An Assessment of ABET's Assessment Process

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Abstract

In the U.S.A., accreditation of engineering schools by ABET has for years been centered on the assessment of the program of the studies and the educational objectives. Much has been written on the methodology for assessment. The emphasis has been on what can be measured. However, some of the most important aspects of education for example, creativity and innovative thinking, which cannot be measured, have been ignored. Enormous amounts of effort in the collection of assessment data and the proportionately small benefits have often frustrated the faculty. The process seems to force teaching to overload and dull the minds of the students rather than to develop them. The heart of education is to develop an ability to think. The process of assessment seems not to place much importance on this aspect of education. Since there is always room for subjectivity on the part of the evaluator, the process is far from being perfect or flawless. At times, subjectivity of an evaluator can cause much extra work, which in the eyes of another evaluator is otherwise fine. Also, why ABET's requirements should be so much more extensive than the licensing requirements. The paper elaborates on these issues, presents examples and suggests remedies to make the process more effective as well as useful.

Introduction

The assessment program for ABET EC2000 has been in use for a number of years. From the beginning, this has been a difficult, time consuming, and a matter of discomfort for the faculty. Much has been written about the development of program educational objectives, program outcomes and the assessment tools [2 3 4 5 7 10]. The purpose of this paper is not to discuss the process of establishing an assessment program but to focus on the effectiveness of the assessment program in light of the experience of going through the four ABET visits at the author's university. Both the advantages and shortcomings are critically examined.

Advantages of Assessment Program

One of the most significant aspects of the ABET EC2000 assessment program is that it has come out of the so called 'bean counting' mode of accreditation process, which was based on counting credit hours, design units, etc. Instead it is now based on what students have learnt and what can they demonstrate in terms of the performance and work they can do. Accordingly, this has encouraged interaction between industry and the faculty. For example, program educational objects are set through an effective participation by faculty and industry. Assessment on what the graduates have been performing requires help of industry. Thus, an ongoing communication between industry and the faculty is a definite pro for the assessment program. Engineering schools are now communicating more regularly with the constituencies that their graduates are supposed to serve. As noted above, interaction among industry and faculty together with the feedback process required by the ABET EC2000 assures both balance and quality in education. In summary, an ongoing assessment program, if properly implemented, can be a step in the right direction to improve the quality of education.

Concerns and Suggestions

General. It has not been easy to fully grasp certain aspects of the evaluation criteria especially a clear definition of an educational objective and the criterion 3. In addition, the significant amount of time and effort required to implement the process has led to an overload on the faculty resulting in the taking away of quality time. A survey was conducted to find faculty's response to the amount of work load required to ABET's assessment process. About seventy five percent of the faculty were the opinion that it does impose extra time demand, at times excessive due to the following up of industry survey for example. It has also been observed based on author's experience over four evaluations that documentation has become increasingly excessive, a typical of the bureaucratic system.

On creative and innovative thinking. Since it has not been easy to develop assessment instruments to measure aspects that are abstract in nature, there has been a tendency to establish program educational objectives and program outcomes that can be measured. The focus of this has taken away from some of the important aspects of education such as creativity and innovative thinking, which cannot be easily measured. Not each faculty is as enthusiastic in restricting their teaching to measurable topics only. The faculty would like to challenge and inspire students to critical and innovative thinking. Is it not the heart of education to develop an ability to think? The process of assessment seems not to place much importance to this aspect of education. An interactive approach[8] that focuses on engaging students can be used for the development of these skills. According to the interactive approach, students are challenged to go beyond the fundamental of a course and develop a topic or issue during specially assigned class periods called "Interactive Periods". The process of probing, through questions and answers, forces students to think creatively. This will be possible if less time is spent on 'awareness skills', as noted further in a subsequent paragraph.

On subjectivity in the evaluation process. No matter how carefully the program objectives have been drawn, it has been the author's experience that they are subject to personal interpretation or personal judgement. In the beginning, quite a lot of time was consumed especially in the wording of the educational objectives so that they are aligned with the wordings and terminology recommended by ABET. This is to minimize confusion in the interpretation of ABET's program. There is also a room for subjectivity on the part of the evaluator. It has yet to be tested as to how differently two evaluators would evaluate the same program. The author recognizes the need for further research on this aspect. This should help minimize the room for subjective interpretation of Program Educational Objectives by the evaluators and the program of host institution. The author's experience on such subjectivity by an evaluator has been painful because it was not only very discouraging but required much extra work, thus, taking away quality time from the faculty. Program Educational Objectives (PEO) were acceptable in 2004 but were not acceptable in 2010. We were conscientious of the need for periodic revisions of PEO and had determined that no revision/changes were warranted for 2010. This is not to reflect upon evaluators' capability but to point out that because of the lack of set standards for evaluations, an evaluator cannot escape subjectivity.

On employer survey and advisory board. Often, it has not been easy to make industry take enthusiastic participation in the assessment instrument such as an employer survey. Very few

professors engaged in research would like to be an evaluator or an active participant in the assessment program. With regards to the employers' survey, there seems to be no standard check as to how representative the survey is. It is not only the numbers of responses that are important but also how well the different sub-disciplines of a discipline in engineering have been represented by the participating employers. A balanced representation of employers should make the survey more meaningful. A survey by EBI (Education Benchmark Incorporated) is very common, and a large number of universities use it for employers and alumni surveys. But there is no check on the representativeness of the data. Similarly, an advisory board may or may not be a representative body. In this era of multitasking and information overload when everybody is too busy, it is not easy to involve a representative cross section of people in the advisory board. Often retirees are the more willing members of an advisory board. There is a need to seek out and broaden involvement of active personnel from industry. Although ABET requires the program to decide themselves in the selection of 'advisory board' and in the drafting of 'employer survey', it is rarely checked, and there are no guidelines for ABET to check if the feedback from the survey or the advisory board is representative of all the sub-disciplines of a major discipline in engineering.

Given the limitation noted above, the formulation of educational objectives through involvement of constituents and the gathering of assessment data from employers may fall short of their intended purposes. Confidence in assessment finding can be improved by minimizing those limitations. This would require careful formulation of the survey assessment tools. Analysis of the data gathered and the feedback for improvement of the program should be based on the data that is first checked for it representativeness before an analysis is undertaken.

On technical versus awareness skills. Per Criteria 3 of EC2000 there are eleven students learning attributes. There is no mention of any relative importance each carry. For example, attributes a–e and k relate to the heart of engineering in which students should be well-grounded, and should, in the author's opinion, carry a lot more importance in determining the ability of students to perform as real engineers. Although the other attributes, which focus on professional and awareness skills (attributes f to j), are important, the quality time that they should, in the author's opinion, take away from teaching real engineering needs to be investigated. This is because the incorporation of these into the curriculum and the difficulties in the development of assessment tools to these attributes have often been a matter of discomfort in the early stages of the assessment process. As the assessment process matures with time, it becomes easier. However, there is a need to assign lesser importance to the awareness skills. This way the assessment process can be more efficient by spending relatively less time on assessment of the awareness skill. There also remains a potential for subjectivity in interpretation of these attributes and in the development of their assessment tools, which can be a source of poor deficiencies/weaknesses. As also noted by Koehn[9], the practitioners believe that the same level of significance should not be stressed on the awareness issue in an engineering curriculum.

It may be noted that licensing requirements are solely based on technical competency except that State of California requires a take home exam on ethics. However, ABET's requirements are much more extensive. Granted that an engineer ought to be aware of global issues, societal concerns, ethics and other issues per ABET's f to j of Criteria 3, but these should not be done at the cost of technical competency. This is not to downgrade the non-technical requirements but to

suggest that ABET should reassess its requirements in the light of the desire to incorporate advances in engineering over the last 3-4 decades in the bachelor's degree program which remains confined to 4 years, and as pointed out by Shuman, et al.[7], the students' complaints against the heavy coursework loads.

On consistency in evaluation. Although it is believed that before one becomes an evaluator, one has to participate as an observer on a typical evaluation visit, yet it has been noticed that some evaluators have never had the experience of being an observer. Some societies, in their training program for evaluators, do not require them to be observers first. Also, there is a need to have a particular program evaluated by two different evaluators to see if there are in any weaknesses in the training programs to determine if the element of subjectivity can impact the final results. The ABET Industry Advisory Council's efforts on quality control are to be published for the purposes of refining the assessment program and encourage greater participation by the engineering faculty especially for continuous improvement on an ongoing basis rather than a year before evaluation time.

Conclusions

1. ABET Assessment process has demonstrated accomplishment in improving the quality of education, yet some important attributes of education such as the creativity and the development of an ability to think have not been given due attention they deserve.
2. In the assessment process, regarding employer survey, there should be a way to check if the data collected is representative of all the areas across a discipline in engineering.
3. There is a need to assign a level of importance to the five Engineering Skills based attributes (a, b, c, e and k) with respect to the other professional skill based attributes (f – j) to help budget the time and efforts to achieve balance.

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