How to Define and Develop Ability-based Leadership for Engineering Students and Early Career Professionals

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Abstract

With *Engineering Criteria 2000*[1] the Engineering Accreditation Commission of the **Accreditation Board for Engineering and Technology (ABET)** moved the engineering education community toward the defining of student outcomes in ability-based terms, and set the expectation that continuous curriculum improvement processes would be based on the measurement of ability-based outcomes. Criterion 3 of ABET's Engineering Criteria specifies a base set of Outcomes that all accredited programs must demonstrate that their graduates have. The word "Leadership" does not appear. This paper describes a project designed to create a

set of ability-based outcomes that define “Leadership” for the early career practicing engineer using constituents representing students, employers, faculty and early career engineers.

Introduction

The Engineering Accreditation Commission of ABET clearly imposed a paradigm shift on engineering education when it established ability-based student outcomes as the basis for assessment, accreditation and continuous curriculum improvement processes. Specifically, **ABET** *Engineering Criteria's* Criterion 3 is of particular interest, because it is applied to all programs; and, the language of Criterion 3: Program Outcomes and Assessment specifically states: “Engineering programs must demonstrate that their graduates have eleven specific outcomes, the now well known ABET (a-k). The challenges of Criterion 3 become immediately obvious with a careful reading of (a-k). Eight Criterion 3 Outcomes begin with the phrase “an ability to…” It is clear that the Engineering Accreditation Commission (EAC) designed Criterion 3 to address ability-based outcomes and ability-based assessment!

Abilities are defined to be collections of specific *Competencies*. *Competencies* are defined to be the application of behavior and motivation to knowledge, understandings and skills. Examples of ability-based Criterion 3 Program Outcomes include:

d) *an ability to function on a multidisciplinary team*,
g) *an ability to communicate effectively*,
i) *an ability to engage in life-long learning*.

Although “leadership” is not included in any Engineering Criteria Outcomes, the development of leadership is considered to be an important student outcome by many engineering programs. This paper describes a process used by Iowa State University Engineering Career Services and college constituents to create a set of ability-based statements that define leadership for early career engineering practice.

Development Process

Having successfully used Critical Incident data gathering techniques to address ABET Criterion 3 Outcomes,[2,3,4,5] this technique was chosen to gather basic examples of early career engineers demonstrating leadership while practicing their professions. Constituents were asked

to prepare Critical Incident stories the describing demonstration of leadership using a **STAR** format. Each **STAR** story was required to contain a description of the specific **S**ituation, the specific **T**asks required, the **A**ctions taken by the individual and the **R**esults of those actions having been taken.

Two focus groups, representing different constituent groups, were conducted to share the **STAR**s, analyze common elements of these stories and construct ability-based statements that represented leadership outcomes demonstrated in the **STAR**s. One constituent group was the Graduates of the Last Decade (GOLD) advisory group to the College of Engineering. This group is comprised of early career engineering professionals that had held significant leadership positions during their undergraduate experience at Iowa State University. The second constituent group was comprised of the Employer Advisory Board for Engineering Experiential Education and its faculty counterpart, the Dean's Task Group for Cooperative Education, Internship, and Summer Work Experience; several students with significant coop/intern experience also serve on this Task Group.

In each focus group subgroups of the constituents (students, employers, faculty, and early career professionals) shared their Critical Incident stories, discussed and analyzed the contents and attempted to reduce the content to a minimum set of ability-based statements. In report-out sessions these subgroups shared their ability-based statements, and statements common to more than one group were combined.

Results

Examples of Ability-based Leadership Outcomes that were common to the two independent focus groups include:

An ability to articulate and champion a vision.
An ability to organize individuals or groups to achieve a specific goal.
An ability to assume risk.
An ability to overcome adversity.
An ability to create effective, productive relationships.
An ability to coach, mentor and develop others.

References

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