a recognition of,” and “a knowledge of” caused unnecessarily complicated interpretations.

As an example of problematic ambiguity within Criteria 3/5, consider Criterion 3(c). It states that students are expected to acquire “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.” However, the phrase “such as” in the criterion provides programs with the flexibility of selectively choosing one or more of the eight constraints. As such Criterion 3(c) does not require that any program specifically include any of eight.

**OBSERVATIONS AND CONCLUSIONS BASED ON THE COMPARISON**

The second of this white paper’s two purposes is to offer observations and draw conclusions based on the comparison. Appendix D supports the following observations:

1) Every Criteria 3/5, with one exception, was used at least once, that is, essentially all ABET criteria contribute to the EBOK. The exception is 3(j), a knowledge of contemporary issues. In this sense, Criteria 3/5 and EBOK are aligned.

2) ABET Criteria 3/5 do not contribute to acquiring the following 16 of the 30 EBOK capabilities:

- 4. Manufacturing/Construction
- 6. Engineering Economics
- 11. Quality Control and Quality Assurance
- 12. Risk, Reliability, and Uncertainty
- 13. Safety
- 15. Systems Engineering
- 16. Operations and Maintenance
- 17. Sustainability and Environmental Impact
- 18. Technical Breadth
- 19. Technical Depth
- 20. Business Aspects of Engineering
- 24. Leadership
3) If we define the “gap” as the fraction of the 30 EBOK capabilities not supported by ABET Criteria 3/5. Then the “gap” is one half. That is, just over one-half of the EBOK capabilities are not supported by the minimums set forth in the current ABET criteria.

CAVEATS CONCERNING THE OBSERVATIONS AND CONCLUSIONS

The preceding observations and conclusions are based on the comparison of today’s EAC/ABET baccalaureate degree engineering criteria, which are minimums and apply to all engineering disciplines, to the professional practice capabilities recommended in NSPE’s future-oriented EBOK which are aspirational and also intended to apply to all engineering disciplines. Given the “minimums” and “aspirational” distinctions, consider the following factors when interpreting the observations and conclusions:

1) Some engineering disciplines use their Program Criteria to systematically prepare their graduates to acquire more of the EBOK capabilities. For example, Criteria 3/5 do not support EBOK Capability 19, Technical Depth. However, a discipline could use its Program Criteria to define its technical depth. (Note: This is the only place in this document that refers to Program Criteria. All other references to ABET criteria refer to EAC/ABET General Criteria 3 and 5 as defined in the Purpose section.)

2) ABET minimums aside, some baccalaureate degree engineering programs go above the accreditation standard or might choose to do so. They may be inspired by their discipline’s BOK or the EBOK or be motivated in other ways.

3) Consider the formal education effort and/or the Engineer Intern effort required to teach and learn various capabilities. It is highly variable. Based on my teaching and practice experience, the fundamentals of EBOK Capability 28, Project Management, which is not supported by ABET criteria, can be taught and learned as a small part of an undergraduate course and then reinforced during experience. In contrast, EBOK Capability 18, Technical Breadth, which is also not supported by the current ABET criteria, would require a major undergraduate effort to lay the foundation.

4) The fact that an EBOK capability is not supported by Criteria 3/5 does not necessarily mean that a graduate of a baccalaureate degree engineering program operating in the minimums mode is destined to miss acquiring that capability. His or her four-year Engineer Intern experience could provide the means to develop the missed capability. For example, a fortunate intern might acquire EBOK Capabilities 13, Safety, or 20, Business Aspects of Engineering, by participating
in in-house and/or external education and training programs and other professional development activities. This idea is included in the next section of this white paper.

CLOSING THE GAP

Assume acceptance of the EBOK as the description of the future “necessary depth and breadth of knowledge, skills, and attitudes required of an individual to enter practice as a professional engineer [licensed] in responsible charge of engineering activities that potentially impact public health, safety, and welfare.” Then current engineering students in accredited programs, based on the minimum requirements for those programs, are not being exposed to one half of the EBOK’s 30 capabilities.

How could the engineering profession close the “gap”? I do not know the detailed answer, but it could be a combination of:

- Further improvements to and/or lengthening of engineering baccalaureate programs
- More focused and systematic Engineer Intern experiences
- Addition of more post-baccalaureate formal education

Some will say that, whatever is needed to close the “gap,” it does not need to include more formal education. For example, the Engineer Intern experience will be the bridge from the baccalaureate degree to all of the missing EBOK capabilities. While, as noted in Caveat 4, some capabilities can be acquired by participating in-house and/or external education and training programs and other professional development activities, experience is not the gap-closing panacea.

Many of the capabilities in the “gap” need course work. That course work may be provided or received in traditional classrooms or via distance learning followed by strengthening during the Engineer Intern period. Examples of these capabilities are Engineering Economics; Risk, Reliability and Uncertainty; Systems Engineering; Sustainability and Environmental Impact; Leadership; and Project Management. Topics like these do not lend themselves to only effective on-the-job teaching and learning.

Going forward, the formal educational requirements for licensure must be expanded and coordinated with a strengthened Engineer Intern experience.
APPENDIX A

EAC/ABET GENERAL CRITERION 3: STUDENT OUTCOMES

The program must have documented student outcomes that prepare graduates to attain the program educational objectives. Student outcomes are outcomes (a) through (k) plus any additional outcomes that may be articulated by the program.

(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.
EAC/ABET GENERAL CRITERION 5: CURRICULUM

The curriculum requirements specify subject areas appropriate to engineering but do not prescribe specific courses. The faculty must ensure that the program curriculum devotes adequate attention and time to each component, consistent with the outcomes and objectives of the program and institution. The professional component must include:

(a) one year of a combination of college level mathematics and basic sciences (some with experimental experience) appropriate to the discipline. Basic sciences are defined as biological, chemical, and physical sciences.

(b) one and one-half years of engineering topics, consisting of engineering sciences and engineering design appropriate to the student's field of study. The engineering sciences have their roots in mathematics and basic sciences but carry knowledge further toward creative application. These studies provide a bridge between mathematics and basic sciences on the one hand and engineering practice on the other. Engineering design is the process of devising a system, component, or process to meet desired needs. It is a decision-making process (often iterative), in which the basic sciences, mathematics, and the engineering sciences are applied to convert resources optimally to meet these stated needs.

(c) a general education component that complements the technical content of the curriculum and is consistent with the program and institution objectives.

Students must be prepared for engineering practice through a curriculum culminating in a major design experience based on the knowledge and skills acquired in earlier course work and incorporating appropriate engineering standards and multiple realistic constraints.

One year is the lesser of 32 semester hours (or equivalent) or one-fourth of the total credits required for graduation.
APPENDIX C

EXAMPLE DESCRIPTION OF AN EBOK CAPABILITY: 5. DESIGN

5. Design

Description

Design, whether used as a verb to represent a process or interpreted as a noun to refer to the result of the process, is a core capability in engineering. As a process, design may be defined as fulfilling client, owner, or customer needs while also satisfying established regulations and codes and meeting the standard of care. Design is the means by which ideas become reality. The design process -- the root of engineering -- begins with defining the problem and project requirements and is followed by collecting relevant data and information; logical thinking; applying scientific principles; developing alternatives; considering socioeconomic and environmental effects; assessing risk, reliability, operability, and operational safety; specifying quality assurance provisions; using judgment in all aspects; and formulating a plan of action. The final step in the design process is communicating the results in a manner that enables implementation through manufacturing, construction, or some other means.

Engineering design is the process of devising a system, component, or process to meet desired needs. It is a decision-making process, often iterative, in which the basic sciences, mathematics and the engineering sciences are applied to convert resources optimally to meet these stated needs. The design process incorporates engineering standards and multiple realistic constraints.

While the design process typically relies heavily on proven means and methods, it may include innovative approaches. The goal of design is quality, that is, meeting all requirements such as meeting functional needs and staying within a budget. The ultimate result of the design process -- the fruit that grows from the root -- is an optimal solution consisting of a structure, facility, system, product, or process. More specifically, design leads to highly varied results such as automobiles, airports, chemical processes, computers and other electronic devices, nuclear power plants, prosthetic devices, skyscrapers, ships, and spacecraft.

Example Abilities

As examples of design capability, an engineer entering practice at the professional level should be able to:

- Identify, or work collaboratively to identify, the pertinent technical, environmental, economic, regulatory, and other project requirements and constraints;
• Gather information needed to fully understand the problem to be solved and to form the basis for the evaluation of alternatives and design;

• Contribute to the development of alternatives and prepare design details for complex projects;

• Analyze the pros and cons of some alternative design options and assist in the selection of an optimized design alternative;

• Analyze the constructability or manufacturing feasibility of a project or product;

• Design a basic facility, structure, system, product, or process to meet well-defined requirements; and

• Apply lessons learned from other design projects.
## APPENDIX D

### CRITERIA 3 & 5 CONTRIBUTIONS TO THE EBOK CAPABILITIES

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1</strong>&lt;br&gt;Target: The EBOK’s aspirational capabilities required to enter practice as a professional engineer&lt;br&gt;(i)</td>
<td><strong>2</strong>&lt;br&gt;Contributions by ABET’s Criteria 3/5&lt;br&gt;(ii)</td>
<td><strong>3</strong>&lt;br&gt;Comments</td>
</tr>
</tbody>
</table>

### Basic or Foundational

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1. Mathematics</strong></td>
<td>Criterion 3(a): an ability to apply knowledge of mathematics, science, and engineering</td>
<td></td>
</tr>
<tr>
<td><strong>2. Natural Sciences</strong></td>
<td>Criterion 3(a): an ability to apply knowledge of mathematics, science, and engineering</td>
<td></td>
</tr>
<tr>
<td><strong>3. Humanities and Social Sciences</strong></td>
<td>Criterion 5, General Education (iii)</td>
<td>Caveat: This assumes that students are expected to make wise use of their limited general education opportunities.</td>
</tr>
</tbody>
</table>

### Technical

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>4. Manufacturing/Construction</strong></td>
<td><strong>NOT SUPPORTED BY THE CURRENT ABET CRITERIA</strong></td>
<td>See footnote iv</td>
</tr>
<tr>
<td></td>
<td>Target: The EBOK's aspirational capabilities required to enter practice as a professional engineer (i)</td>
<td>Contributions by ABET's Criteria 3/5 (ii)</td>
</tr>
<tr>
<td>---</td>
<td>-------------------------------------------------------------------------------------------------</td>
<td>---------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>5.</td>
<td>Design</td>
<td>Criterion 3(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</td>
</tr>
<tr>
<td>6.</td>
<td>Engineering Economics</td>
<td>NOT SUPPORTED BY THE CURRENT ABET CRITERIA</td>
</tr>
<tr>
<td>7.</td>
<td>Engineering Science</td>
<td>Criterion 3(a): an ability to apply knowledge of mathematics, science, and engineering</td>
</tr>
<tr>
<td>8.</td>
<td>Engineering Tools</td>
<td>Criterion 3(k): an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice</td>
</tr>
<tr>
<td>9.</td>
<td>Experiments</td>
<td>Criterion 3(b): an ability to design and conduct experiments, as well as to analyze and interpret data</td>
</tr>
<tr>
<td>10.</td>
<td>Problem Recognition and Solving</td>
<td>Criterion 3(e): an ability to identify, formulate, and solve engineering problems</td>
</tr>
<tr>
<td>11.</td>
<td>Quality Control and Quality Assurance</td>
<td>NOT SUPPORTED BY THE CURRENT ABET CRITERIA</td>
</tr>
<tr>
<td>12.</td>
<td>Risk, Reliability, and Uncertainty</td>
<td>NOT SUPPORTED BY THE CURRENT ABET CRITERIA</td>
</tr>
<tr>
<td>13.</td>
<td>Safety</td>
<td>NOT SUPPORTED BY THE CURRENT ABET CRITERIA</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>---</td>
<td>------------------------------------------------------------------</td>
<td>------------------------------------------------------------------</td>
</tr>
<tr>
<td></td>
<td><strong>Target:</strong> The EBOK's aspirational capabilities required to enter practice as a professional engineer (i)</td>
<td><strong>Contributions by ABET's Criteria 3/5 (ii)</strong></td>
</tr>
<tr>
<td>14</td>
<td>Societal Impact</td>
<td>Criterion 3(h): the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and <em>societal</em> context</td>
</tr>
<tr>
<td>15</td>
<td>Systems Engineering</td>
<td><strong>NOT SUPPORTED BY THE CURRENT ABET CRITERIA</strong></td>
</tr>
<tr>
<td>16</td>
<td>Operations and Maintenance</td>
<td><strong>NOT SUPPORTED BY THE CURRENT ABET CRITERIA</strong></td>
</tr>
<tr>
<td>17</td>
<td>Sustainability and Environmental Impact</td>
<td><strong>NOT SUPPORTED BY THE CURRENT ABET CRITERIA</strong></td>
</tr>
<tr>
<td>18</td>
<td>Technical Breadth</td>
<td><strong>NOT SUPPORTED BY THE CURRENT ABET CRITERIA</strong></td>
</tr>
<tr>
<td>19</td>
<td>Technical Depth</td>
<td><strong>NOT SUPPORTED BY THE CURRENT ABET CRITERIA</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Professional Practice</strong></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>Business Aspects of Engineering</td>
<td><strong>NOT SUPPORTED BY THE CURRENT ABET CRITERIA</strong></td>
</tr>
<tr>
<td>22</td>
<td>Ethical Responsibility</td>
<td>Criterion 3(f): an understanding of professional and ethical responsibility</td>
</tr>
<tr>
<td></td>
<td>Target: The EBOK's aspirational capabilities required to enter practice as a professional engineer (i)</td>
<td>Contributions by ABET's Criteria 3/5 (ii)</td>
</tr>
<tr>
<td>---</td>
<td>--------------------------------------------------------------------------------------------------</td>
<td>-----------------------------------------------</td>
</tr>
<tr>
<td>23.</td>
<td>Global Knowledge and Awareness</td>
<td>Criterion 3(h): the broad education necessary to understand the impact of engineering solutions in a <strong>global</strong>, economic, environmental, and societal context</td>
</tr>
<tr>
<td>24.</td>
<td>Leadership</td>
<td><strong>NOT SUPPORTED BY THE CURRENT ABET CRITERIA</strong></td>
</tr>
<tr>
<td>25.</td>
<td>Legal Aspects of Engineering</td>
<td><strong>NOT SUPPORTED BY THE CURRENT ABET CRITERIA</strong></td>
</tr>
<tr>
<td>26.</td>
<td>Lifelong Learning</td>
<td>Criterion 3(i): a recognition of the need for and ability to engage in lifelong learning</td>
</tr>
<tr>
<td>27.</td>
<td>Professional Attitudes</td>
<td><strong>NOT SUPPORTED BY THE CURRENT ABET CRITERIA</strong></td>
</tr>
<tr>
<td>28.</td>
<td>Project Management</td>
<td><strong>NOT SUPPORTED BY THE CURRENT ABET CRITERIA</strong></td>
</tr>
<tr>
<td>29.</td>
<td>Public Policy and Engineering</td>
<td><strong>NOT SUPPORTED BY THE CURRENT ABET CRITERIA</strong></td>
</tr>
<tr>
<td>30.</td>
<td>Teamwork</td>
<td>Criterion 3(d): an ability to function on multidisciplinary teams</td>
</tr>
</tbody>
</table>
Footnotes:

i) These are just the names of the capabilities. For descriptions of the 30 capabilities refer to Appendix D in the EBOK report.

ii) This column includes complete statements from the EAC/ABET General Criterion 3: Student Outcomes.

iii) The relevant part of Criterion 5 is Part c which specifies "a general education component."

iv) Criterion 3(c) states that students are expected to acquire “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.” However, the phrase “such as” in the criterion provides programs with the flexibility of selectively choosing one or more of the eight constraints. As such Criterion 3(c) does not require that any program specifically include manufacturability, safety, and/or sustainability.

v) Criterion 3(h), which is "the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context" is not sufficient to support the sustainability aspect of EBOK Capability 17.

vi) Criterion 3(k), which is "an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice" is not sufficient to support EBOK Capability 19.