Assessing the Civil Engineering Body of Knowledge in the Affective Domain

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Introduction

The authors of this paper are members of the ASCE Task Committee created to revise the Body of Knowledge for Civil Engineers (BOK). The purpose of this paper is to provide an overview of ASCE activities that have led to a proposed third edition of the Body of Knowledge for Civil Engineers (BOK3) and to discuss the incorporation of the affective domain in assessing attainment of the BOK outcomes.

The American Society of Civil Engineers has been engaged in defining and refining a body of knowledge for civil engineers for nearly 20 years in support of its Policy Statement 465 - Academic Prerequisites for Licensure and Professional Practice. Policy Statement 465 (PS 465) was first adopted in 1998 and supported "the concept of the master's degree as the First Professional Degree (FPD) for the practice of civil engineering at the professional level." [1] This policy created significant debate among members of the society and motivated ASCE to form the Task Committee for the First Professional Degree (TCFPD) in 1999. This committee was tasked with developing a vision for the full realization of the policy and a strategy to achieve it. Based on this committee's report [2] the ASCE Board of Direction revised PS 465 in 2001 and softened the language of the policy to "supports the concept of a master's degree or equivalent as a prerequisite for licensure and the practice of civil engineering at the professional level [3]. In that same year, ASCE discontinued TCFPD and established a new committee, the Task Committee on the Academic Prerequisites for Professional Practice (TCAP^3) to develop detailed plans to attain the full realization of PS 465. In late 2002 TCAP^3 created the Body of Knowledge Task Committee (BOKTC) to define the academic requirements for the practice of civil engineering at the professional level. It was through the work of both TCAP^3 and BOKTC that the ASCE Board of Direction again revised the language of PS 465 in 2004 to:

> *"ASCE supports attainment of a body of knowledge for entry into the practice of civil engineering at the professional level. This would be accomplished through the adoption of appropriate engineering education and experience requirements as a prerequisite for licensure* " [3].

The American Society of Civil Engineers published the first Body of Knowledge for Civil Engineering (BOK) in 2004. In that document, a distinguished group of educators and practitioners, who formed the Body of Knowledge Committee, outlined the general knowledge all civil engineers should possess for entry into the professional practice of civil engineering. The document defined fifteen distinct outcomes that would be achieved through a combination of education and engineering work experience at the time of licensure [4]. Further, a prescribed level of attainment was defined for each outcome. The levels of attainment loosely followed the Taxonomy of Educational Objectives in the Cognitive Domain created by Bloom and his examiner colleagues in 1956 [5]. In the first edition of the BOK, only the equivalent of the lowest three levels of Bloom's Taxonomy (recognize, understand and apply) were used. When ASCE published the second edition of the Body of Knowledge (BOK2) in 2008, the number of

desired outcomes was increased from 15 to 24 [6]. These outcomes were organized into three categories; foundational, technical and professional. Attainment levels in the cognitive domain were developed for each of the 24 outcomes and were defined by working statements that covered all six levels of Bloom's Taxonomy for the cognitive domain. Target levels of attainment were defined for entry into the professional practice of civil engineering, then defined as professional licensure, as well as well as for completion of the baccalaureate degree, the Master's degree or 30 credit hours beyond the baccalaureate degree (plus 30), and through engineering experience [6]. While the BOK2 Task Committee crafted attainment statements in the affective domain that were similar in format to the statements for cognitive achievement for some of the outcomes, it concluded that the ability to measure attainment in the affective domain was far less certain than measuring attainment in the cognitive domain and chose to relegate the assessment in the affective domain to an advisory appendix of the BOK2.

ASCE reconstituted the ASCE Task Committee on the Body of Knowledge in early 2016 and selected a mixture of seasoned practitioners and educators as members. The committee convened in October of 2016 to determine if there was a need for the creation of a third edition of the BOK. Committee members attempted to identify new concepts and developments in the practice of civil engineering that were not addressed ten years earlier in BOK2. At the conclusion of that first meeting, the committee decided collectively that there was sufficient change in practice to warrant a third edition of the Body of Knowledge for Civil Engineers (BOK3). While the committee identified several new outcomes to be addressed, along with the need for revisiting several existing outcomes, it felt that it needed the broader perspective of the general membership of ASCE on what a revised BOK should look like. As a result, they created a survey to encourage the membership of ASCE to rank order the importance of the existing 24 outcomes of BOK2 and to identify the need for new emphasis areas or outcomes. This survey was sent to a large and diverse population of ASCE members. Based on the results of the survey, a pre-draft list of desired outcomes tentatively grew from 24 to 36. Due to the nature of some of the proposed outcomes, and comments regarding some existing outcomes, the BOK3 Task Committee felt that a number of outcomes required not only cognitive knowledge of the outcome, but also a sense of ownership or internal valuing of the outcome. Hence the committee resurrected idea of assessing each outcome in the affective domain, using the Taxonomy of Education Objectives Volume II - Affective Domain [7] as a guide.

Educational Taxonomies

Frameworks for assessing intellectual and emotional development have existed since at least the late 1800s, but a common framework and language that defined activities and concepts to effectively classify and assess intellectual and emotional development across the disparate groups in education did not exist [8]. In the mid-twentieth century a group of educational examiners, led by Benjamin S. Bloom, committed themselves to create this common framework. They met annually as a working group through the late 1940s and early 1950s to create a common framework for the characterization and assessment of educational activities. Their goal was to create a common hierarchal set of terms and language that characterized educational objectives in a uniform and repeatable way. The publication describing their early work presented the concept of three domains of educational activities. Those domains included the cognitive, which deals with the recognition of knowledge and the progressive development of

intellectual abilities; the affective domain, which describes changes in interests, attitudes, and values; and the psychomotor domain, which categorizes manipulative or motor skills [5]. While the group found ample evidence in the literature to support development of a common framework in both the cognitive and affective domains, they found little research to support a common framework in the psychomotor domain. Given that previous research found the relationship between cognitive achievement and attitudes and values were poorly correlated [9], the group chose to focus on the cognitive domain. Thus, the 1956 publication of this group provided a thorough description of the cognitive domain and established six levels of successively higher intellectual development. In addition, various key words were suggested to describe activities that might be associated with attaining a particular level of intellectual development. The highlights of the taxonomy are briefly described in Table 1 by presenting a short definition for each level, a reduced set of key works for each level, and two examples of activities that could be assessed. The work in the cognitive domain by Bloom and his colleagues served as a seminal work in curriculum development for many years, with a number of researchers either developing refinements to the implementation of the taxonomy or deriding the taxonomy as having only limited benefit in assessing intellectual development, (see the work of Ormell, Roberts or Seddon [10][11][12]), to mention a few. Major revisions to Bloom's taxonomy did not occur until 2001 when Anderson and Krathwohl proposed a revision to the hierarchy (i.e., by reversing the order of *synthesis* and *evaluation*), added a new dimension which described cognitive processes associated with each level of the taxonomy and added a category of metacognitive knowledge [13]. Even though there has been much written about the benefits of the revised taxonomy, the BOK2 Task Committee chose to use the original Bloom's Taxonomy and not Anderson and Krathwohl's revisions when developing statements to prescribe the levels of attainment for the 24 outcomes of BOK2. The committee felt that in the field of engineering one had to know how to create or design before one could evaluate the work of others or assess which design alternative might be best for a given situation. Thus, *evaluate* remained at the top of the hierarchal pyramid. The committee also felt that the addition of the dimension of cognitive processes added an unnecessary complexity to determining a level of attainment for each outcome of the BOK2.

Failing to create a viable framework to classify objectives in the affective domain in their first publication, motivated many members of the original group of examiners to continue seeking evidence to support the development of a taxonomy in the affective domain. The examiners found a large body of evidence to suggest that teachers regarded achievement in the cognitive domain to be public in nature and had no hesitation to assign a grade on the basis of performance. On the other hand, teachers felt that it was not appropriate to evaluate students based on their interests, attitudes, or character development, feeling these were more private in nature and certainly more difficult to assess. Their work over the next eight years in organizing and categorizing behaviors in the affective domain ultimately resulted in the description of a continuum of activities ranging from simply being aware of a concept or phenomenon to completely internalizing the concept or phenomenon and making it a part of one's outlook on life [5].

Table 1. Defining the levels of Bloom's Taxonomy for the Cognitive Domain (Adapted from Anderson et.al., [13])

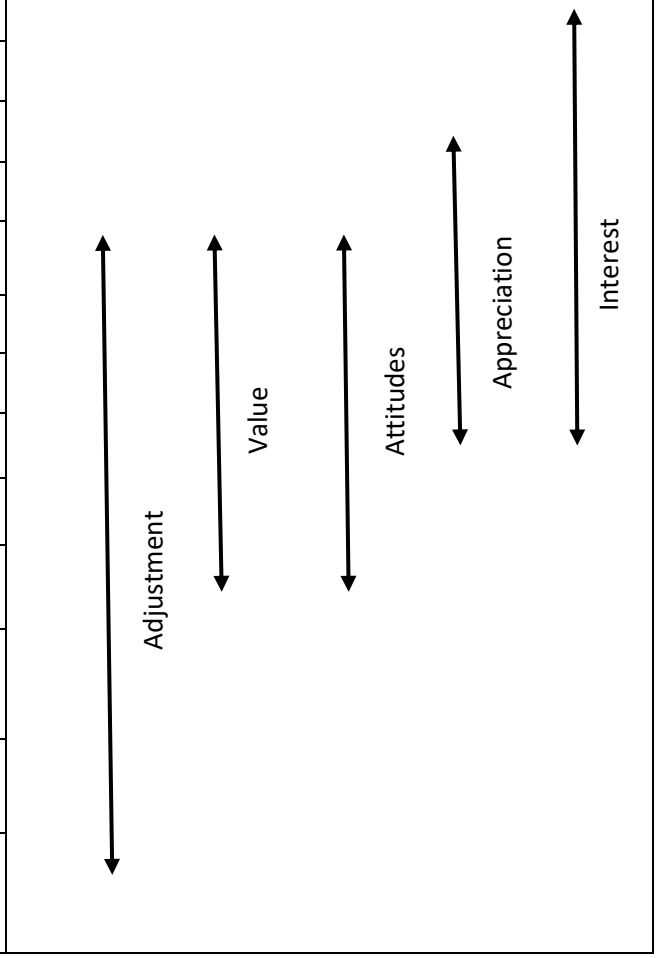
Bloom's Level	Examples and Key Words
(1) Remember: Recall or retrieve previously learned information	**Example:** Recite safety rules. List the steps in the engineering design process. **Key Words:** define, describe, identify, label, list, match, recall, recite, recognize reproduce
(2) Comprehend: Restating a problem in one's own words, or interpreting content or instructions.	**Example:** Explain how to conduct an experiment. Translate an equation into a spreadsheet. **Key Words:** convert, distinguish, explain, extend, paraphrase, rewrite, summarize.
(3) Apply: Apply what was learned to solve a problem, or use a concept in a new situation	**Example:** Calculate stress in a in a beam. Construct a free body diagram. **Key Words:** Calculate, compute, construct, determine, predict, produce, solve, use.
(4) **Analyze:** Break concepts or problems into their component parts so that their structure can be understood	**Example:** Select the appropriate technique(s) to interpret data. Identify the largest bending moment in structure. Key Words: Breakdown, compare, contrast, differentiate, identify, illustrate, infer, relate, select, separate.
(5) **Synthesize:** Combining disparate knowledge to create a new whole. Build a pattern or matrix from diverse elements	**Example:** Design a structure to carry specified loads. Create construction specifications for a project. **Key Words:** Categorize, compile, create, design, devise, plan, revise, summarize
(6) **Evaluate:** Making judgements about the value of ideas, work products or processes.	**Example:** Critique a proposed design. Justify a novel design or construction technique. **Key Words:** Assess, conclude critique, judge, justify, validate.

The classification scheme developed by Krathwohl and his colleagues is briefly summarized in Table 2. Table 2 presents a collection of affective activities that represent an internalization continuum where level one, *receiving*, is the lowest level of internalization and level five, *characterization by a value complex* is the highest. Also illustrated in Table 2 is a set of affective behaviors that are associated with the continuum of activities. It is generally accepted that one's set of values are not significantly adjusted until one is willing to respond to or accept a concept or phenomenon. *Receiving* is the most basic level of the continuum and is achieved when the engineer is simply made aware of material, ideas or phenomena and is willing to tolerate them. *Responding* is when an engineer is willing to participate in active discussion and perhaps question these new ideas or concepts in an attempt to better understand them. *Valuing* is when the engineer commits to a concept or idea and practices it because a perceived benefit can

be derive or possibly because it is the right thing to do. *Organization* occurs when the engineer assigns a value to an idea or concept and internalizes it as a consistent behavioral philosophy by developing a prioritization scheme that is based on resolving conflict between contrasting values. *Characterization* occurs when the engineer acts consistently in accordance with the values that he or she has internalized. The highest level of the value system then forms consistent behavior at this level under all circumstances. Tables 3 and 4 offer simplified definitions of the activities and possible examples of actions that would signify attainment of a particular level on the continuum. Just as in the cognitive domain, the affective domain has a list of action verbs that can be used in defining activities and actions for each level of the domain. Table 5 presents a partial list of those verbs.

Even the original BOK Task Committee concluded that knowledge and skills measurable in the cognitive domain, while necessary, were not sufficient to be a fully functioning professional civil engineer. A civil engineer's attitude, that is, the manner in which he or she approaches and values

Table 2. Levels of Internalization in the Affective Domain (Adapted from Krathwohl, et.al.,[7])

	Level of Internalization	
1 Receiving	1.1 Awareness	
	1.2 Willingness to receive	
	1.3 Selected Attention	
2 Responding	2.1 Acquiescence in Responding	
	2.2 Willingness to Respond	
	2.3 Satisfaction in Responding	
3 Valuing	3.1 Acceptance	
	3.2 Preference for a Value	
	3.3 Commitment	
4 Organization	4.1 Conceptualization of a Value	
	4.2 Organization of a Value System	
5 Characterization by a Value Complex	5.1 Generalized Set	
	5.2 Characterization	

his or her work, determines how effectively he or she uses knowledge and skills. Accordingly, they concluded that attitude was an essential part of the civil engineering BOK [14]. Yet the

original task committee did not address how to assess attitude nor did it describe any level of attainment. While the BOK2 Task Committee did address a methodology to address attitudes through the affective domain and even established an attainment matrix for certain outcomes, they concluded that mechanisms to assess attainment in the affective domain would be ill-defined and it would be difficult to create a uniform assessment specification. Instead, the BOK2 Task Committee elected to create a separate, standalone outcome, *Attitudes*. Levels of attainment for the *Attitude* outcome were described entirely within the cognitive domain [6].

Motivation for addressing attainment of the BOK in the affective domain?

The 2006 ASCE Summit on The Future of Civil Engineering - 2025 [14] portrayed the engineer of the future to be knowledgeable, skillful, and one who embraces attitudes conducive to professional practice. While the first two attributes are conveniently measured in the cognitive domain, attitudes most often are a reflection of one's value system and, as such, outcomes related to attitude should be measured in the affective domain. Duczyminski [15] points out that, regardless of topic, affective outcomes are often closely related to deeper levels of thinking. Students engaged in a subject who recognize its value, can exhibit a change of attitude, and ultimately achieve a consistent behavior. A number of academics have recognized the need to supplement cognitive learning with the attainment of affective outcomes to promote deeper learning and have incorporated specific learning strategies to accomplish this [16],[17],[18]. Bielefeldt [18], for example, used project based learning and project based service learning to reach the synthesis level in the cognitive domain and the valuing or even organization level in the affective domain. Again, this suggests that students learn deeper when affective outcomes are addressed. Lynch [19] suggests there is overlap between the affective and cognitive domains, especially at the lower levels of attainment in each domain. However, he and his colleagues point out that in addition to overlap, there is synergy among the two domains throughout all levels. The two domains can express concern about different aspects of a topic, and clearly, knowledge about something is different than internalization of a value related to it. Expressing that value in professional action is an attribute that must be developed through the educational and experiential processes which

Table 3. Simplified Definitions of Activities in the Affective Domain Continuum

Level	Definition
Receiving	Being aware of or attending to something in the environment.
Responding	Exhibit some new behaviors as a result of experience.
Valuing	Display some definite involvement or commitment.
Organization	Integrate a new value into one's general set of values, giving it some ranking among one's general priorities.
Characterization by Value	Act consistently with the new value.

qualify an engineer for entry into the professional practice of civil engineering. Based on this and other evidence in the literature the BOK3 Task Committee was motivated to reconsider attainment of BOK outcomes in the affective domain.

Selection and classification of BOK3 Outcomes

As previously stated, the number of unique outcomes identified in both the ASCE member survey and BOK2 totaled thirty-six. Initially, every member of the BOK3 Task Committee was assigned two or three outcomes with a charge of creating an attainment rubric in both the cognitive and affective domains and a brief rationale for the inclusion of the outcome in the Third Edition of the Civil Engineering Body of Knowledge (BOK3). At the conclusion of this exercise the committee deliberated for two days in an attempt to reduce the number of outcomes to a manageable and practical level. Based on the responses from the survey and discussion among committee members several of the existing BOK2 outcomes were eliminated. Notably, globalization, public policy, business and public administration, and contemporary issues and historical perspectives were eliminated as stand-alone outcomes. Additionally, some of the existing 24 outcomes were slightly renamed to include elements of suggested new areas without explicitly creating a new outcome. Through a process of combination, elimination and aggregation of concepts, the number of outcomes was ultimately reduced to 21 in the proposed first draft of the BOK3. As in the BOK2 the outcomes are grouped into three categories; foundational (4), technical (10), and professional (7). This concept of categorization is still under discussion because the distinction between technical and professional is often blurred. Initially the committee attempted to classify all 21 proposed outcomes using both the cognitive and affective domains. However, it proved difficult to distinguish the difference between

Table 4. Example of Actions Demonstrating Affective Attainment.

Level	Example
Receiving	Individual reads a book passage and recognizes the relationship to ethical behavior.
Responding	Individual participates in a discussion about the book, reads another book by the same author or another book about ethical behavior, etc.
Valuing	The individual demonstrates this by voluntarily attending a lecture on ethical behavior.
Organization	The individual organizes a study session for other students on topics related to ethical behavior.
Characterization by Value	The individual is firmly committed to the value, perhaps becoming a public advocate of a revised or new code of ethics for his profession.

Table 5. Partial List of Action Verbs Appropriate for Each Level of the Affective Domain

Receiving	Responding	Valuing	Organization	Characterization by Value
Acknowledge	Complete	Accept	Codify	Affect
Attend	Comply	Apply	Discriminate	Attest
Aware	Cooperate	Defend	Display	Confirm
Develop	Discuss	Devote	Order	Corroborate
Identify	Examine	Pursue	Organize	Internalize
Receive	Obey	Seek	Systematize	Substantiate
Recognize	Respond	Support	Weigh	Verify

the attainment of a level in the affective domain from a corresponding level in the cognitive domain for many of the foundational and technical outcomes. Evidence of the parallelism in wording between the cognitive and affective domains for two of the technical outcomes is illustrated in Table 6, where affective levels are positioned against corresponding cognitive levels.

As a result, the committee elected to specify attainment levels for all 21 proposed outcomes in the cognitive domain, but only the seven professional outcomes are described in the affective domain. Individual committee members made a first attempt at developing statements to define actions that would indicate attainment for each level of the affective domain, as well as establishing target levels of attainment along the path to entry into professional practice of civil engineering. The work of the individual members was reviewed by the full committee where modifications were made to outcome statements and in some cases the level of attainment and the pathway to fulfillment were changed by the full committee. Finally, an editing subcommittee reviewed all of the outcome statements to produce a unified set of outcome statements that were consistent with the concepts and key words from Krathwolh's Taxonomy for the Affective Domain [7]. The information presented in Tables 7 through 13 represents the demonstrated abilities a civil engineer must possess and the manner in which each level of attainment is fulfilled for each of the seven professional outcomes. The highest level of attainment in the unshaded and bolded region of the tables is the proposed level that a civil engineer should attain for entry into the professional practice of civil engineering. Any level appearing in the shaded region is considered to be beyond the level necessary for entry into professional practice and would be attained through post entry level experience or education. The committee created three new pathways to attainment for both the cognitive and affective domains, which did not appear in BOK2, namely:

- Post Graduate Education (PG) - a replacement for the Master's or P"lus 30" designation in BOK2 that indicates formal education beyond the baccalaureate degree;

- Mentored Experience (ME) - experience gained under the mentorship of an engineer who has already satisfied the BOK requirements for entry into professional practice; and
- Self Directed (SD) - a program of learning initiated and pursued by the individual.

Two of these new pathways, in addition to the existing Undergraduate Education (UG) pathway appear in Tables 7-13.

Future Work of the Committee

The BOK3 Committee is currently creating explanations to define the important characteristics of each outcome and the rationale for its inclusion into the BOK3. In addition, the explanations include statements to illustrate how outcomes or concepts which did not make the final outcome cut would be incorporated into one of the final outcomes. For example, the explanations for the *design outcome* incorporates concepts of safety, historical perspective, economic impact and cultural awareness. Once the explanations are finalized, the general membership will be surveyed once again to ascertain if an important outcome is missing, if the combination of outcomes creates confusion, or if an outcome should be eliminated. Further the membership will be asked to comment on the proposed levels of attainment of each outcome for entry into professional practice and if the pathway for attainment is appropriate. When considering he results of the survey, the committee may elect to add some additional foundational and technical outcomes to the list of those that will be assessed in the affective domain. Currently leading candidates for inclusion in the affective domain are Humanities, Social Science, Sustainability, Risk and Uncertainty. By the time this paper is delivered, the results of the survey will have been compiled and a revised draft of the BOK completed. The activities of the committee are tracked and archived at the ASCE Collaborate site devoted to the BOK3 Task Committee. ASCE members with permission may access this site at https://collaborate.asce.org/home. It is the intent of the committee to have a completed BOK3 document by October of 2018 which may be publically distributed for comment before presentation to the ASCE Board of Direction for approval.

Table 6. Comparison of Proposed Attainment Statements in the Cognitive and Affective Domain

Outcome Level Descriptor Affective/Cognitive		**1—Receiving/ Remember**	**2—Responding/ Comprehend**	**3—Valuing/ Apply**	**4— Organizing/Analyze**	**5— Characterization/ Synthesize**	**6 -/Evaluate**
Risk and Uncertainty	Affective	Be **aware** of uncertainties and variabilities in data and knowledge relevant to engineering design and project management.	**Discuss** the differences between uncertainties that are data-based and knowledge-based	Support the application of the principles of probability and statistics to solve problems containing uncertainties.	Weigh the impacts of uncertainties on the demand and capacity of a well-defined system and project management.	**Advocate** criteria for the ill-defined design of an engineered system or project management to manage the risk.	
	Cognitive	**Identify** concepts and principles of probability, statistics and risk relevant to civil engineering.	**Explain** concepts and principles of probability, statistics and risk relevant to civil engineering.	**Apply** concepts and principles of probability and statistics and **determine** risk relevant to civil engineering.	**Select** appropriate concepts and principles of probability and statistics and **analyze** risk in complex civil engineering problems.	**Integrate** risk analyses into the solutions to complex civil engineering problems.	**Assess** the acceptability of the risks associated with solutions to complex civil engineering problems.
Design	Affective	Be **aware** of the factors involved in the engineering design process	**Examine** codes, standards and constraints related to engineering design.	**Apply** design principles and constraints to the solution of an engineering problem.	**Discriminate** between design alternatives based on client need, realistic constraints and responsibility to the public.	**Advocate** for responsible engineering designs which address concerns for public safety, sustainability and societal impact.	
	Cognitive	**Define** engineering design and the engineering design process.	**Explain** engineering design and the engineering design process.	**Formulate** a set of possible design solutions to complex civil engineering problems.	**Analyze** a set of possible design solutions to complex civil engineering problems.	**Develop** the most appropriate sustainable design solution to complex civil engineering problems.	**Assess** advanced concepts and principles in the solutions of complex problems in a technical area appropriate to the practice of civil engineering.

Table 7. Sustainability

Affective Domain Level of Achievement	**Demonstrated Ability**	**Fulfilled Through**
1 – Receive (be aware of, be willing to receive, and be attentive to a particular phenomenon or behavior)	**Acknowledge** the importance of sustainability in the practice of civil engineering.	Undergraduate Education
2 – Respond (actively participate in an activity, attend to a task, and react to motivation)	**Comply** with the concepts and principles of sustainability in the practice of civil engineering.	Undergraduate Education
3 – Value (attach value to a particular object, phenomenon, or behavior)	**Value** the benefits of sustainability in the practice of civil engineering.	Mentored Experience
4 – Organize (sort values into priorities by contrasting different values, resolving conflicts between them, and creating a unique value system)	**Integrate** a commitment to sustainability principles in everyday practice.	Self-Developed
5 – Internalize (follow a value system that controls behavior that is pervasive, consistent, predictable, and a defining characteristic)	**Advocate** for principles of sustainability.	

Table 8. Communication

Affective Domain Level of Achievement	**Demonstrated Ability**	**Fulfilled Through**
1 – Receive (be aware of, be willing to receive, and be attentive to a particular phenomenon or behavior)	**Acknowledge** the importance of effective and persuasive communication to technical and nontechnical audiences.	Undergraduate Education
2 – Respond (actively participate in an activity, attend to a task, and react to motivation)	**Practice** effective and persuasive communication to technical and nontechnical audiences.	Undergraduate Education
3 – Value (attach value to a particular object, phenomenon, or behavior)	**Value** effective and persuasive communication to technical and nontechnical audiences.	Mentored Experience
4 – Organize (sort values into priorities by contrasting different values, resolving conflicts between them, and creating a unique value system)	**Display** effective and persuasive communication to technical and nontechnical audiences.	Self-Developed
5 – Internalize (follow a value system that controls behavior that is pervasive, consistent, predictable, and a defining characteristic)	**Advocate** for effective and persuasive communication to technical and nontechnical audiences.	

Table 9. Teamwork and Leadership

Affective Domain Level of Achievement	Demonstrated Ability	Fulfilled Through
1 – Receive (be aware of, be willing to receive, and be attentive to a particular phenomenon or behavior)	**Acknowledge** the importance of teamwork, leadership, diversity and inclusion.	Undergraduate Education
2 – Respond (actively participate in an activity, attend to a task, and react to motivation)	**Practice** concepts and principles of teamwork, leadership, diversity and inclusion.	Undergraduate Education
3 – Value (attach value to a particular object, phenomenon, or behavior)	**Value** the need for teamwork, leadership, diversity and inclusion.	Mentored Experience
4 – Organize (sort values into priorities by contrasting different values, resolving conflicts between them, and creating a unique value system)	**Display** effective teamwork and leadership, including support of diversity and inclusion.	Self-Developed
5 – Internalize (follow a value system that controls behavior that is pervasive, consistent, predictable, and a defining characteristic)	**Advocate for** teamwork and leadership, diversity and inclusion.	

Table 10. Lifelong Learning

Affective Domain Level of Achievement	Demonstrated Ability	Fulfilled Through
1 – Receive (be aware of, be willing to receive, and be attentive to a particular phenomenon or behavior)	**Acknowledge** the need for lifelong learning.	Undergraduate Education
2 – Respond (actively participate in an activity, attend to a task, and react to motivation)	**Participate** in lifelong learning opportunities.	Undergraduate Education
3 – Value (attach value to a particular object, phenomenon, or behavior)	**Value** lifelong learning in the practice of civil engineering.	Mentored Experience
4 – Organize (sort values into priorities by contrasting different values, resolving conflicts between them, and creating a unique value system)	**Establish** a lifelong learning plan to support one's own professional development.	Self-Developed
5 – Internalize (follow a value system that controls behavior that is pervasive, consistent, predictable, and a defining characteristic)	**Advocate for** lifelong learning in the practice of civil engineering.	

Table 11. Professional Responsibilities

Affective Domain Level of Achievement	Demonstrated Ability	Fulfilled Through
1 – Receive (be aware of, be willing to receive, and be attentive to a particular phenomenon or behavior)	**Acknowledge** professional responsibilities relevant to the practice of civil engineering, including safety, legal issues, licensure, credentialing, and innovation..	Undergraduate Education
2 – Respond (actively participate in an activity, attend to a task, and react to motivation)	**Examine** professional responsibilities relevant to the practice of civil engineering, including safety, legal issues, licensure, credentialing, and innovation.	Undergraduate Education
3 – Value (attach value to a particular object, phenomenon, or behavior)	**Value** professional responsibilities relevant to the practice of civil engineering, including safety, legal issues, licensure, credentialing, and innovation.	Mentored Experience
4 – Organize (sort values into priorities by contrasting different values, resolving conflicts between them, and creating a unique value system)	**Form judgements** about professional responsibilities relevant to the practice of civil engineering, including safety, legal issues, licensure, credentialing, and innovation.	Self-Developed
5 – Internalize (follow a value system that controls behavior that is pervasive, consistent, predictable, and a defining characteristic)	**Advocate for** professional responsibilities relevant to the practice of civil engineering, including safety, legal issues, licensure, credentialing, and innovation.	

Table 12. Professional Attitudes

Affective Domain Level of Achievement	Demonstrated Ability	Fulfilled Through
1 – Receive (be aware of, be willing to receive, and be attentive to a particular phenomenon or behavior)	**Acknowledge** professional attitudes including creativity, curiosity, flexibility, and dependability in the practice of civil engineering.	Undergraduate Education
2 – Respond (actively participate in an activity, attend to a task, and react to motivation)	**Practice** professional attitudes including creativity, curiosity, flexibility, and dependability in the practice of civil engineering.	Undergraduate Education
3 – Value (attach value to a particular object, phenomenon, or behavior)	**Value** professional attitudes including creativity, curiosity, flexibility, and dependability in the practice of civil engineering.	Mentored Experience
4 – Organize (sort values into priorities by contrasting different values, resolving conflicts	**Establish** professional attitudes including creativity, curiosity, flexibility, and	Self-Developed

between them, and creating a unique value system)	dependability in the practice of civil engineering.	
5 – Internalize (follow a value system that controls behavior that is pervasive, consistent, predictable, and a defining characteristic)	**Advocate** for professional attitudes including creativity, curiosity, flexibility, and dependability in the practice of civil engineering.	

Table 13. Ethical Responsibility

Affective Domain Level of Achievement	**Demonstrated Ability**	**Fulfilled Through**
1 – Receive (be aware of, be willing to receive, and be attentive to a particular phenomenon or behavior)	**Acknowledge** the importance of ethical behavior in the practice of civil engineering.	Undergraduate Education
2 – Respond (actively participate in an activity, attend to a task, and react to motivation)	**Comply** with the ASCE Code of Ethics and statutory requirements.	Undergraduate Education
3 – Value (attach value to a particular object, phenomenon, or behavior)	**Value** ethical behavior in the practice of civil engineering.	Mentored Experience
4 – Organize (sort values into priorities by contrasting different values, resolving conflicts between them, and creating a unique value system)	**Adhere to** ethical behavior in accordance with the ASCE Code of Ethics and statutory requirements.	Mentored Experience
5 – Internalize (follow a value system that controls behavior that is pervasive, consistent, predictable, and a defining characteristic)	**Advocate for** ethical behavior in the practice of civil engineering.	Self Developed

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