# 2006-110: PROGRESS ON RAISING THE BAR – CURRENT PROGRESS AND ANTICIPATED NEXT STEPS

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# ASCE's "Raise the Bar Effort"—
# Current Progress and Anticipated Next Steps

## Abstract

In October 2001, American Society of Civil Engineers (ASCE) approved Policy Statement 465 entitled "Academic Prerequisites for Licensure and Professional Practice." The underlying purpose of ASCE Policy Statement 465 is to prepare the civil engineering professional of the future. The Committee on Academic Prerequisites for Professional Practice (CAP^3) has been working to implement the policy for the past four years. The purpose of this paper is to describe the progress over the last year and the next steps for the implementation of Policy Statement 465.

## Introduction

In October 2001, the American Society of Civil Engineers (ASCE) Board of Direction unanimously approved Policy Statement 465, entitled "Academic Prerequisites for Licensure and Professional Practice." In October 2004, the policy was revised. This revised policy supports "the attainment of the Body of Knowledge (BOK) for the entry into the practice of civil engineering at the professional level." Undergirding this policy is the belief that the BOK necessary to enter the practice of civil engineering at the professional level in the future will be beyond the scope of a traditional 4-year bachelor's degree and required practical experience. While ASCE recognizes that implementation of Policy Statement 465 will not occur overnight, this policy has the potential to transform the practice of civil engineering, and positively influence the safety, quality, efficiency, and sustainability of the built environment in the 21st Century. The purpose of this paper is to describe the progress over the last year and the next steps for the implementation of Policy Statement 465.

## Background

The last four years have seen major progress in ASCE's "Raise the Bar" initiative, from the creation of a Civil Engineering Body of Knowledge (BOK), to a sea change in the reaction towards this initiative. The CAP ^3 Body of Knowledge committee formulated and published the first edition of the *Civil Engineering Body of Knowledge for the 21st Century* in early 2004. The definition of BOK is shown in Figure 1. This effort moved the focus of ASCE's initiative from one principally referencing degrees to a new focus on the requisite areas of knowledge necessary for the professional practice of engineering in the future.

Figure 1.-Definition of Body of Knowledge

The overarching goal of CAP^3 is to develop, organize, and implement ASCE's "Raise the Bar" initiative. To accomplish this multi-phased objective, CAP^3 has spread its efforts over several fronts including curricula, accreditation, licensure, BOK fulfillment and validation, levels of achievement, and refinement of the Body of Knowledge. Efforts in each of these fronts were carried out by a constituent committee. The organizational structure (Figure 2) for CAP^3 is as follows:
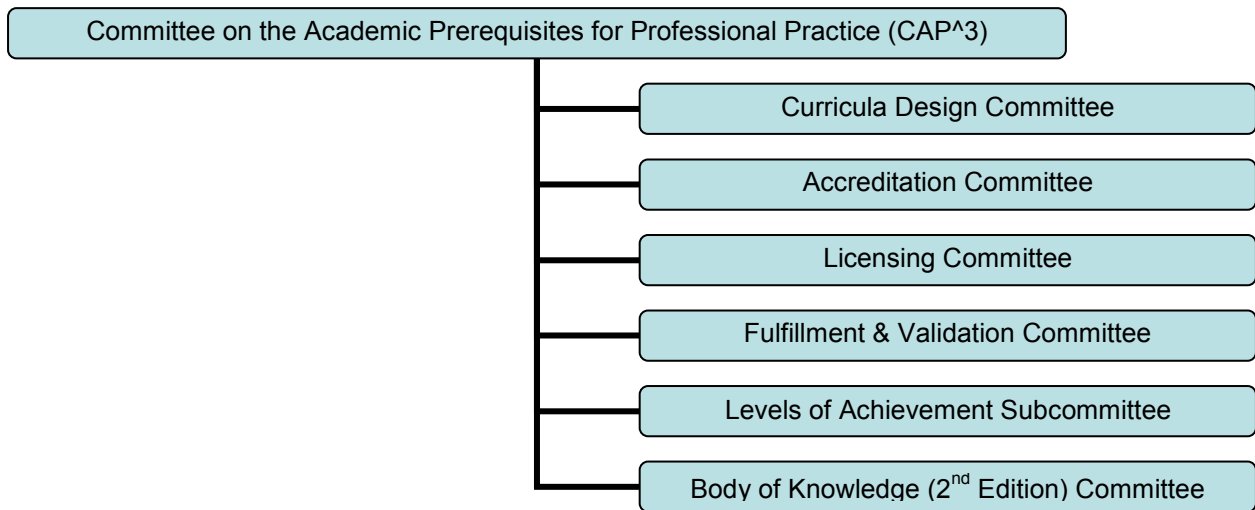


Figure 2.-Organizational Structure of CAP^3

Meetings of CAP^3 and its constituent committees are listed in Appendix B. There were 9 face-to-face meetings and 93 conference calls during Fiscal Year 2005. Through these engagements, the overall efforts and accomplishments of the committees in Fiscal Year 2005 were as follows:

The **Curricula Design Committee** has been working in earnest for the past two years. The Curriculum Committee is evaluating the BOK, mapping the BOK against the curricula of 25 participating undergraduate programs, and making suggestions on inconsistencies and how to improve the BOK. The Curriculum Committee regularly corresponds with a wide group of stakeholders, and is leading the charge to engage CEE faculty and administrators.

The **Accreditation Committee** has been formulating revised civil engineering program criteria, in concert with the ASCE accreditation community, for submission to the Engineering Accreditation Commission of ABET, Inc. The goal of this endeavor is to incorporate primary elements of the BOK into civil engineering curricula via the basic level civil engineering program criteria and the advanced level general criteria. In general, flexibility is being sought to allow universities to efficiently obtain accreditation of both undergraduate and graduate programs of the same engineering discipline. Such flexibility does not exist within current interpretations of ABET policies.

The **Licensure Committee** has continued to provide input to CAP^3 and to each of its committees from a licensure perspective. The Licensure Committee has closely monitored the activities of National Council of Examiners for Engineering and Surveying (NCEES) regarding proposed modifications to the Model Law. Additionally, the Licensure Committee continues to seek and identify states that may wish to consider early implementation of additional engineering education requirements as a prerequisite for licensure.

The **BOK Fulfillment and Validation Committee** began work in the fall of 2004 on two fronts. They explored concepts to allow alternative education providers other than universities to provide credible post-graduate engineering education. To become viable, such alternative education channels must be equivalent in academic rigor and individual performance assessment to upper level undergraduate and graduate level education at traditional universities. This committee also addressed how to assure that the requisite BOK is fulfilled through a combination of a bachelor's degree and approximately 30 credits of courses in technical and professional practice topics. The committee was "sunset" on May 1, 2005.

The **Levels of Achievement Subcommittee** was formed as a result of input from the Curricula Design committee. The proposed 3 levels of competence (recognition, understanding, and ability) were difficult to apply in mapping the Body of Knowledge into existing curriculum. Thus, a subcommittee was formed to address this issue. The subcommittee completed their work in September 2005.

The **Second Edition of the Body of Knowledge Committee** was formed at the end of 2005 to develop the second edition of the ASCE BOK. Since the publication of the original BOK document in February 2004, there have been many papers written, talks presented and discussions held on the BOK. The purpose of the new BOK-2 committee is to review all that has transpired and to update the BOK as necessary to reflect the new information. The expected date of completion of this effort is February 2007.

The remainder of the paper will address at greater length the efforts and accomplishments of the Curricula, Accreditation, BOK Fulfillment and Validation, Levels of Achievement, and Second Edition of the Body of Knowledge Committees. Committee members are listed in the <u>Appendix A</u>.

**Curricula Design Committee**

The **Curricula Design Committee** has been working in earnest for the past year. The Curriculum committee's primary activities have been evaluating the BOK, mapping the BOK against the curricula of 25 participating undergraduate programs, drafting curricula on paper that would fulfill the BOK, and making suggestions on how to improve the BOK. The Curriculum Committee regularly corresponds with a wide group of stakeholders and is leading the effort to incorporate the BOK into the formal academic process (as applicable).

*Activities and Accomplishments*

- The committee conducted conference calls approximately every two weeks for the past year. The third face-to-face meeting of the committee was held on June 11, 2005 in Portland, Oregon.

- The committee formed a group of correspondents comprised of civil engineers and others interested in ASCE Policy Statement 465 and civil engineering education. This group reviews draft materials, responds to questions, and otherwise provides ideas and information for consideration by the committee.

- The committee has authored or co-authored articles and papers and made numerous presentations about its activities and progress for ASCE and other professional organizations such as the American Society for Engineering Education (ASEE). Currently, the committee is also compiling a bibliography of all published articles and reports related to education reform and "Raising the Bar."

- Currently, there are 25 universities that are assessing their curricula relative to the BOK. The committee has worked to assess how much of the BOK is covered in these 25 participating partner schools. This task—called program mapping—began in November 2003 and is expected to be completed in December 2005. Western Michigan University is actually implementing the BOK in its new undergraduate Civil Engineering degree program, as well as refocusing its graduate degree program. Norwich University is implementing a distance education master's program to support the BOK. With time, other curriculum design partners are expected to implement BOK-based programs.

- The committee and its curricular design partners continue to review the outcomes and commentaries of the BOK. A related goal of this endeavor is to determine the appropriate location for the professional breadth outcomes (Outcomes 13, 14, and 15) in the curriculum as well as how they can be taught. At this point, it is assumed that Outcomes 13, 14, and 15 will be part of the undergraduate program.
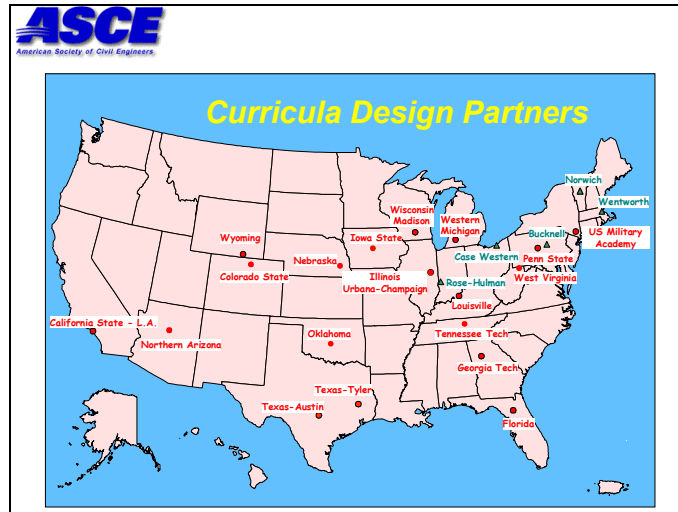
Figure 3.-Curricula Design Partners

- Work is being done to identify potential funding sources for BOK curricular development and implementation; to inform interested CE department heads, chairs, and faculty of such funding; and to encourage these parties to apply. One possible funding source is the U.S. Department of Education (DOE). The DOE solicits proposals annually. Although there are no substantive actions to report, the committee remains in communication with the DOE.

- The committee also established a subcommittee to re-examine the attitude section presented in the first edition of the BOK. The report is complete and will be forwarded to the Second Edition of the Body of Knowledge Committee for their consideration in preparing the next edition of the BOK.

*Future Tasks*

- After curriculum mapping is completed, the next step of the committee is compiling new education concepts, ideas, techniques, technologies, and best practices.

- The committee also hopes to encourage and support programs that fulfill the BOK.

**Accreditation Committee**

Thus far in 2005, the Accreditation Committee has drafted its primary work products, developed consensus for these documents within the civil engineering accreditation community, and has been communicating and coordinating with the Engineering Accreditation Commission (EAC) of ABET, Inc.

The Accreditation Committee, has drafted proposed revised ABET basic level civil engineering program criteria to incorporate the appropriate components of the BOK into the undergraduate civil engineering curricula -- and incorporate Bloom's taxonomy into the description of achievement levels. The Accreditation Committee has also been working with the EAC of ABET on modifications to the ABET advanced level general criteria, to provide assurance that holders

of an accredited master's degree in civil engineering have satisfied the full civil engineering body of knowledge, and to facilitate the ABET accreditation of engineering master's programs in the U.S. To allow the latter, flexibility is being sought to allow universities to efficiently obtain accreditation of both undergraduate and graduate programs of the same engineering discipline. Such flexibility does not currently exist in engineering within current interpretations of ABET policies. Finally, the Accreditation Committee is working on modifications to a draft Commentary on the proposed BOK-compliant accreditation criteria.
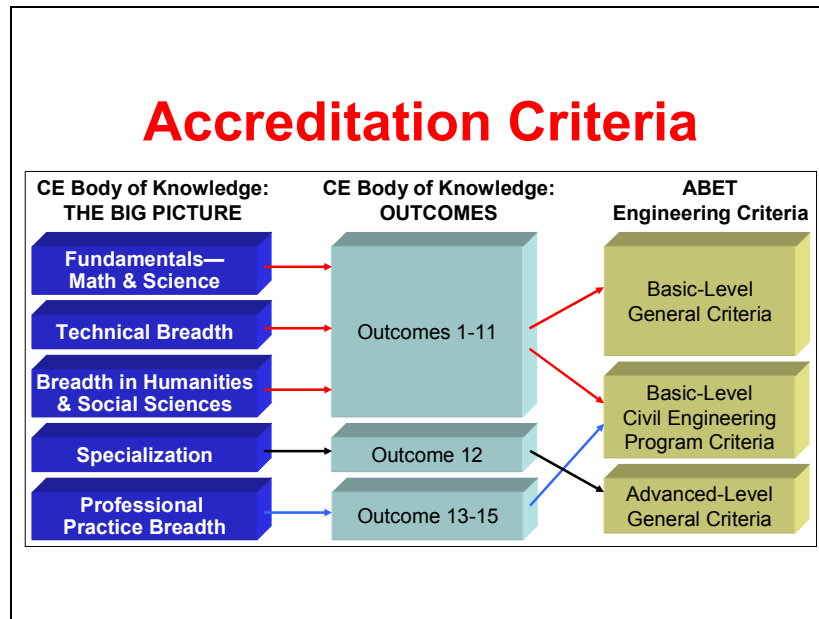
## Accreditation Criteria

| CE Body of Knowledge: THE BIG PICTURE | CE Body of Knowledge: OUTCOMES | ABET Engineering Criteria |
|---|---|---|
| Fundamentals—Math & Science | | Basic-Level General Criteria |
| Technical Breadth | Outcomes 1-11 | |
| Breadth in Humanities & Social Sciences | | Basic-Level Civil Engineering Program Criteria |
| Specialization | Outcome 12 | |
| Professional Practice Breadth | Outcome 13-15 | Advanced-Level General Criteria |

Figure 4.-Aligning BOK Big Picture Ideas with Outcomes and Accreditation Criteria

*Activities and Accomplishments*:

- The Accreditation Committee continued its internal communications activities with bi-weekly telephone conferences.

- The committee updated its membership in 2005 to maintain a roster that includes a key member(s) from each of the following groups:
  - CAP^3
  - ABET Board of Directors
  - Engineering Accreditation Commission (EAC)
  - Committee on Curricula & Accreditation (CC&A) of ASCE's Educational Activities Committee (EdAC)
  - Department Heads Council Executive Committee (DHCEC) of ASCE's EdAC.
  - Body of Knowledge Committee of CAP^3
  - Curricula Committee of CAP^3
  - Licensing Committee of CAP^3

- The committee regularly updated its draft Accreditation Master Plan to incorporate those changes needed in response to a changing environment. The Accreditation Master Plan lays out in detail how the committee will work to publish approved criteria in the Engineering Accreditation Commission (EAC)/ABET document titled *Criteria for Accrediting Engineering Programs* (effective for evaluations conducted during the 2008-2009 accreditation cycle) that fulfill the formal educational requirements for entry into the professional practice of civil engineering (i.e., licensure) as specified in the Civil Engineering Body of Knowledge for the 21st Century.

- The committee conducted a session dedicated to ASCE's accreditation effort at the 2005 ASEE Annual Conference & Exposition.

- The committee successfully worked to have the EAC of ABET withdraw its previous (July 2004) proposal for a new Advanced Level General Criteria. That version of the proposed Advanced Level General Criteria would have been detrimental to the ASCE Policy Statement 465 initiative. The Criteria Committee of EAC subsequently drafted a new proposal for modifying the Advanced Level General Criteria. This latest draft drew heavily from the committee's recommended language, but differs in one significant aspect from the proposal put forward by the accreditation committee. The committee is now working through ABET channels to seek further modification of EAC's latest draft criteria.

- The committee conducted telephone conferences of the entire "ASCE Accreditation Community" on a 6-week schedule throughout most of 2005. This community consists of ALL of the members of the following groups:

  - Accreditation Committee of CAP^3
  - CC&A of ASCE's Educational Activities Committee (EdAC)
  - ASCE Representatives on the EAC of ABET
  - ASCE Representatives on the ABET Board of Directors
  - Department Heads Council Executive Committee (DHCEC) of ASCE's EdAC

- The committee developed draft Basic Level Civil Engineering Program Criteria and draft advanced Level General Criteria that are aligned with the formal educational requirements for entry into the professional practice of civil engineering (i.e., licensure) consistent with the BOK.

- The committee developed a draft document entitled "Commentary on the ABET Engineering Criteria for Civil and Similarly Named Programs" to provide guidance to CE department heads and CE program evaluators. This document interprets the ABET/EAC criteria in the context of the BOK.

- On May 21, 2005, the committee presented its draft Basic Level Civil Engineering Program Criteria and its draft Advanced Level General Criteria at the ASCE National Department Heads' Meeting in Salt Lake City, UT. The outcome was very positive and generated support for implementation of both sets of draft criteria.

- The committee met with the EAC Criteria Committee on July 13, 2005, and explained the committee's overall initiative and plans. The committee also provided crucial comment to the EAC on proposed Advanced Level General Criteria, leading to the probable adoption of

much, but not all, of the committee's suggested language. Finally, the committee participated in EAC discussions leading up to a decision by the EAC to openly evaluate lifting of the prohibition against dual level accreditation.

- The committee met with the DHCEC, CTC&A, and the CC&A on October 1, 2005 and thoroughly briefed these key stakeholders on its draft accreditation products.

*Future Plans*

- The committee must finalize its draft Basic Level Civil Engineering Program Criteria and continue to generate support within the ASCE Accreditation Community and the broader community of stakeholders, culminating in formal submission to the Criteria Committee of the EAC of ABET by June of 2006.

- The committee will finalize its "Commentary on the ABET Engineering Criteria for Civil and Similarly Named Programs" prior to formal submission of the proposed Basic Level Civil Engineering Program Criteria to the EAC.

- The committee will continue to engage the Criteria Committee of EAC as it evaluates lifting the prohibition against dual accreditation of both their basic and advanced level engineering programs at the same institution. Opposition to lifting the prohibition is strong, but the door to debate the issue has been opened. The committee will also continue its dialogue with the EAC regarding the currently proposed Advanced Level General Criteria.

- The committee will continue working to better establish communication with sister engineering societies so they better understand the objectives of ASCE Policy Statement 465 and our efforts to improve the quality of engineering to meet the professional practice challenges of the future.

**BOK Fulfillment and Validation Committee**

The CAP^3 BOK Fulfillment and Validation Committee was established in July 2004. In the fall of 2004 the committee began to explore approaches that would allow alternative education providers, other than universities, to provide post-graduate, creditable engineering education equivalent in academic rigor and individual performance assessment to traditional upper-level undergraduate and graduate-level education. The committee also sought to develop methods that would ensure that an education, obtained through a bachelors degree and 30 additional credit hours of course work, fulfilled the BOK. Licensing boards need assurances that the courses offered by non-university organizations are of a quality comparable to those offered by universities and that the 30 credit hour equivalents, as a group, fulfill the required educational component.

*Activities and Accomplishments*

- The committee's challenge was to determine a method of presenting to the nation's 56 licensing boards information that they could use in determining whether a candidate could sit for the Principles and Practice of Engineering Exam, the final step in obtaining a license.

The committee determined that it would be impractical for any organization to validate individual courses and that the focus should be on approving the bodies that offer these courses. The committee carefully examined many current and potential nontraditional providers of post-baccalaureate courses and organizations that now or in the future could review the qualifications of such providers. It also examined organizations that could, prior to submission of an application to a licensing board; review a candidate's program to determine that the courses taken had indeed fulfilled the post-baccalaureate requirements.
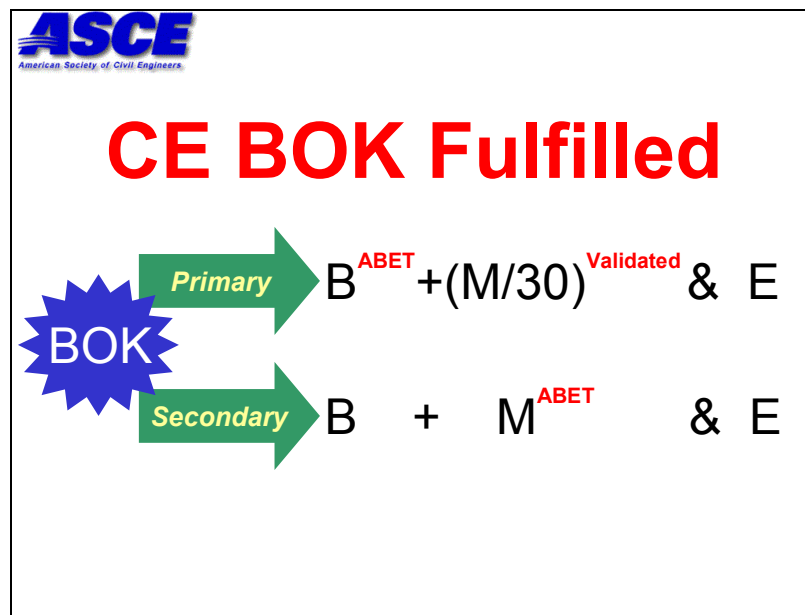


Figure 5.-Paths to Fulfill CE BOK

- The committee reviewed a number of organizations capable of either validating the credentials of +30 providers or reviewing the courses taken to attain the BOK. These organizations included the following:

  o The International Association for Continuing Education and Training (IACET), a nonprofit entity that currently evaluates organizations to determine whether they qualify as "authorized providers" of continuing education and special courses.

  o The American Council on Education (ACE), a nonprofit association, that serves as a major coordinating body of the nation's higher education institutions.

  o ABET, which accredits engineering programs of colleges and universities, and, through its Engineering Credentials Evaluation International (ECEI) subsidiary, reviews academic programs of individual foreign applicants for engineering licensing.

- The National Council of Examiners for Engineering and Surveying (NCEES) which has considerable experience in evaluating the educational qualifications required of individuals seeking engineering licensing.
  - ASCE and other engineering societies.
  - Licensing boards.
- After careful review of the potential methods of validating the providers of courses in the B(ABET)+30 path and ensuring that applicants have completed those courses, the committee concluded that the B+30 path was a viable option for attaining the BOK and that processes could  be developed to support this path.

*Recommendations*

The committee recommended that:

- ASCE supports establishment of a process to approve alternative providers of upper-level undergraduate and graduate-level technical and professional practice courses that would  be included in the post-baccalaureate, +30 component of the individual's education. The committee believed that ABET is the most capable and most experienced organization in this area and would be an appropriate provider of review services, for a fee, for  alternative education providers. If ABET is not interested in or able to provide such a service, then, the committee recommended that a new organization sponsored by multiple engineering organizations, similar to ABET, the IACET, or the ACE, be considered to fulfill this role.
- ASCE support establishment of processes to review the courses taken by candidates for engineering licensing to ensure that those courses fulfill the +30 requirement of the civil engineering BOK. The committee believes that state licensing boards, with optional individual review of applicants by the NCEES at the option of each state board, are the most appropriate entities to fulfill this role.
- A complete copy of the Fulfillment and Validation of the Attainment of the Civil Engineering Body of Knowledge Report dated April 2005 can be found on www.asce.org/raisethebar

*Future Tasks*

- Responsibility for execution of the recommendations of the BOK F&V Committee have been assumed by the CAP^3 Committee, which is currently initiating discussions with ABET and NCEES concerning their possible roles in the fulfillment and validation processes.

**Levels of Achievement Subcommittee**

The Body of Knowledge (BOK) is defined in ASCE Policy Statement 465 as "the necessary depth and breadth of knowledge, skills, and attitudes required of an individual entering the

practice of civil engineering at the professional level in the 21st Century." As noted earlier, the foundational role of the BOK in implementing ASCE PS 465 resulted in the 2004 publication by ASCE of the report Civil Engineering Body of Knowledge for the 21st Century. The BOK is presented in that report in accordance with these three themes: 1) what should be taught to and learned by future civil engineering students; 2) how should it be taught and learned; and 3) who should teach and learn it. The Committee's primary focus was the "what."

Implementation of ASCE PS 465 is a complex, long-term, and highly interdependent effort illustrated, in part, by the number of involved stakeholders within and outside of ASCE. Many of these stakeholders reviewed and began to work with the BOK in carrying out their responsibilities. As a result of reviewing and using the BOK report recommendations, stakeholders identified a problem and raised issues related to the BOK.

The problem revolved around the three principal words used to define competency levels, namely recognition, understanding, and ability. In particular, the CAP^3 Curriculum Design Committee came to this conclusion: Until there were understandable and readily applicable competency definitions—including definitions that would be understood by those outside the committee—evaluation of existing curricula and development of example curricula would be difficult if not impossible.
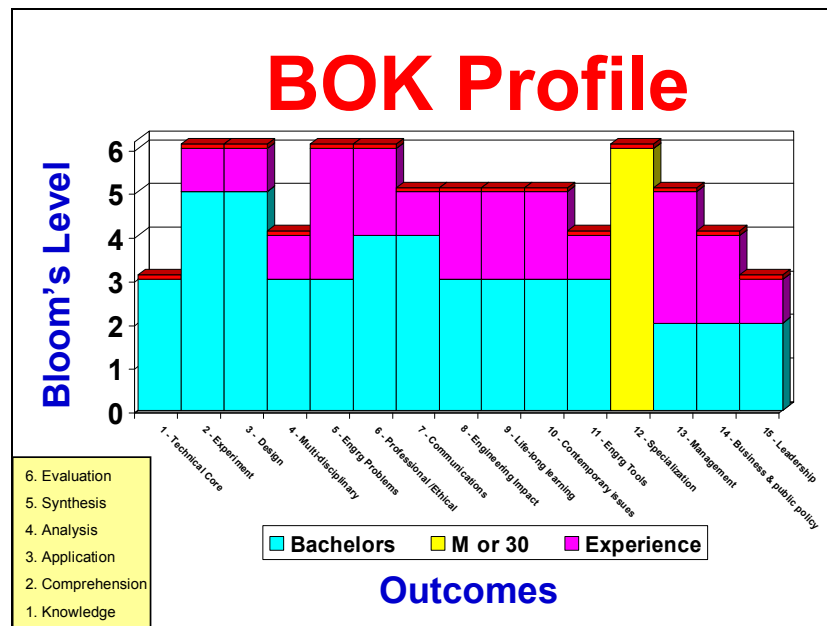


Figure 6.-BOK Profile using Bloom's Taxonomy

Accordingly, CAP^3 formed the Levels of Achievement Subcommittee in February 2005 and charged it with resolving the levels of competency problem. The Subcommittee, including members and corresponding members from academia and public and private practice, studied the problem. The Subcommittee's report, Levels of Achievement Applicable to the Body of Knowledge Required for Entry Into the Practice of Civil Engineering at the Professional Level --

- Recommends substituting achievement for competency in all future references to levels of demonstrated learning.

- Recommends using Bloom's Taxonomy as the framework for defining levels of achievement. Bloom's levels of the cognitive domain (knowledge, comprehension, application, analysis, synthesis, and evaluation) are widely known and understood across the education community (Bloom 1956). Furthermore, use of measurable, action-oriented verbs facilitates consistent curricula design and assessment.

- Recommends using a revised statement of the original 15 civil engineering outcomes using action verbs. This revision was prepared by the Subcommittee and appears in the report.

- Asks the CAP^3 Curricula Design Committee to use the revised outcomes in the continued mapping and design of BOK-based curricula, suggest refinements, and comment on the usefulness of the BOK Outcome Rubric introduced in this report.

The Curricula Design Committee has begun that process and reports success. The Levels of Achievement Sommittee --

- Asked the CAP^3 Accreditation Committee to use the revised outcomes as the basis for drafting Basic Level Civil Engineering Program Criteria and Advanced Level General Criteria. The Accreditation Committee is following this suggestion.

- Asked the recently formed second BOK Committee to consider adopting the 15 outcomes as stated in this report, using verbs based on Bloom's Taxonomy, and possibly to present them as a rubric. The Subcommittee also recommends that the second edition committee explore the possible application of refinements to Bloom's Taxonomy and more explicitly address the role of critical thinking in the BOK.

- Asked the American Academy of Water Resources Engineering to consider applying the achievement level concept in defining the requirements for Diplomate status. The AAWRE has indicated its willingness to follow this suggestion.

- Asked the new ABET Accreditation Council Task Force to proceed with refining ABET General Criteria using Bloom's Taxonomy, an approach that is likely to be applicable to other engineering disciplines, as well as the disciplines represented by the other ABET Commissions.

- Asked Civil and Environmental Engineering Departments to consider applying the 15 Civil Engineering Outcomes, as defined in the Subcommittee's report using verbs, in evaluating and designing baccalaureate and Master's degree curricula.

- Asked other engineering disciplines and organizations to comment on the approach used and recommendations presented in this report.

The Subcommittee's report was received by CAP^3 in September and, having completed its work, the Subcommittee was "sunset."

The **Second Edition of the Body of Knowledge Committee**

The Second Edition of the Body of Knowledge Committee (BOK-2) was formed in November 2005 to update the First Edition of the BOK that was issued in February 2004. There was considerable effort expended by many people in developing BOK-1. Because this was a relatively new concept in engineering education, the Committee expected the original report would generate considerable discussion, and it did. The comments and the correspondence relating to BOK-1 were reviewed, categorized, and archived pending the rewrite of the BOK. The Committee is now proceeding with that task. The Committee has been formulated to include members of the BOK-1 Committee (for "corporate memory"), and individuals who had nothing to do with BOK-1 (for fresh viewpoints).

*Activities and Accomplishments*

- The BOK-2 Committee has participated in numerous telephone conference calls and one face-to-face meeting at the end of January 2006.

- The Committee has reviewed all of the comments and correspondence received by ASCE regarding BOK-1 since the publication of that report in February 2004. All of the content of BOK-1 is subject to revision, with the following constraints:
  - The results of the BOK-2 effort must be presented in terms of "outcomes", similar to the format of BOK-1.
  - The outcomes of BOK-2 must be worded consistently with the Bloom's Taxonomy system as adopted by CAP[3].
  - The levels of achievement corresponding to the individual outcomes must be in a format consistent with the rubric developed by the Levels of Achievement Committee.
  - The outcomes developed by the BOK-2 Committee must be in harmony with the ABET/EAC General Criteria, but not necessarily identical. It is expected the ABET/EAC outcomes will be necessary to describe the ASCE BOK-2 outcomes, but not sufficient.

- The Committee has begun the rewrite of the BOK incorporating all of the above.

Figure 7.-BOK Outcomes

*Future Tasks*

- The BOK-2 Committee expects to have a draft BOK-2 document available for review by mid-Summer 2006. The draft document will be available to all interested parties, inside and outside of ASCE.

- The Committee will review all comments received and modify the draft document as necessary.

- A second draft of the document is expected to be available in the Fall of 2006 for review by all interested parties.

- The Committee will review all comments received and modify the draft document as necessary.

- The final document is expected to be completed by January 2007, with publication and issuance during Engineer's Week at the end of February 2007.

**Summary**

The ASCE Committee on Academic Prerequisites for Professional Practice has made significant progress in the last 4 years. The progress is encouraging but there remains considerable work in years to come to fully transform the profession.

# References

The following documents published by the American Society of Civil Engineers (ASCE) and its Committee on the Academic Prerequisites for Professional Practice (CAP^3) are available on
http://www.asce.org/raisethebar:

1. *Civil Engineering Body of Knowledge for the 21ˢᵗ Century*, January 2004.

2. "Key Points About ASCE Policy 465," October 2005.

3. *Engineering the Future of Civil Engineering*, October 2001.

4. *Fulfillment & Validation of the Civil Engineering Body of Knowledge*, April 2005.

5. *Levels of Achievement Applicable to the Body of Knowledge*, September 2005. (Including Bloom, B.S., et al., (1956). **Taxonomy of Educational Objectives,** New York: Longman.)

6. *Program Criteria for Civil and Similarly Named Engineering Programs*, September 2005.

7. *Commentary on the ABET Criteria for Civil and Similarly Named Engineering Programs*, April 2005.

8. "Raise the Bar" Newsletters, quarterly since March 2004.

**APPENDIX A: Membership of Constituent Committees**


**Current and Former Members of Committee on Academic Prerequisites for Professional Practice (CAP^3)**

Jeffrey S. Russell, University of Wisconsin-Madison, Chair
Stuart G. Walesh, S.G. Walesh Consulting, Vice-Chair
Thomas A. Lenox, ASCE Staff Leader
Richard O. Anderson, SOMAT Engineering
N. Catherine Bazan-Arias, GAI Consultants, Inc.
H. Edmund Bergeron, H.E. Bergeron Consulting
Norman L. Buehring, ASCE Vice President, Emeritus
Angela DeSoto-Duncan, U.S.A.C.E
Gerald E. Galloway, Jr., University of Maryland
Craig W. Helms, Civil Engineering of the Carolinas
C. Gary Kellogg, Delon Hampton and Associates
E. Walter LeFevre, University of Arkansas
Brook Maples, The Nielsen-Wurster Group, Inc.
Oliver G. McGee, The Ohio State University
Craig N. Musselman, CMA Engineers
David G. Mongan, Whitney, Baily & Magnani, LLC
Jon Nelson, Tetra-Tech, Inc.
Deb Nemeier, University of Califonia-Davis
Sheina K. Pool, MMLA, Inc.
Bobby E. Price, Louisiana Tech University, emeritus
Ernest T. Smerdon, University of Arizona, emeritus
William A. Welsh, ASCE Vice President
James Schaaf, Schaaf Associates
David R. Martinelli, West Virginia University, Liaison to DHCEC
John Steadman, Liaison to IEEE-USA
Robert C. Krebs, Liaison to NCEES
John E. Durrant, ASCE Staff Liaison
Walter Marlowe, Staff Liaison
James J. O'Brien, Staff Liaison

**Members of Curricula Design Committee**
James Nelson, University of Texas-Tyler, Chair
Thomas Siller, Colorado State University, Vice Chair
Brian Brenner, Tufts University
Thomas Descoteaux, Norwich University
Jeffrey Evans, Bucknell University
Laurence Jacobs, Georgia Institute of Technology
Dale Jacobson, Jacobson Helgoth Consultants, Liaison to ERWI
Young Kim, California State University-Los Angeles
Robert Knox, University of Oklahoma
Randall Kolar, University of Oklahoma
Michael Kupferman, Wentworth Institute of Technology
Arthur Miller, Penn State University
Ron Welch, United States Military Academy

Allen Estes, United States Military Academy
Gayle Mitchell, Ohio University
J.P. Mohsen, University of Louisville
Robert Mullen, Case Western Reserve
Jeffrey Russell, University of Wisconsin-Madison
Edwin Schmeckpeper, University of Idaho
Kevin Sutterer, Rose-Hulman Institute of Technology
David A. Lange, University of Illinois-Urban Champaign
Eric Williamson, University of Texas at Austin
David Huddleston, Tennessee Tech University
John Tawresey, KPFF Consulting Engineers, Liaison to SEI
Stuart Walesh, S.G. Walesh Consulting
Marlee Walton, Iowa State University
Thomas A. Lenox, ASCE CAP^3 Staff Liaison
James O'Brien, ASCE Staff Liaison
Members of the Attitudes Subcommittee
John Tawresey, KPFF Consulting Engineers, Chair
Dale Jacobson, Jacobson, Helgoth Consultants
Tom Descoteaux, Norwich University
Maria Garlock, Princeton University
John Abel, Cornell University
Jon Stewart, University of California-Los Angeles

**Members of the Accreditation Committee**

Wayne Bergstrom, Wilcox Professional Services, LLC., Chair
Stephen J. Ressler, US Military Academy, Vice Chair and CC&A Rep
Ernest T. Smerdon, University of Arizona
Richard O. Anderson, SOMAT Engineering, Inc.
Peter J. Carrato, Bechtel, EAC Rep
H. Chik Erzurumlu, Portland State University, EAC Rep
Phillip Borrowam, Hanson Professional Services, Inc., EAC Rep
Ron Harichandran, Michigan State University, DHCEC Rep
David R. Martinelli, West Virginia University, DHCEC Rep
Robert Mimiaga, CC&A Rep
Craig N. Musselman, CMA Engineers Inc, Licensing Rep
James K. Nelson, University of Texas-Tyler, Curricula Rep
John W. Steadman, University of South Alabama, IEEE-USA
Stuart G. Walesh, S.G. Walesh Consulting, BOK Liaison
William A. Welsh, ABET Board
James J. O'Brien, ASCE Staff Contact
Jeffrey S. Russell, University of Wisconsin-Madison, CAP^3 Liaison
Thomas A. Lenox, ASCE CAP^3 Staff Liaison

**Members of Licensure Committee**
Craig N. Musselman, emeritus member of the NH PE Board, Chair
Bobby E. Price, emeritus member of the LA PE Board and Past President of NSPE
Dale Sall, PE of the Nebraska PE Board and Chair of USCIEP
E. Walter LeFevre, emeritus member of the Arkansas PE Board
Ed Bergeron, emeritus member of the NH PE Board
Kerry Hawkins, Member LA PE Board

Richard Moore, Member of the Wyoming PE Board
Kevin Nelson, Member of the North Dakota PE Board
Howard Gibbs, Member of the Washington District PE Board
Eric L. Flicker, Pennoni and Associates
Walter Marlowe, ASCE Staff Contact
Jeffrey S. Russell, University of Wisconsin-Madison, CAP^3 Liaison
Thomas A. Lenox, ASCE CAP^3 Staff Liaison

**Members of the BOK Fulfillment & Validation Committee (Sunset May 1, 2005)**
Jeffrey S. Russell, University of Wisconsin-Madison, Chair
Gerry Galloway, Titan Corporation, Vice Chair
Rick Barnaby, FHWA
Mark Brewer, PBS&J
Mary Leslie, CDM
John Casazza, Director of Continuing Education, ASCE
Robyn Colosimo, U.S.A.C.E.
John Klus, University of Wisconsin
Craig Musselman, CMA Engineers
James Nelson, University of Texas-Tyler
Thomas Lenox, ASCE CAP^3 Staff Liaison
James O'Brien, Accreditation Staff Liaison
Walter Marlowe, ASCE Staff Contact

**Members of the Levels of Achievement (Sunset September 15, 2005)**
Stuart G. Walesh, S.G.Walesh Consulting, Chair
James K. Nelson, University of Texas-Tyler
Stephen.Ressler, United States Military Academy
Kevin Sutterer Rose-Hulman Institute of Technology
Mark Pagano, Purdue University
Debra Larson, Northern Arizona University
Jeffrey Evans, Bucknell University
William Espey Espey Consultants
James J. O'Brien, ASCE Staff
Walter Marlow, ASCE Staff
Jeffrey S. Russell, University of Wisconsin-Madison, CAP^3 Liaison
Thomas A. Lenox, ASCE CAP^3 Staff Liaison

**Members of Body of Knowledge (BOK) Committee (Sunset as of February 2004)**
Stuart G. Walesh, S.G. Walesh Consulting, Chair
Chris T. Hendrickson, Carnegie Mellon University, Vice Chair
Michael J. Chajes, University of Delaware
Abbie Dement, Lowe Engineers
Gerald G. Galloway, Jr., Titan Corporation
Ralph J. Hodek, Michigan Technological University
Dale W. Sall, JEO Consulting Group
John S. Shearer, PBS&J
Thomas Siller, Colorado State University
John Tawresey, KPFF Consulting Engineers
Marlee Walton, Iowa State University

Jeffrey S. Russell, University of Wisconsin-Madison, CAP^3 Liaison
James J. O'Brien, ASCE, Staff Contact
Thomas A. Lenox, ASCE Staff Liaison

**APPENDIX B: Meetings of CAP^3 and Constituent Committees**

| COMMITTEE | MEETING DATE | TYPE |
|---|---|---|
| Fulfillment & Validation Conference | Tuesday, October 05, 2004 | Telephone |
| Accreditation Conference | Thursday, October 07, 2004 | Telephone |
| CAP^3 Conference | Thursday, October 07, 2004 | Telephone |
| Fulfillment & Validation Conference | Tuesday, October 19, 2004 | Telephone |
| CAP^3 Conference | Thursday, October 21, 2004 | Telephone |
| Fulfillment & Validation Conference | Tuesday, November 02, 2004 | Telephone |
| Accreditation Community Conference | Thursday, November 04, 2004 | Telephone |
| CAP^3 Conference | Thursday, November 04, 2004 | Telephone |
| Curricula Conference | Monday, November 08, 2004 | Telephone |
| Fulfillment & Validation Conference | Tuesday, November 16, 2004 | Telephone |
| Accreditation Conference | Thursday, November 18, 2004 | Telephone |
| CAP^3 Conference | Thursday, November 18, 2004 | Telephone |
| Fulfillment & Validation Conference | Tuesday, November 30, 2004 | Telephone |
| Accreditation Conference | Thursday, December 02, 2004 | Telephone |
| CAP^3 Conference | Thursday, December 02, 2004 | Telephone |
| Leaders | Friday, December 03, 2004 | Herndon, VA |
| Accreditation | Saturday, December 04, 2004 | Reston, VA |
| Curricula | Saturday, December 04, 2004 | Reston, VA |
| Fulfillment & Validation | Saturday, December 04, 2004 | Reston, VA |
| Leaders | Saturday, December 04, 2004 | Herndon, VA |
| Accreditation Conference | Thursday, December 16, 2004 | Telephone |
| CAP^3 Conference | Thursday, December 16, 2004 | Telephone |
| Fulfillment & Validation Conference | Wednesday, December 22, 2004 | Telephone |
| Accreditation Conference | Thursday, December 30, 2004 | Telephone |
| CAP^3 Conference | Thursday, December 30, 2004 | Telephone |
| Fulfillment & Validation Conference | Tuesday, January 04, 2005 | Telephone |

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|---|---|---|
| CAP^3 Conference | Thursday, January 06, 2005 | Telephone |
| Accreditation Community Conference | Thursday, January 13, 2005 | Telephone |
| Fulfillment & Validation Conference | Tuesday, January 25, 2005 | Telephone |
| Accreditation Conference | Thursday, January 27, 2005 | Telephone |
| CAP^3 Conference | Thursday, January 27, 2005 | Telephone |
| Leaders Conference | Thursday, February 03, 2005 | Telephone |
| Curricula Conference | Wednesday, February 09, 2005 | Telephone |
| Levels of Achievement Conference | Wednesday, February 09, 2005 | Telephone |
| Accreditation Conference | Thursday, February 10, 2005 | Telephone |
| CAP^3 Conference | Thursday, February 10, 2005 | Telephone |
| Levels of Achievement Conference | Tuesday, February 22, 2005 | Telephone |
| Curricula Conference | Wednesday, February 23, 2005 | Telephone |
| TCS2025 Conference | Wednesday, February 23, 2005 | Telephone |
| Accreditation Community Conference | Thursday, February 24, 2005 | Telephone |
| CAP^3 Conference | Thursday, February 24, 2005 | Telephone |
| Levels of Achievement Conference | Tuesday, March 01, 2005 | Telephone |
| Curricula Conference | Wednesday, March 09, 2005 | Telephone |
| Accreditation Conference | Thursday, March 10, 2005 | Telephone |
| CAP^3 Conference | Thursday, March 10, 2005 | Telephone |
| Leaders Conference | Tuesday, March 22, 2005 | Telephone |
| Curricula Conference | Wednesday, March 23, 2005 | Telephone |
| Accreditation Conference | Thursday, March 24, 2005 | Telephone |
| CAP^3 Conference | Thursday, March 24, 2005 | Telephone |
| Levels of Achievement Conference | Friday, March 25, 2005 | Telephone |
| TCS2025 Conference | Tuesday, March 29, 2005 | Telephone |

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|---|---|---|
| Curricula Conference | Wednesday, April 06, 2005 | Telephone |
| Levels of Achievement Conference | Wednesday, April 06, 2005 | Telephone |
| Accreditation Community Conference | Thursday, April 07, 2005 | Telephone |
| CAP^3 Conference | Thursday, April 07, 2005 | Telephone |
| TCS2025 Conference | Monday, April 11, 2005 | Telephone |
| Levels of Achievement Conference | Friday, April 15, 2005 | Telephone |
| Curricula Conference | Wednesday, April 20, 2005 | Telephone |
| Accreditation Conference | Thursday, April 21, 2005 | Telephone |
| CAP^3 Conference | Thursday, April 21, 2005 | Telephone |
| Licensure Conference | Tuesday, April 26, 2005 | Telephone |
| TCS2025 Conference | Tuesday, April 26, 2005 | Telephone |
| Levels of Achievement Conference | Friday, April 29, 2005 | Telephone |
| Curricula Conference | Wednesday, May 04, 2005 | Telephone |
| Accreditation Conference | Thursday, May 05, 2005 | Telephone |
| CAP^3 Conference | Thursday, May 05, 2005 | Telephone |
| TCS2025 Conference | Tuesday, May 10, 2005 | Telephone |
| Curricula Conference | Wednesday, May 18, 2005 | Telephone |
| Levels of Achievement Conference | Wednesday, May 18, 2005 | Telephone |
| Accreditation Community Conference | Thursday, May 19, 2005 | Telephone |
| CAP^3 Conference | Thursday, May 19, 2005 | Telephone |
| TCS2025 Conference | Tuesday, May 24, 2005 | Telephone |
| Curricula Conference | Wednesday, June 01, 2005 | Telephone |
| Accreditation Conference | Thursday, June 02, 2005 | Telephone |
| CAP^3 Conference | Thursday, June 02, 2005 | Telephone |
| Levels of Achievement Conference | Thursday, June 02, 2005 | Telephone |

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|---|---|---|
| CAP^3 Conference | Thursday, June 09, 2005 | Telephone |
| Curricula | Saturday, June 11, 2005 | Portland, OR |
| Leaders | Sunday, June 12, 2005 | Portland, OR |
| CAP^3 Conference | Thursday, June 16, 2005 | Telephone |
| Accreditation Conference | Thursday, June 23, 2005 | Telephone |
| Levels of Achievement Conference | Thursday, June 23, 2005 | Telephone |
| Curricula Conference | Wednesday, June 29, 2005 | Telephone |
| Accreditation Community Conference | Thursday, June 30, 2005 | Telephone |
| CAP^3 Conference | Thursday, June 30, 2005 | Telephone |
| Curricula Conference | Wednesday, July 13, 2005 | Telephone |
| Accreditation Conference | Thursday, July 14, 2005 | Telephone |
| CAP^3 Conference | Thursday, July 21, 2005 | Telephone |
| Accreditation Conference | Thursday, July 28, 2005 | Telephone |
| Curricula Conference | Wednesday, August 10, 2005 | Telephone |
| Accreditation Community Conference | Thursday, August 11, 2005 | Telephone |
| CAP^3 Conference | Thursday, August 11, 2005 | Telephone |
| Accreditation Conference | Thursday, August 25, 2005 | Telephone |
| Licensure | Saturday, August 27, 2005 | Memphis, TN |
| Curricula Conference | Wednesday, August 31, 2005 | Telephone |
| CAP^3 Conference | Thursday, September 01, 2005 | Telephone |
| Curricula Conference | Wednesday, September 07, 2005 | Telephone |
| Accreditation Conference | Thursday, September 08, 2005 | Telephone |
| Leaders | Saturday, September 10, 2005 | Herndon, VA |
| CAP^3 Conference | Wednesday, September 21, 2005 | Telephone |
| Curricula Conference | Wednesday, September 21, 2005 | Telephone |
| Accreditation Community Conference | Thursday, September 22, 2005 | Telephone |