



Association of Environmental Engineering and Science Professors

BOARD OF DIRECTORS OFFICERS

President

James R. Mihelcic, Ph.D.
Civil & Environmental
Engineering
Michigan Technological
University
Houghton, MI 49931-1295
Phone: 906/487-2324
Fax: 906/487-2943
jm41@mtu.edu

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Civil & Environmental
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Mail Stop 258
Reno, NV 89557-0152
Phone: 775/784-6942
Fax: 775/784-1390
amyec@unr.edu

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Peter Adriaens, Ph.D.
Environmental & Resources
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181 EWRE Building
Ann Arbor, MI 48109-2125
Phone: 734/763-1464
Fax: 734/763-2275
adriaens@umich.edu

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University of Illinois at
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205 N. Mathews
3215 Newmark
Urbana, IL 68101
Phone: 217/333-3822
Fax: 217/333-6968
werth@uiuc.edu

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Civil, Environmental, &
Architectural Engineering
University of Colorado
428 UCB
Boulder, CO 80309-0428
Phone: 303/492-8433
Fax: 303/492-7317
angela.bielefeldt@colorado.edu

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2303 Naples Court
Champaign, IL 61822-3510
Phone: 217/398-6969
Fax: 217/355-9232
jfetznr@uiuc.edu

July 18, 2008

To: Dr. Debra R. Reinhart, C. Robert Baillod
American Academy of Environmental Engineering
Committee Co-Chairs, Environmental Engineering Body of Knowledge
(BOK)

Copy: Hector Fuentes, AEESP/AAEE Liaison

Subject: AEESP Board of Directors comments on draft BOK

Dear Debra and Bob,

The AEESP Board of Directors thanks you and your committee members for the tremendous effort you put in to complete the Draft Environmental Engineering BOK. Here we provide comments on the BOK in two general categories: 1) comments that will allow the BOK to have greater support by the AEESP membership; 2) incorporation of Leadership as Outcome 18, 3) an over dependency on ASCE language for several outcomes, and 4) a few specific comments related to specific components of the draft document. Though the BOK is discussed at all AEESP Board Meetings, these specific comments were prepared primarily by James Mihelcic and Jeanne VanBriesen.

Remember that in August, 2007 the AEESP Board of Directors sent you a letter regarding the EEn BOK.

In that letter we wrote:

"The AEESP Board is eager to support the final BOK document. However, we are very concerned about the potential for the BOK document to be perceived as defining our field in a narrow fashion. This issue must be resolved before the Board and the AEESP membership can endorse the BOK. Specifically, we require that the draft and final BOK include clear language indicating that the BOK does not represent or imply a prescriptive set of courses or topics. Related to this, I am happy to see you have stated in our email correspondence that you want the Environmental Engineering Body of Knowledge (BOK) to be useful, have consensus from stakeholders, and not be prescriptive."

Your committee should be aware that there are AEESP members who are supportive of a body of methodology (or body of perspective) that has a focus on the common ways we solve environmental engineering problems. Some members also have observed that your committee's output will provide assistance in defining ourselves as a discipline and provide some coherence to our field. Your committee's output may also provide some newer environmental engineering programs with guidance as they develop and modify their programs. However, many members feel that one of the strengths of environmental engineering has been its flexibility and ability to adapt to established and emerging disciplines. Again, many worry that a prescriptive BOK would limit that unique attribute of our discipline. Remember, as I have stated, we see the outcome of the BOK as a guide, but not something that is prescriptive. I appreciate all the time that you and your committee have taken to listen to the views of the AEESP membership. Our hope is that we can continue to dialogue on this important topic to reach consensus."

We understand there will be many users of the Final BOK. In our previous correspondence, the AEESP Board had requested the draft and final BOK "include **clear** language indicating that the BOK does not represent or imply a prescriptive set of courses or topics."

In our review, this type of language which is important in regards to how the FINAL BOK is used is not clear and only occurs in two locations,

1. On Page 43 in the draft BOK (in the section of Educators' Expectations of the EnvE BOK) it is written: "The EnvE BOK should not be prescriptive, following an established past practice. Rather it should be directional, forward looking; more of a compass than a detailed roadmap or route from in the past"
2. On page 4 (last paragraph of Introduction) it is written: "It is not expected that every type of practicing environmental engineer will achieve all outcomes at the same level, but rather each educational program and each individual will follow an educational and experiential path suitable to their respective educational objectives"

The executive summary **was not** available for review so we are not sure what language is included there.

As in our first letter, we would like to see **clear** language that is **highlighted in bold** included in both the Executive Summary and in the Introduction indicating that the BOK does not represent or imply a prescriptive set of courses or topics. We would like the following text (which incorporates your wording from page 1 of the Introduction and page 43).

- “The Environmental Engineering BOK (and later uses of it for accreditation and licensure) must recognize that environmental engineering is rapidly evolving; therefore, the Environmental Engineering BOK must not be prescriptive, and instead facilitate adaptation to future challenges and needs. It is not expected that every graduating or practicing environmental engineer will achieve all outcomes at the same level. Rather, each unique educational program and each individual will develop an educational and professional path suitable to their respective education and professional objectives. Accordingly, the Environmental Engineering BOK should not be prescriptive, but instead be directional, forward looking; and more of a compass than a detailed roadmap.”

There is some prescriptive language in the Draft BOK that we would like removed. On the bottom of page 19: “In the EnvE BOK, it is **clear** that the capacity to use this knowledge for engineering applications, synthesis, and evaluation alternatives **must be** defined.”

Related to this, there is very strong language in the introduction about the need for the BOK at this time. For example, “leading engineering educators and practitioners have come to believe that, at this time, there is a need to identify this knowledge. . .” It would be helpful for the reader to have more context here. Why “at this time”? What has happened in the past several years that make the need for the BOK urgent? Similarly, the general statement that the need is particularly important due to “many changes occurring today and in the future” is vague. Even with the note that this is further described in the report, this statement comes across as specious.

We note that the EnvE BOK already has 18 outcomes. The majority of these outcomes could form a body of perspective that has a focus on the common ways we solve environmental engineering problems. However, outcomes are only useful to educators if they are both implementable and measurable.

The Draft EEn BOK lists “leadership” as Outcome 18 (page 42). The Draft BOK also suggests that educators may have to measure outcomes of leadership that we believe are not easily implemented or measured, for example in Outcome 18, “at the completion of the baccalaureate degree in Environmental Engineering ... apply leadership skills to direct the efforts of a small group.” We recommend that Outcome 18 be either removed from the EEn BOK or the level of achievement just mentioned be changed to shift more of the burden of applying and measuring this outcome to professional practice.

In addition, for Outcome 16 (Project Management, page 40) under the level of achievement, project management is prescriptively tied to the task of “construction” while in the “outcome explanation” there is no direct requirement that the level of achievement be related to the specific task of construction. We suggest this level of achievement be removed.

We note that at times in the Draft BOK, there is a dependence on language used by ASCE and perhaps the ASCE BOK (specifically outcomes 8, 12, 13, 18). The Final EEn BOK (and the environmental engineering discipline) would benefit by using knowledge and definitions common to our distinct discipline. Just a few examples,

- Page 13, Section 4. The definition of sustainability is from ASCE. There are better definitions in our opinion that I am sure several members of your committee are aware of. The ASCE definition is very anthropogenic in terms of its focus on meeting human needs for what is effectively civil engineering infrastructure. It also includes no real emphasis on the importance of the social and economic requirements. There are well over 300 definitions of sustainability and sustainable development, in short, sustainability is often interpreted as mutually advancing the long-term goals of economic growth, societal prosperity, and environmental protection. We suggest the EnvE BOK use a definition that is more appropriate for the environmental engineering discipline.
- Page 37. In paragraph on Outcome Explanation for Outcome 13 (page 37), Why do we refer to other engineering discipline code of ethics? Is there perhaps a code of ethics adopted by an environmental science or engineering professional organization that we could use?

Finally, we note that it is unclear how one without a BS EnvE would meet the Bacc. BOK. This is shown in Figure 1 as a step to meeting the BOK and eventual Licensure, but without taking a BS EnvE in addition to one's existing BS, how are the components of the BOK met and certified? The language at the top of page 19 does not help. It frames all that will follow in terms of what would be expected at the completion of the BS in EnvE and then the MS or post-baccalaureate work and then the experience. It is not clear how a professional with a BS in chemistry or biology would proceed to meet the expected performance levels for the different outcomes and more importantly how such a professional would **demonstrate** proficiency at the required levels without acquiring a BS EnvE. This **must** be clarified as multiple paths to the environmental engineering profession are very common.

In terms of more general comments related to specific parts of the Draft EEn BOK.

- Section B would benefit from a separate section on the history of licensure. The current draft has 1) definition, 2) education, 3) employment sectors, and 4) technical specialties. But, the employment sectors section refers to the education and licensure needs of each employment sector. This would be clearer if following the education section, there was a general overview of licensure. This would also help the reader to understand the role and relevance of licensure for EnvE and how this fits with the broader issue of protection of the public. Readers who are from other engineering disciplines will not understand this aspect without a solid, well-written introduction to the concept of licensure.
- In terms of Employment Sectors (pages 7-9) there are an increasing number of our graduates working for nongovernmental organizations (NGOs). This employment sector is not included, and we feel it should be mentioned. There is also unsubstantiated language throughout this section that implies that “an *increasing* number of faculty are licensed” or “*growing* number of consulting engineers are becoming board certified and licensed. We are not suggesting that licensure or board certification are not important, we just recommend that these broad statements be supported with more specifics and references in the Final BOK.

On page 8 the section on industry does not discuss the educational needs for this sector. To keep these sections parallel, we recommend a discussion of education and licensure for all the sectors.

- Outcome 5 is more focused on the historic method of controlling environmental risk by controlling exposure. As our profession and other engineering and science disciplines become “green,” risk will be minimized by reducing or eliminating the hazard with less emphasis on controlling exposure. The ultimate goal will then be specification and use of completely benign materials or chemicals such that there is no need to control exposure.
- On page 31, we suggest the wording “shall strive” be changed to ‘will” in the following sentence: “Engineering “will” adhere to principles of sustainable development in order to protect the environment for future generations.”
- Outcome 12 is represented by only one knowledge domain in Figure 2: Business management. It seems very unlikely that only a background in business management would enable one to work on multidisciplinary teams. Many environmental engineers would consider this outcome to be part of their skill set and would not indicate that they learned this as part of business management or through work experience in business management. This is part of the work experience of most engineers!
- Outcome 10 and 12 do not include the additional required post baccalaureate. If there are no additional requirements, this should be stated.
- p. 43, under “adaptable.” This section is very clearly expressed but it is not at all clear in the actual document. As presented, it seems to be a response to the document rather than part of the plan.

In closing, we would like to affirm again that the AEESP Board appreciates the work of your committee to prepare the draft and final Environmental Engineering BOK.

Respectively,

Representing the AEESP Board of Directors

James R. Mihelcic, Board of Directors & President, AEESP

Jeanne VanBriesen, Board of Directors, AEESP